BSc

Syllabuses and Regulations

2019-2020

Faculty of Science
The University of Hong Kong
This booklet includes information on:

- **BSc Degree curriculum and graduation requirements**

- **List of courses and descriptions**
  A full list of Science courses and descriptions include information on course code, title, credit value, contents, semester offered, teaching and learning activities, assessment methods and grade descriptors.

- **Majors & Minors**
  Details of the Science Majors and Minors available for students.

- **Degree regulations**
  Rules that cover curriculum requirements and progression in curriculum, selection of courses, assessment, advanced standing, grading system and degree honours classification.

- **Teaching weeks**
  Teaching weeks show the dates of semesters, University holidays, revision and examination periods.

Further Information detailing instructions on the selection of courses, grading, graduation requirements, honours classification, application for advanced standing and exemption, etc, can be found in the *Handbook for BSc Students* available at http://www.scifac.hku.hk/ug/current

Updates on BSc Syllabuses and Regulations can be found at http://webapp.science.hku.hk/sr4/servlet/enquiry
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SECTION I  

BSc Degree Curriculum and Graduation Requirements

1. A BSc Degree Curriculum

The Faculty of Science offers a number of Science majors leading to the award of a BSc degree.

All students admitted to the first year of the 6901 BSc programme in the academic year of 2019-2020 and thereafter are required to complete at least one Science major out of the 14 regular or 6 intensive Science majors as your primary major for the award of the BSc degree. In addition to the primary Science major, students may take a second major or a minor in a Science or non-Science discipline. Students should note that some non-Science majors and minors may require students to have achieved a minimum academic result before they are allowed to enroll in them.

(a) A typical BSc curriculum for students admitted under the 4-year curriculum

To complete the BSc degree curriculum, you have to pass at least 240 credits, equivalent to 40 6-credit courses, normally spread over 4-years of full-time study. A BSc curriculum typically comprises:

(i) UG5:
   - 2 English courses and 1 Chinese course for university language requirements (18 credits)
   - 6 common core courses in 4 Areas of Inquiry (36 credits)

(ii) For regular Science major:
   - 16 courses for the regular Science major including 2 Science Foundation courses, Disciplinary courses and capstone course (96 credits)
   - A choice of 15 courses as elective courses, or to fulfill the requirements of a minor or a second major (90 credits)

OR

For intensive Science major (applicable to 2015-16 intake and thereafter):
   - 24 - 25 courses for the intensive Science major including 2 Science Foundation courses, Disciplinary courses and capstone course(s) (144 - 150 credits)
   - A choice of 6 - 7 courses as elective courses, or to fulfill the requirements of a minor (36 - 42 credits)

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Curriculum requirements (240 credits)

<table>
<thead>
<tr>
<th>Option A</th>
<th>Option B</th>
<th>Option C</th>
<th>Option D</th>
<th>Option E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students taking one</td>
<td>Students taking one</td>
<td>Students taking double majors</td>
<td>Students taking an intensive Science</td>
<td>Students taking an intensive Science</td>
</tr>
<tr>
<td>regular Science</td>
<td>regular Science major and one minor</td>
<td>one major and a 2nd major</td>
<td>major</td>
<td>major and a minor</td>
</tr>
<tr>
<td>major</td>
<td></td>
<td>(one regular Science major and a 2nd major or a regular Science major)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Primary regular Science Major: 96 credits
2 Science Foundation courses (SCNC1111 & SCNC1112, taken in Year 1), 13 Disciplinary courses and 1 Capstone course

Primary intensive Science Major*: 144 - 150 credits
2 Science Foundation courses (SCNC1111 & SCNC1112, taken in Year 1), 21 - 22 Disciplinary courses and 1 - 2 Capstone course(s)

Common Core Courses: 35 credits
6 courses in 4 Areas of Inquiry
(at least 1 and not more than 2 courses from each AoI)

Language Courses: 16 credits
English: 12 credits [6 credits in Core University English (CAES1000), taken in Year 1) and 6 credits in English in the Discipline (CAES9820/CAES9821, taken in Year 2)]
Chinese: 6 credits (GSC1000, taken in Year 3)

Electives: 90 credits
To make up the 240 total credits

Electives: 36 - 42 credits

2nd Major **: 72 - 96 credits
To make up the 240 total credits

Minor*: 36 - 42 credits

Notes:
* Student must select at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits.
** Common Core courses should be completed normally within the first three years of study.
Students who have been admitted to Year 1 in 2018-19 (and thereafter) and have achieved any one of the following qualifications are exempted from this requirement, and Core University English is optional. Those who do not take this course should take a 6-credit elective course in lieu:

- Level 5 or above in English Language in the HKDSE
- holder of a Bachelor's degree from an English-medium university
- achieved Grade A or above in English Language GCE Advanced Level (AL) / Advanced Subsidiary Level (ASL)
- achieved an overall IELTS score of no less than 7 AND with all sub-scores no less than 6.5 on the Reading, Speaking, Listening and Writing Tests
- achieved an overall TOEFL Internet-based test score of no less than 94 AND no less than a 24 on the writing, a 20 on the speaking, a 20 on the listening, AND a 19 on the reading sections
- achieved in International Baccalaureate (IB) Grade 4 or above in English A/ English Language A/ English A: Literature/ English A: Language and Literature (HL); or Grade 5 or above in English B/ English Language B (HL); or Grade 5 or above in English A/ English Language A/ English A: Literature/ English A: Language and Literature (SL)
- achieved Grade 4 or above on the Advanced Placement (AP) English Language/ English Language and Composition/ English Literature and Composition Test
- achieved a NEW Scholastic Aptitude Test (SAT) score of 35 or above on both the Writing & Language Test and Reading Test (from 2016)
- achieved Grade B or above in H1 General Paper at the Singapore GCE A-level
- achieved Grade A or better in English language at Malaysia SPM examination
- achieved Grade A2 or better in Malaysia UEC-Senior English Language
- attained merit (3 points) or above in each set of credits in New Zealand NCEA Literacy (10 credits made up of 5 credits in reading and 5 credits in writing)
- achieved a score of 95% or better in English at All India Senior School Certificate Examination / Higher School Certificate
- achieved a final score of 90% or better in English at Grade 12 Canadian high school curriculum
- achieved Grade B or better in English Language at Sri Lanka Ordinary examination
- achieved a score of 90 or better in English in the Russian Unified State Exam (Единый государственный экзамен, ЕГЭ, Yedinyiy goсударствeniy ekzamen, EGE)
- Academic Speaking and Writing test conducted by CAES for students who have not taken any of the above tests

➢ When applying to take the Academic Speaking and Writing Test, students should provide evidence to the home Faculty and the CAES1000 Course Coordinator that they were admitted to HKU using qualifications other than those included in the above list.

➢ Applicants are required to show the evidence of those other qualifications to the assessor on the day of the Academic Speaking and Writing Test.

➢ If any applicants failed to provide any evidence that they were admitted to HKU using qualifications other than those included in the above list provided by CAES, the CAES assessor has the rights not to allow the applicant to take the test.

To satisfy the Chinese language enhancement requirement, students are required to successfully complete the 6-credit Faculty-specific Chinese language enhancement course, except for:

(a) Putonghua-speaking students who should take CUND9002 (Practical Chinese and Hong Kong Society) or CUND9003 (Cantonese for Non-Cantonese Speaking Students). They may take the course in Year 1 or 2 if they so wish; and

(b) students who have not studied Chinese language during their secondary education or who have not attained the requisite level of competence in the Chinese language to take the Chinese language enhancement course should write to the Board of the Faculty to apply to be exempted from the Chinese language requirement, and

(i) take a 6-credit Cantonese or Putonghua language course offered by the School of Chinese especially for international and exchange students; OR

(ii) take an elective course in lieu.

* Credit requirement for different majors or minors may vary.

* Students having a second major in Science are allowed to double-count the two Science Foundation Courses. The 12 credits can be made up by selecting any courses.

(b) Common Core Curriculum

The Common Core Curriculum is designed to provide key common learning experience for all HKU students and to broaden their horizons beyond their chosen disciplinary fields of study. It focuses on issues that have been, and continue to be, of deeply profound significance to mankind, the core intellectual skills that all HKU undergraduates should acquire and the core values that they should uphold. The Common Core Curriculum is divided into four Areas of Inquiry (A0Is): (1) Scientific and Technological Literacy; (2) Humanities; (3) Global Issues; (4) China: Culture, State and Society. Students have to pass 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits. Common Core courses should be completed normally within the first three years of
the BSc study and cannot be extra taken as free electives.

2. BSc Graduation Requirements and Honours Classification

(a) Award of a BSc degree

For students admitted to the first year in 2014-15 or before, and students admitted directly in the third year in 2016-17 or before:

To be eligible for the award of the degree of Bachelor of Science, students must fulfill the following requirements:

(i) Satisfied the requirements in UG5 of the Regulations for First Degree Curricula’s;
(ii) Passed not fewer than 240 credits, comprising 96 credits of the required courses as prescribed in the major programme of the BSc degree curriculum.

* UG5 specifies that students have to successfully complete:
  (a) 12 credits in English language enhancement, including 6 credits in Core University English¹ (i.e. CAES1000) and 6 credits in an English in the Discipline course² (i.e. CAES9820 Academic English for Science Students);
  (b) 6 credits in Chinese language enhancement³ (i.e. CSCI9001 Practical Chinese for Science Students);
  (c) 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry⁴ with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits; and
  (d) a capstone experience as specified in the syllabuses of the degree curriculum.

For students admitted to the first year in 2015-16, 2016-17 and 2017-18, students admitted directly to the second year in 2017-18 and 2018-19, and students admitted directly to the third year in 2017-18, 2018-19 and 2019-2020:

To be eligible for the award of the degree of Bachelor of Science, students must fulfill the following requirements:

(i) Satisfied the requirements in UG5 of the Regulations for First Degree Curricula’s;
(ii) Passed not fewer than 240 credits, comprising 96 credits of the required courses as prescribed in the regular major programme, or 144 credits (or a higher credit requirement by the accredited bodies) of the prescribed course in the intensive major programme, of the BSc degree curriculum.

* UG5 specifies that students have to successfully complete:
  (a) 12 credits in English language enhancement, including 6 credits in Core University English¹ (i.e. CAES1000) and 6 credits in an English in the Discipline course² (i.e. CAES9820 Academic English for Science Students);
  (b) 6 credits in Chinese language enhancement³ (i.e. CSCI9001 Practical Chinese for Science Students);
  (c) 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry⁴ with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits; and
  (d) a capstone experience as specified in the syllabuses of the degree curriculum.

For students admitted to the first year in 2018-19 and thereafter, and students admitted directly to the second year in 2019-20 and thereafter:

To be eligible for the award of the degree of Bachelor of Science, students must fulfill the following requirements:

(i) Satisfied the requirements in UG5 of the Regulations for First Degree Curricula’s;
(ii) Passed not fewer than 240 credits, comprising 96 credits of the required courses as prescribed in the regular major programme, or 144 credits (or a higher credit requirement by the accredited bodies) of the prescribed course in the intensive major programme, of the BSc degree curriculum.
UG5 specifies that students have to successfully complete:

(a) 12 credits in English language enhancement, including 6 credits in Core University English\(^1\) (i.e. CAES1000) and 6 credits in an English in the Discipline course\(^2\) (i.e. CAES9820 Academic English for Science Students OR CAES9821 Professional and Technical Communication for Mathematical Sciences);

(b) 6 credits in Chinese language enhancement\(^3\) (i.e. CSCI9001 Practical Chinese for Science Students);

(c) 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry\(^4\) with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits; and

(d) a capstone experience as specified in the syllabuses of the degree curriculum.

(b) Honours Classification

For students admitted to the first year in 2016-17 or before, students admitted directly to the second year in 2017-18, and students admitted directly to the third year in 2018-19 or before:

Classification of honours are calculated using the cumulative grade point average CGPA as below:

<table>
<thead>
<tr>
<th>CGPA range</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class Honours</td>
</tr>
<tr>
<td>Second Class Honours Division I</td>
</tr>
<tr>
<td>Second Class Honours Division II</td>
</tr>
<tr>
<td>Third Class Honours</td>
</tr>
<tr>
<td>Pass</td>
</tr>
</tbody>
</table>

For students admitted to the first year in 2017-18 and thereafter, students admitted directly to the second year in 2018-19 and thereafter, and students admitted directly to the third year in 2019-2020 and thereafter:

Classification of honours are calculated using the graduation grade point average GGPA\(^*\) as below:

<table>
<thead>
<tr>
<th>CGPA range</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class Honours</td>
</tr>
<tr>
<td>Second Class Honours Division I</td>
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<tr>
<td>Second Class Honours Division II</td>
</tr>
<tr>
<td>Third Class Honours</td>
</tr>
<tr>
<td>Pass</td>
</tr>
</tbody>
</table>

\(^*\) For students in the 2017-18 intake and thereafter who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core courses with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.

Credits granted for advanced standing in recognition of studies completed successfully before admission to the curriculum and credits transfer in recognition of studies completed on exchange during candidature at HKU are not included in the calculation of GPA.

\(^1\) Candidates who have been admitted to Year 1 in 2018-19 (and thereafter) and have achieved any one of the following qualifications are exempted from this requirement, and Core University English is optional. Those who do not take this course should take a 6-credit elective course in lieu, see Regulation UG6:

- Level 5 or above in English Language in the HKDSE
- holder of a Bachelor’s degree from an English-medium university
- achieved Grade A or above in English Language GCE Advanced Level (AL) / Advanced Subsidiary Level (ASL)
- achieved an overall IELTS score of no less than 7 AND with all sub-scores no less than 6.5 on the Reading, Speaking, Listening and Writing Tests
- achieved an overall TOEFL Internet-based test score of no less than 94 AND no less than a 24 on the writing, a 20 on the speaking, a 20 on the listening, AND a 19 on the reading sections
- achieved in International Baccalaureate (IB) Grade 4 or above in English A1/ English Language A/ English A: Literature/ English A: Language and Literature (HL); or Grade 5 or above in English B/ English Language B (HL); or Grade 5 or above in English A1/ English Language A/ English A: Literature/ English A: Language and Literature (SL)
- achieved Grade 4 or above on the Advanced Placement (AP) English Language/English Language and Composition/English Literature and Composition Test
- achieved a NEW Scholastic Aptitude Test (SAT) score of 35 or above on both the Writing & Language Test and Reading Test (from 2016)
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  ➢ If any applicants failed to provide any evidence that they were admitted to HKU using qualifications other than those included in the above list provided by CAES, the CAES assessor has the rights not to allow the applicant to take the test.

2 (a) To satisfy the English in the Discipline (ED) requirement, candidates who have passed the ED course for a Major but subsequently change that Major are required to pass the ED course for the new Major, or either of the double Majors finally declared upon graduation irrespective of whether the second Major is offered within or outside of the candidates’ home Faculty.

(b) Candidates declaring double Majors can, if they fail in the ED course for one of the Majors, either (i) re-take and successfully complete that failed ED course, or (ii) successfully complete the ED course for the other Major, irrespective of whether the Major is offered within or outside of the candidates’ home Faculty.

(c) Candidates who undertake studies in double Majors or double degrees are not required to take a second ED course but may be advised by the Faculty to do so.

3 Candidates who have not studied Chinese language during their secondary education may be exempted from this requirement and should take a 6-credit elective course in lieu, see Regulation UG6.
Capstone Requirement for Science Students
SECTION II Capstone Requirement for Science Students

Capstone experience is an integral part of the major programme which focuses on integration and application of knowledge and skills gained in the early years of study. The capstone course carries a minimum of 6 credits and students must complete this for fulfillment of the graduation requirements. Capstone course is normally taken in the senior years (year 3 or 4) of study. The earliest that a student is allowed to take a capstone course is their year 3 study. The capstone courses in each Science major may be different but a range of courses (e.g. research project, seminar, field work, internship and capstone project) is offered to suit individual student’s needs and interests. The following courses are currently recognized as capstone courses in the different majors:

<table>
<thead>
<tr>
<th>BSc - Major</th>
<th>Recognized Capstone Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Biochemistry</td>
<td>1. BIOC3999 Directed studies in biochemistry (6)</td>
</tr>
<tr>
<td></td>
<td>2. BIOC4966 Biochemistry internship (6)</td>
</tr>
<tr>
<td></td>
<td>3. BIOC4999 Biochemistry project (12)</td>
</tr>
<tr>
<td>2. Biological Sciences</td>
<td>1. BIOL3994 Directed studies in biological sciences (6)</td>
</tr>
<tr>
<td></td>
<td>2. BIOL4964 Biological sciences internship (6)</td>
</tr>
<tr>
<td></td>
<td>3. BIOL4994 Biological sciences project (12)</td>
</tr>
<tr>
<td>3. Chemistry</td>
<td>1. CHEM3999 Directed studies in chemistry (6)</td>
</tr>
<tr>
<td>Chemistry (Intensive)</td>
<td>2. CHEM4910 Chemistry literacy and research (6)</td>
</tr>
<tr>
<td></td>
<td>3. CHEM4911 Capstone experience for chemistry undergraduates: HKUtopia (6)</td>
</tr>
<tr>
<td></td>
<td>4. CHEM4966 Chemistry internship (6)</td>
</tr>
<tr>
<td></td>
<td>5. CHEM4999 Chemistry project (12)</td>
</tr>
<tr>
<td>4. Decision Analytics</td>
<td>1. STAT3799 Directed studies in statistics (6)</td>
</tr>
<tr>
<td>5. Risk Management</td>
<td>2. STAT4710 Capstone experience for statistics undergraduates (6)</td>
</tr>
<tr>
<td></td>
<td>4. STAT4799 Statistics project (12)</td>
</tr>
<tr>
<td>7. Earth System Science</td>
<td>1. EASC4911 Earth system: contemporary issues (6)</td>
</tr>
<tr>
<td>8a. Ecology &amp; Biodiversity</td>
<td>1. BIOL4991 Ecology &amp; biodiversity project (12)</td>
</tr>
<tr>
<td>8b. Ecology &amp; Biodiversity</td>
<td>1. BIOL3991 Directed studies in ecology &amp; biodiversity (6)</td>
</tr>
<tr>
<td></td>
<td>2. BIOL4911 Conservation science in practice (6)</td>
</tr>
<tr>
<td></td>
<td>3. BIOL4991 Ecology &amp; biodiversity project (12)</td>
</tr>
<tr>
<td>9a. Environmental Science</td>
<td>1. ENVS3999 Directed studies in environmental science (6)</td>
</tr>
<tr>
<td>9b. Environmental Science (Intensive)</td>
<td>2. ENVS4966 Environmental science internship (6)</td>
</tr>
<tr>
<td></td>
<td>3. ENVS4999 Environmental science project (12)</td>
</tr>
<tr>
<td>10. Food &amp; Nutritional Science</td>
<td>1. BIOL3992 Directed studies in food &amp; nutritional science (6)</td>
</tr>
<tr>
<td></td>
<td>2. BIOL4922 Food product development and evaluation (6)</td>
</tr>
<tr>
<td></td>
<td>3. BIOL4962 Food &amp; nutritional science internship (6)</td>
</tr>
<tr>
<td></td>
<td>4. BIOL4992 Food &amp; nutritional science project (12)</td>
</tr>
<tr>
<td>11. Geology</td>
<td>1. EASC4955 Integrated field studies (6)</td>
</tr>
<tr>
<td>Geology (Intensive)</td>
<td>1. MATH3999 Directed studies in mathematics (6)</td>
</tr>
<tr>
<td>12. Mathematics</td>
<td>2. MATH4910 Senior mathematics seminar (6)</td>
</tr>
<tr>
<td>Mathematics (Intensive)</td>
<td>3. MATH4911 Mathematics capstone project (6)</td>
</tr>
<tr>
<td></td>
<td>4. MATH4966 Mathematics internship (6)</td>
</tr>
<tr>
<td></td>
<td>5. MATH4999 Mathematics project (12)</td>
</tr>
<tr>
<td>13. Mathematics / Physics</td>
<td>1. MATH3999 Directed studies in mathematics (6)</td>
</tr>
<tr>
<td></td>
<td>2. MATH4910 Senior mathematics seminar (6)</td>
</tr>
<tr>
<td></td>
<td>3. MATH4911 Mathematics capstone project (6)</td>
</tr>
<tr>
<td></td>
<td>4. MATH4966 Mathematics internship (6)</td>
</tr>
<tr>
<td></td>
<td>5. MATH4999 Mathematics project (12)</td>
</tr>
<tr>
<td></td>
<td>6. PHYS3999 Directed studies in physics (6)</td>
</tr>
<tr>
<td></td>
<td>7. PHYS4966 Physics internship (6)</td>
</tr>
<tr>
<td></td>
<td>8. PHYS4999 Physics project (12)</td>
</tr>
<tr>
<td></td>
<td>2. BIOL4963 Molecular biology &amp; biotechnology internship (6)</td>
</tr>
<tr>
<td></td>
<td>3. BIOL4993 Molecular biology &amp; biotechnology project (12)</td>
</tr>
<tr>
<td>15. Astronomy</td>
<td>1. PHYS3999 Directed studies in physics (6)</td>
</tr>
<tr>
<td>16. Physics</td>
<td>2. PHYS4966 Physics internship (6)</td>
</tr>
<tr>
<td>Physics (Intensive)</td>
<td>3. PHYS4999 Physics project (12)</td>
</tr>
</tbody>
</table>
Credit Unit Statement of BSc Degree Curriculum

SCIENCE
1. General guideline for contact hours requirement in the BSc Degree Curriculum

(a) A 6-credit course has around 120-180 total study hours, including contact hours, study time, assignment and assessment.
(b) About 30% of the total study hours are actual contact hours in the form of a class, e.g. lecture hours.
(c) A 6-credit course has around 36 to 45 lecture hours.
(d) For lecture-based courses, normally there will be tutorial/discussion sessions.
(e) For courses employing a non-lecture or lab-based approach, e.g. field camp, IT-based or project-based courses, students are expected to devote about 120-180 hours for a 6-credit course and 240-360 hours for a 12-credit course.

2. Credit Unit Statement of the BSc Degree Curriculum

The BSc degree curriculum consists of six major types of courses based on the learning activities. The majority of courses in the programmes are 6 credits. Examples of the contact hours requirements for the six categories of courses are described as follows.

(a) Lecture-based courses (6 credits)
Contact hours for 6-credit course: 36 hours of lectures and 12 hours of tutorial/discussion
These courses are taught predominantly by lectures and tutorials. Assessment is by a combination of examination (0-80%) and continuous assessment (20-100%). Continuous assessment tasks include written assignments (totaling no more than 8,000 words) such as essays and project reports, and oral presentations. Details of the assessment tasks can be found in the description of individual courses.

(b) Lecture with laboratory component courses (6 credits)
Contact hours for 6-credit course: 24 hours of lectures, 24 hours of laboratory and 6 hours of tutorial
These courses are taught by a combination of lectures and laboratory/practical sessions. Assessment is by a combination of examination (0-70%) and continuous assessment (30-100%). Continuous assessment tasks include written assignments (totaling no more than 8,000 words) such as essays, laboratory reports, and project reports, and oral presentations. Details of the assessment tasks can be found in the description of individual courses.

(c) Laboratory and Workshop courses (6 credits)
Contact hours: 48 hours of laboratory or workshop and 12 hours of tutorial
These courses aim at enriching the student’s research skills and encourage group work through hands-on activities in which science research is introduced. Students are expected to spend an additional 100 hours on self-study, preparation work for the laboratory, and writing reports. Continuous assessment tasks (100%) include written assignments (totaling no more than 8,000 words) such as laboratory report for each experiment (normally no more than 10 experiments) and essays. Details of the assessment tasks can be found in the description of individual courses.

(d) Project-based courses (6 and 12 credits)
These courses aim at providing students with an opportunity to pursue their own research interest under the supervision of a teacher. The teacher normally meets with the student weekly to discuss project progress. Assessment task is normally through research reports or a dissertation (totaling no more than 10,000 words for a 6-credit course and 20,000 words for a 12-credit course). Oral presentation will form part of the assessment. Details of the assessment tasks can be found in the description of individual courses.

(e) Field camps (6 credits)
Contact hours: at least 72 hours in the field
These courses aim at giving practical experience in a variety of contexts. Fieldwork may be conducted locally or overseas during reading week or summer. Fieldwork courses have a small number of lecture hours but are predominately practical in nature. Assessment tasks
Internship (6 credits)
Students have to undertake at least 160 hours of internship work. Internships aim to offer students the opportunity to gain work experience related to their major of study. The teacher meets with the student regularly to discuss work progress. Students have to undertake at least 160 hours of internship work arranged formally. Assessment tasks (100%) normally include the following outputs: a written report of no more than 2000 words and feedback from the internship supervisor and an oral presentation on students’ internship experience. Details of the assessment tasks can be found in the description of individual courses.

3. The types of courses in the 14 Science Majors and 18 Science Minors are as follows:

<table>
<thead>
<tr>
<th>Majors/Minors</th>
<th>Lecture-based</th>
<th>Lecture with laboratory component</th>
<th>Laboratory &amp; Workshop</th>
<th>Project-based</th>
<th>Field camps</th>
<th>Internship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial Studies (Minor)</td>
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<tr>
<td>Astronomy (Minor)</td>
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<tr>
<td>Biochemistry (Major &amp; Minor)</td>
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<tr>
<td>Biological Sciences (Major)</td>
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<tr>
<td>Chemistry (Intensive Major, Major &amp; Minor)</td>
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<tr>
<td>Computational &amp; Financial Mathematics (Minor)</td>
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<tr>
<td>Decision Analytics (Major)</td>
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<tr>
<td>Earth Sciences (Minor)</td>
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<td>Ecology &amp; Biodiversity (Intensive Major, Major &amp; Minor)</td>
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<tr>
<td>Environmental Science (Major &amp; Minor)</td>
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<tr>
<td>Food &amp; Nutritional Science (Major &amp; Minor)</td>
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<tr>
<td>Geology (Intensive Major &amp; Major)</td>
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<tr>
<td>Marine Biology (Minor)</td>
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<tr>
<td>Mathematics (Intensive Major, Major &amp; Minor)</td>
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<tr>
<td>Molecular Biology &amp; Biotechnology (Intensive Major, Major &amp; Minor)</td>
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<tr>
<td>Operations Research &amp; Mathematical Programming (Minor)</td>
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<tr>
<td>Physics (Intensive Major, Major &amp; Minor)</td>
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<tr>
<td>Plant Science (Minor)</td>
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<tr>
<td>Risk Management (Major &amp; Minor)</td>
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<tr>
<td>Science Entrepreneurship (Minor)</td>
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<tr>
<td>Statistics (Major &amp; Minor)</td>
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</tbody>
</table>

The above different categories of courses follow the unified Credit Unit Statement of the BSc curriculum.
List of BSc Courses and English and Chinese language courses on offer in 2019-2020 and 2020-2021
## List of BSc Courses on offer in 2019/2020 and 2020/2021

### School of Biomedical Sciences

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
<th>Pre-requisite</th>
<th>Available in</th>
<th>Semester offered in 2019 - 2020</th>
<th>Exam. held in 2019 - 2020</th>
<th>Quote</th>
<th>Course Coordinator</th>
<th>Major / Minor (The Major/Minor that this course appears as.)</th>
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</thead>
<tbody>
<tr>
<td>BIOC1600</td>
<td>Perspectives in biochemistry</td>
<td>6</td>
<td>Level 3 or above in HKDSE Biology, Chemistry, or Combined Science with Biology or Chemistry component, or equivalent</td>
<td>Y</td>
<td>Y</td>
<td>Dec</td>
<td>1</td>
<td>Dr J Tanner, Biomedical Sciences</td>
<td>Major in Biochemistry (2014,2013,2012)</td>
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*Availability of courses in 2020-2021 is subject to change.*
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Offered in</th>
<th>Exam Details</th>
<th>Instructor(s)</th>
<th>Major(s)/Minor(s)</th>
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<tbody>
<tr>
<td>BIOC4966</td>
<td>Biochemistry internship</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Biochemistry Major including BIOC3604. This capstone course is for Biochemistry Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 1, 2, S</td>
<td>No exam</td>
<td>Prof J D Huang, Biomedical Sciences</td>
<td>Major in Biochemistry (2019,2018,2017,2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOC4999</td>
<td>Biochemistry project</td>
<td>12</td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Biochemistry Major including 4 of the following 5 courses: BIOL3401, BIOC3601, BIOC3604, BIOC4610 and BIOC4613. BIOC4610 and BIOC4613 can be taken concurrently with this course. This capstone course is for Biochemistry Major students only. This capstone course is ONLY opened to students who are in year 3 or above in the Biochemistry Major program.</td>
<td>Y Y 0</td>
<td>No exam</td>
<td>Dr N S Wong, Biomedical Sciences</td>
<td>Major in Biochemistry (2019,2018,2017,2016,2015,2014,2013,2012)</td>
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**School of Biological Sciences**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Offered in</th>
<th>Exam Details</th>
<th>Instructor(s)</th>
<th>Major(s)/Minor(s)</th>
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<tr>
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<td>Level</td>
<td>Type</td>
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<td>Credits</td>
<td>Pre-requisites</td>
<td>Co-requisites</td>
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<td>BIOL1111</td>
<td>Introductory microbiology</td>
<td>6</td>
<td>NIL</td>
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<td>80</td>
<td>---, Biological Sciences</td>
<td>(2014,2013,2012)</td>
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<td>BIOL1501</td>
<td>Bioethics</td>
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<td>BIOL1502</td>
<td>The gene</td>
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<tr>
<td>BIOL2101</td>
<td>Principles of food chemistry</td>
<td>6</td>
<td>Pass in BIOL1201; and NOT for students who have passed in BIOL3201. The course is only for students admitted in 2017-2018 or thereafter.</td>
<td>1 Dec</td>
<td>70</td>
<td>Dr. J. C. Y. Lee, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science (2019,2018,2017)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credit Hours</td>
<td>Prerequisites</td>
<td>Instructor</td>
<td>Co-ordinator</td>
<td>Major(s)</td>
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<td>Exam</td>
<td>Instructor</td>
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<tr>
<td>BIOL3108</td>
<td>Microbial physiology</td>
<td>6</td>
<td>Pass in BIOL2600 or BIOL2103 or BIOC26004</td>
<td>N N</td>
<td>--- 50 Dr A Yan, Biological Sciences</td>
<td>Major in Biological Sciences (2015,2014,2013,2012)</td>
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<tr>
<td>Code</td>
<td>Course</td>
<td>Prerequisites</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>BIOL3201</td>
<td>Food chemistry</td>
<td>Pass in BIOL2600 or BIOL2103 or BIOL2220 or MEDE2301, and NOT for students who have passed in BIOL2101. This course is only for students admitted in 2016-2017 or before.</td>
<td>Y</td>
<td>Y</td>
<td>1</td>
<td>Dec</td>
<td>30</td>
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<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>Pass in BIOL2600 or BIOL2103 or BIOL2220 or MEDE2301</td>
<td>Y</td>
<td>Y</td>
<td>1</td>
<td>Dec</td>
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<tr>
<td>Code</td>
<td>Course Description</td>
<td>Credits</td>
<td>Pre-requisites</td>
<td>Semester</td>
<td>Instructor</td>
<td>Major Areas</td>
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<tr>
<td>BIOL3209</td>
<td>Food and nutrient analysis</td>
<td>6</td>
<td>Pass in BIOL2101 or BIOL3201</td>
<td>Y Y</td>
<td>1 Dec</td>
<td>Dr J C Y Lee, Biological Sciences</td>
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<tr>
<td>BIOL3210</td>
<td>Grain production and utilization</td>
<td>6</td>
<td>Pass in any level 2 BIOL course</td>
<td>N N</td>
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<td>Prof H Corke, Biological Sciences</td>
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<tr>
<td>BIOL3211</td>
<td>Nutrigenomics</td>
<td>6</td>
<td>Pass in BIOC2600 or BIOL2220 or MEDE2301</td>
<td>Y Y</td>
<td>1 Dec</td>
<td>Dr K C Tan-Un, Biological Sciences</td>
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<tr>
<td>BIOL3215</td>
<td>Principles of dietary assessment</td>
<td>6</td>
<td>Pass in BIOL2102</td>
<td>N N</td>
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<td>Dr J C Y Louie, Biological Sciences</td>
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<tr>
<td>BIOL3216</td>
<td>Food waste management</td>
<td>6</td>
<td>Pass in BIOL2101 or BIOL3201</td>
<td>Y Y</td>
<td>2 May</td>
<td>Dr O Habimana, Biological Sciences</td>
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<tr>
<td>BIOL3217</td>
<td>Food, environment and health</td>
<td>6</td>
<td>Pass in BIOL 2101 or ENVS2001 or ENVS2002 or BIOL3201</td>
<td>Y Y</td>
<td>2 No exam</td>
<td>Dr T. Sobko, Biological Sciences</td>
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<tr>
<td>BIOL3218</td>
<td>Food hygiene and quality control</td>
<td>6</td>
<td>Pass in BIOL2101 or BIOL3201 or BIOL3203 Not for students who have passed in</td>
<td>Y Y</td>
<td>1 Dec</td>
<td>Dr O Habimana, Biological Sciences</td>
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<tr>
<td>BIOL3301</td>
<td>Marine biology</td>
<td>6</td>
<td>Pass in BIOL2306 or ENVS2002</td>
<td>Y Y</td>
<td>1 Dec</td>
<td>Dr M Yasuhara, Biological Sciences</td>
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List of BSc Courses
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Launched</th>
<th>Prerequisites</th>
<th>Assessment</th>
<th>Lecturer</th>
<th>Faculty</th>
<th>Notes</th>
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<td>BIOL3302</td>
<td>Systematics and phylogenetics</td>
<td>6</td>
<td>2016</td>
<td>Pass in BIOL1309; and Any level 2 BIOL course</td>
<td>Y Y 1 Dec 60</td>
<td>Prof R M K Saunders, Biological Sciences</td>
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<tr>
<td>BIOL3303</td>
<td>Conservation biology</td>
<td>6</td>
<td>2016</td>
<td>Pass in BIOL2306</td>
<td>Y Y 2 May 100</td>
<td>Dr T C Bonebrake, Biological Sciences</td>
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<tr>
<td>BIOL3305</td>
<td>Tropical and temperate marine ecology field course</td>
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<td>2016</td>
<td>Pass in &quot;C&quot; or above in BIOL2306 or BIOL3301 or BIOL3303 or ENV2001</td>
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<td>Dr B Russell, Biological Sciences</td>
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<tr>
<td>BIOL3313</td>
<td>Freshwater ecology</td>
<td>6</td>
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<td>Pass in BIOL2102 and BIOL2306</td>
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<td>BIOL3314</td>
<td>Plant structure and evolution</td>
<td>6</td>
<td>2016</td>
<td>Pass in BIOL1309; and Any level 2 BIOL course</td>
<td>Y N 2 May 30</td>
<td>Prof R M K Saunders, Biological Sciences</td>
<td>Biological Sciences</td>
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<td>Course Code</td>
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<td>Credits</td>
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<td>Tutorials</td>
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<td>Y</td>
<td>1 Dec</td>
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<td>Department</td>
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<td>BIOL2220</td>
<td>Cell Biology and Cell Technology</td>
<td>BIOL2103 or BIOL2220 or MEDE2301</td>
<td>6</td>
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<td>Prof A S T Wong, Biological Sciences</td>
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<tr>
<td>BIOL3402</td>
<td>Immunology</td>
<td>BIOL2800 or BIOL2103 or BIOL2220 or MEDE2301</td>
<td>6</td>
<td>May</td>
<td>Dr W B L Lim, Biological Sciences</td>
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<tr>
<td>BIOL3403</td>
<td>Protein Structure and Function</td>
<td>BIOL2800 or BIOL2220 or MEDE2301</td>
<td>6</td>
<td>May</td>
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<td>Protein Structure and Function</td>
<td>BIOL2800 or BIOL2220 or MEDE2301</td>
<td>6</td>
<td>May</td>
<td>Dr Y L Zhai, Biological Sciences</td>
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<td>Course Code</td>
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<td>Credit</td>
<td>Corequisites</td>
<td>Exam</td>
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<td>Major(s)</td>
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<td>BIOL3409</td>
<td>Business aspects of biotechnology</td>
<td>6</td>
<td>Pass in any level 3 BIOL or BIOC or BBMS course; NOT for students who have passed in BIOL2409. This course is only for students admitted in 2017-2018 or before.</td>
<td>Y</td>
<td>N</td>
<td>2019,2018,2017,2016; Major in Molecular Biology &amp; Biotechnology (Intensive) (2019,2018,2017,2016, 2015,2014,2013,2012); Biological Sciences</td>
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<td>Dr.</td>
<td>Major in</td>
<td>Minor in</td>
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<td>BIOL3501</td>
<td>Evolution</td>
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<td>50</td>
<td>Dr. M Sun, Biological Sciences</td>
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<tr>
<td>BIOL3502</td>
<td>Conservation genetics</td>
<td>6</td>
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<td>Dr. M Sun, Biological Sciences</td>
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<tr>
<td>BIOL3503</td>
<td>Endocrinology; human physiology II</td>
<td>6</td>
<td>N</td>
<td>Y</td>
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<td>60</td>
<td>Dr. C B Chan, Biological Sciences</td>
<td>Major in Biological Sciences</td>
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<td>BIOL3505</td>
<td>Oyster aquaculture and restoration</td>
<td>6</td>
<td>N</td>
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<td>Dr. T Vengatesen, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity</td>
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<tr>
<td>BIOL3506</td>
<td>Evolutionary biology</td>
<td>6</td>
<td>Y</td>
<td>Y</td>
<td>1 Dec</td>
<td>50</td>
<td>Dr. C Schunter, Biological Sciences</td>
<td>Major in Biological Sciences</td>
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<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
<td>6</td>
<td>Y</td>
<td>Y</td>
<td>2 May</td>
<td>60</td>
<td>Dr. A Yan, Biological Sciences</td>
<td>Major in Molecular Biology &amp; Biotechnology</td>
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<tr>
<td>BIOL3606</td>
<td>Diet and disease</td>
<td>6</td>
<td>Y</td>
<td>Y</td>
<td>2 May</td>
<td>70</td>
<td>Dr. J C Y Lee, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science</td>
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<tr>
<td>BIOL3608</td>
<td>Food commodities</td>
<td>6</td>
<td>Y</td>
<td>Y</td>
<td>2 May</td>
<td>30</td>
<td>Prof. N P Shah, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science</td>
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List of BSc Courses

## List of BSc Courses

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Requirements</th>
<th>Instructor</th>
<th>Co-Directors</th>
<th>Exam</th>
<th>Credits</th>
<th>Major Areas</th>
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<td>BIOL3951</td>
<td>Ecology &amp; biodiversity field course</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Ecology &amp; Biodiversity Major. This capstone course is for Ecology &amp; Biodiversity Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Dr L Karczmarski, Biological Sciences</td>
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<td>Major in Ecology &amp; Biodiversity (2015,2014,2013,2012)</td>
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<tr>
<td>BIOL3992</td>
<td>Directed studies in food &amp; nutritional science</td>
<td>Pass in at least 24 credits of advanced level disciplinary core / elective courses in Food &amp; Nutritional Science Major. This capstone course is for Food &amp; Nutritional Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Dr O Habimana, Biological Sciences</td>
<td></td>
<td>Y</td>
<td>1, 2</td>
<td>Major in Food &amp; Nutritional Science (2019,2018,2017,2016,2015,2014,2013,2012)</td>
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<td>BIOL3993</td>
<td>Directed studies in Molecular biology &amp; biotechnology</td>
<td>Pass in at least 24 credits of advanced level disciplinary core / elective courses in the Molecular Biology &amp; Biotechnology Major. This capstone course is for Molecular Biology &amp; Biotechnology Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Dr A Yan, Biological Sciences</td>
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<td>Y</td>
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<td>Major in Molecular Biology &amp; Biotechnology (2019,2018,2017,2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOL3994</td>
<td>Directed studies in biological sciences</td>
<td>Pass in at least 24 credits of advanced level disciplinary core / elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Biological Sciences Major. This capstone course is for Biological Sciences Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Dr S Cannicci, Biological Sciences</td>
<td></td>
<td>Y</td>
<td>1, 2</td>
<td>Major in Biological Sciences (2019,2018,2017,2016,2015,2014,2013,2012)</td>
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<td>BIOL4201</td>
<td>Nutrition and sports performance</td>
<td>Pass in BIOL3202</td>
<td>Dr T Sobko, Biological Sciences</td>
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<td>Course Code</td>
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<td>BIOL4303</td>
<td>Animal behaviour</td>
<td>6</td>
<td>Pass in one of the following courses: BIOL3301, BIOL3313, BIOL3319, BIOL3320 or BIOL3419 Not for students who have passed in BIOL3101</td>
<td>N N</td>
<td>Dr L Karczmarski, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2015,2014,2013,2012)</td>
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<tr>
<td>BIOL4304</td>
<td>Ecosystem functioning and services</td>
<td>6</td>
<td>Pass in one of the following courses: BIOL3301 or BIOL3303 or BIOL3313 or BIOL3319 or ENVIS3019 or ENVIS3004 or ENVIS3020</td>
<td>Y N</td>
<td>Dr B D Russell, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2019,2018,2017,2016,2015,2014,2013,2012)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credit Hours</td>
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<td>Co-requisites</td>
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<td>BIOL4411</td>
<td>Plant and food biotechnology</td>
<td>6</td>
<td>Pass in BIOL3211 or BIOL3401</td>
<td>Y Y</td>
<td>1 Dec</td>
<td>80 Dr Juliana Xu, Biological Sciences</td>
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<tr>
<td>BIOL4415</td>
<td>Healthcare biotechnology</td>
<td>6</td>
<td>Pass in BIOL3401</td>
<td>Y Y</td>
<td>2 May</td>
<td>70 Prof A S T Wong, Biological Sciences</td>
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<td>BIOL4416</td>
<td>Stem cells and regenerative biology</td>
<td>6</td>
<td>Pass in BIOC3601 or BIOL3404 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408</td>
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<td>40 Dr K W Y Yuen, Biological Sciences</td>
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<tr>
<td>BIOL4417</td>
<td>'Omics' and systems biology</td>
<td>6</td>
<td>Pass in BIOC3601 or BIOL3404 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408</td>
<td>Y Y</td>
<td>2 May</td>
<td>40 Dr J W Zhang, Biological Sciences</td>
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<td>Course Code</td>
<td>Course Title</td>
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<td>SEM Credits</td>
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<tr>
<td>BIOL4451</td>
<td>Cetacean behaviour, ecology and conservation: field research experience</td>
<td>Pass in at least one of the following courses: BIOL3101, BIOL3301, BIOL3313 or BIOL3320. This experiential field course is primarily for Ecology &amp; Biodiversity Major students. The earliest that a student is allowed to take this experiential course is their year 3 study; and because it is conducted in early June, this course is best suited for year 3 students.</td>
<td>N</td>
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<td>Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2016,2015,2014,2013, 2012)</td>
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<td>BIOL4501</td>
<td>Molecular phylogenetics and evolution</td>
<td>Pass in BIOL3401 or BIOL3408</td>
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<td>TBC, Biological Sciences</td>
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<tr>
<td>BIOL4861</td>
<td>Ecology &amp; biodiversity internship</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Ecology and Biodiversity Major. This course is for Ecology &amp; Biodiversity Major students only. The earliest that a student is allowed to take this course is their Year 3.</td>
<td>Y</td>
<td>Y</td>
<td>9</td>
<td>Dr T Vengatesen, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2019,2018,2017,2016, 2015,2014,2013,2012)</td>
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<tr>
<td>BIOL4912</td>
<td>Sensory evaluation of food</td>
<td>Pass in BIOL3201; and Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOLXXX or BIOLXXX) in the Food &amp; Nutritional Science Major. This capstone course is for Food &amp; Nutritional Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>N</td>
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<td>15</td>
<td>Dr J C Y Lee, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science (2016,2015,2014,2013, 2012)</td>
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<tr>
<td>BIOL4913</td>
<td>Advanced practicum on food and nutrient analysis</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOLXXX or BIOLXXX) included BIOL3207 and/or BIOL3209 in the Food &amp; Nutritional Science Major. This capstone course is for Food &amp; Nutritional Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>N</td>
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<td>8</td>
<td>Dr J C Y Lee, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science (2018,2017,2016,2015, 2014,2013,2012)</td>
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<tr>
<td>Course Code</td>
<td>Course Name</td>
<td>Pass in BIOL3101: and Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Ecology &amp; Biodiversity Major. This capstone course is for Ecology &amp; Biodiversity Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) included BIOL3203 and/or BIOL4205 in the Food &amp; Nutritional Science Major. This capstone course is for Food &amp; Nutritional Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study. Not for students who have passed in BIOL4210 Food product development.</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Food &amp; Nutritional Science Major. This capstone course is for Food &amp; Nutritional Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Biological Sciences Major. This capstone course is for Biological Sciences Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Molecular Biology &amp; Biotechnology Major. This capstone course is for Molecular Biology &amp; Biotechnology Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Biological Sciences Major. This capstone course is for Biological Sciences Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
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<tr>
<td>BIOL4993</td>
<td>Molecular biology &amp; biotechnology project</td>
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<td>Pass in at least 24 credits of advanced level disciplinary core / elective courses in the Molecular Biology &amp; Biotechnology Major / Molecular Biology &amp; Biotechnology Major (Intensive); and Cumulative GPA of 3.0 or above. This capstone course is for Molecular Biology &amp; Biotechnology Major / Molecular Biology &amp; Biotechnology Major (Intensive) students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y</td>
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<td>No exam</td>
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<td>BIOL4994</td>
<td>Biological sciences project</td>
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<td>Pass in at least 24 credits of advanced level disciplinary core / elective courses in the Biological Sciences Major; and Cumulative GPA of 3.0 or above. This capstone course is for Biological Sciences Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y</td>
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<td>ENVS3020</td>
<td>Global change ecology</td>
<td>ENVS2001 or</td>
<td>N</td>
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<tr>
<td>ENVS3022</td>
<td>Environmental science field course</td>
<td>ENVS2001 or</td>
<td>N</td>
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<td>ENVS3028</td>
<td>Coastal Sustainability</td>
<td>ENVS2001 or</td>
<td>N</td>
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<tr>
<td>ENVS3402</td>
<td>Qualitative data, social science methods and decision-making in environmental science</td>
<td>ENVS2002</td>
<td>N</td>
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<tr>
<td>ENVS4110</td>
<td>Environmental remediation</td>
<td>BIOL3109 or</td>
<td>Y</td>
<td>N</td>
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<td>May</td>
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Centre for Applied English Studies

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<tr>
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<th>Core University English</th>
<th>Code Required</th>
<th>Code Pass</th>
<th>Code Y</th>
<th>Code Nil</th>
<th>Start Date</th>
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<td>Core University English</td>
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<td>Dr P Wong, English</td>
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<tr>
<td>CAES9820</td>
<td>Academic English for science students</td>
<td>NIL</td>
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<td>CAES9821</td>
<td>Professional and technical</td>
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<tr>
<td>CHEM1041</td>
<td>Foundations of chemistry</td>
<td>6</td>
<td>Level 3 or above in HKDSE Combined Science with Chemistry component or Integrated Science, or equivalent. Students without such background but keen on taking this foundation course may approach the course coordinator for consideration. Not for students with Level 3 or above in HKDSE Chemistry or taking any level 1 Chemistry course or above or any equivalent Chemistry course.</td>
<td>Y Y 1 Dec 156</td>
<td>Dr A P L Tong, Chemistry</td>
<td>Chemistry</td>
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<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>6</td>
<td>Level 3 or above in HKDSE Chemistry or equivalent or a pass in CHEM1041. Not for students having taken any level 1 Chemistry course (except for CHEM1041) or above or any equivalent Chemistry course.</td>
<td>Y Y 1, 2 Dec, May 375</td>
<td>Dr A P L Tong, Chemistry</td>
<td>Chemistry</td>
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<tr>
<td>CHEM1043</td>
<td>General chemistry II</td>
<td>6</td>
<td>Pass in CHEM1042; and Not for students in 2014-15 cohort or before having taken CHEM2541.</td>
<td>Y Y 1, 2 Dec, May 290</td>
<td>Dr A P L Tong, Chemistry</td>
<td>Chemistry</td>
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<tr>
<td>CHEM1044</td>
<td>Mathematics in chemistry</td>
<td>6</td>
<td>Pass in CHEM1042 or already enrolled in this course; and Level 2 or above in Module 1 or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH101</td>
<td>Y Y 2 May 80</td>
<td>Prof C M Che, Chemistry</td>
<td>Chemistry</td>
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<tr>
<td>CHEM2041</td>
<td>Principles of chemistry</td>
<td>6</td>
<td>Pass in CHEM1042; and Not for students who have passed in CHEM2341, or have already enrolled in this course; and Not for students who have passed in CHEM2341, or have already enrolled in this course; and Not for students who have passed in CHEM2341, or have already enrolled in this course; and</td>
<td>N N --- --- 140</td>
<td>Dr I K Chu, Chemistry</td>
<td>Chemistry</td>
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<td>Dates</td>
<td>Instructor(s)</td>
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<td>CHEM2241</td>
<td>Analytical chemistry I</td>
<td>6</td>
<td>Pass in CHEM1042 (for students admitted in 2014-15 or before); Pass in CHEM1042; and already enrolled in this course (for students admitted in 2015-16 or thereafter)</td>
<td>Y Y 1, 2 Dec, May</td>
<td>120 Dr E C M Tse (1st sem), Dr I K Chu (2nd sem)</td>
<td>Major in Chemistry (2019,2018,2017,2016,2015,2014,2013,2012); Major in Chemistry (Intensive) (2019,2018,2017,2016,2015)</td>
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<td>CHEM2341</td>
<td>Inorganic chemistry I</td>
<td>6</td>
<td>Pass in CHEM1042; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before); Pass in CHEM1042; and Pass in CHEM1043, or already enrolled in this course; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)</td>
<td>Y Y 1, 2 Dec, May</td>
<td>120 Prof V W W Yam (1st sem), Dr H Y Au Yeung (2nd sem)</td>
<td>Major in Chemistry (2019,2018,2017,2016,2015,2014,2013,2012); Major in Chemistry (Intensive) (2019,2018,2017,2016,2015)</td>
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<td>CHEM2441</td>
<td>Organic chemistry I</td>
<td>6</td>
<td>Pass in CHEM1042; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before); Pass in CHEM1042; and Pass in CHEM1043, or already enrolled in this course; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)</td>
<td>Y Y 1, 2 Dec, May</td>
<td>200 Dr X Y Li (1st sem), Prof P Chu (2nd sem)</td>
<td>Major in Chemistry (2019,2018,2017,2016,2015,2014,2013,2012); Major in Chemistry (Intensive) (2019,2018,2017,2016,2015)</td>
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<tr>
<td>CHEM2443</td>
<td>Fundamentals of organic chemistry for pharmacy students</td>
<td>6</td>
<td>Pass in CHEM1042; and Not for students who have passed CHEM2442, or already enrolled in this course. (This course is for BPharm students only)</td>
<td>N N --- ---</td>
<td>60 Dr P H Toy, Chemistry</td>
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<tr>
<td>CHEM2541</td>
<td>Introductory physical chemistry</td>
<td>6</td>
<td>Pass in CHEM1042; and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before); Pass in CHEM1042 and CHEM1043, and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)</td>
<td>Y Y 2 May</td>
<td>100 Dr J Y Tang</td>
<td>Major in Chemistry (2019,2018,2017,2016,2015,2014,2013,2012); Major in Chemistry (Intensive) (2019,2018,2017,2016,2015)</td>
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<td>CHEM3141</td>
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<td>Y Y 2 May</td>
<td>100 Dr W T Chan</td>
<td>Major in Chemistry (2014,2013,2012); Major in Environmental Science</td>
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<tr>
<td>CHEM3243</td>
<td>Introductory instrumental chemical analysis</td>
<td>6</td>
<td>Pass in CHEM2041 or CHEM2241, and pass in CHEM3241, or have already enrolled in this course.</td>
<td>Y</td>
<td>May</td>
<td>65 Dr X Li, Chemistry</td>
<td>Minor in Chemistry (2019,2018,2017,2016,2015,2014,2013,2012)</td>
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<td>CHEM3244</td>
<td>Analytical techniques for pharmacy students</td>
<td>6</td>
<td>Pass in BPHM2136 (This course is for BPharm students only)</td>
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<td>6</td>
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<td>CHEM3542</td>
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<td>Y Y 2</td>
<td>May</td>
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<td>CHEM3999</td>
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<td>CHEM4142</td>
<td>Symmetry, group theory and applications</td>
<td>6</td>
<td>Pass in CHEM3341</td>
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<td>Dec</td>
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<td>CHEM4341</td>
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List of BSc Courses
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<td>CHEM4910</td>
<td>Chemistry literacy and research</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major including CHEM3241, and CHEM3341, and CHEM3441, and CHEM3541. This capstone course is for Chemistry Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y</td>
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<td>No exam</td>
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<td>Dr X Li, Chemistry</td>
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<tr>
<td>CHEM4911</td>
<td>Capstone experience for chemistry undergraduates: HKUtopia</td>
<td>6</td>
<td>Students are expected to have satisfactorily completed all introductory chemistry disciplinary core courses and at least 24 credits of advanced level disciplinary core/elective chemistry courses in the Chemistry Major. Students who are interested in taking the course should contact the course coordinator for application in April - May. Late application may not be considered. This capstone course is for Chemistry Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y</td>
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<td>No exam</td>
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<td>Dr A P L Tong, Chemistry</td>
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The earliest that a student is allowed to take this capstone course is their year 3 study.

### School of Chinese

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<tr>
<td>CSCI9001</td>
<td>Practical Chinese for science students</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>Y</td>
<td>1, 2</td>
<td>Dec, May</td>
<td>Mr. K W Wong</td>
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### Department of Earth Sciences

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<td>EASC1020</td>
<td>Introduction to climate science</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>Y</td>
<td>2</td>
<td>No exam</td>
<td>Dr. Z H Liu</td>
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<tr>
<td>EASC1401</td>
<td>Blue Planet</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>Y</td>
<td>1, 2</td>
<td>Dec, May</td>
<td>Dr. P Bach</td>
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<tr>
<td>EASC1402</td>
<td>Principles of geology</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>Y</td>
<td>1</td>
<td>Dec</td>
<td>Prof. M Sun</td>
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<tr>
<td>EASC1403</td>
<td>Geological heritage of Hong Kong</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>Y</td>
<td>2</td>
<td>May</td>
<td>Prof. M F Zhou</td>
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<tr>
<td>EASC1404</td>
<td>Early life on earth</td>
<td>6</td>
<td>NIL</td>
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<td>EASC1405</td>
<td>Peaceful use of nuclear technologies</td>
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<tr>
<td>EASC1406</td>
<td>Introduction to the earth-life system</td>
<td>6</td>
<td>Pass in EASC1401</td>
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<td>Y</td>
<td>2</td>
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<td>Dr. S Crowe</td>
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<tr>
<td>EASC2401</td>
<td>Fluid/solid interactions in earth processes</td>
<td>6</td>
<td>Pass in EASC1401 or EASC1402</td>
<td>Y</td>
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<td>2</td>
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<td>Dr. K H Lemke</td>
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<tr>
<td>EASC2402</td>
<td>Field and laboratory methods</td>
<td>6</td>
<td>Pass in EASC1401 or EASC1402</td>
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<td>No exam</td>
<td>Dr. A King</td>
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## List of BSc Courses

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<td>EASC3403</td>
<td>Sedimentary environments</td>
<td>6</td>
<td>Pass in EASC2402 or EASC3402</td>
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<tr>
<td>EASC3404</td>
<td>Structural geology</td>
<td>6</td>
<td>Pass in EASC2402 and EASC3402</td>
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<td>EASC3405</td>
<td>Environmental remote sensing</td>
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<td>EASC3406</td>
<td>Reconstruction of past climate</td>
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<td>EASC3408</td>
<td>Geophysics</td>
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<td>EASC3409</td>
<td>Igneous and metamorphic petrogenesis</td>
<td>6</td>
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<th>Major in Geology</th>
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<td>EASC3413</td>
<td>Engineering geology</td>
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<td>Pass in EASC3410 and EASC3414, or already enrolled in these courses This course is only for final year students.</td>
<td>Y Y</td>
<td>May</td>
<td>35</td>
<td>Dr L N Y Wong, Earth Sciences</td>
<td>Major in Geology (Intensive)</td>
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<td>EASC3999</td>
<td>Directed studies in earth sciences</td>
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<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in the Geology or Earth System Science Majors; and Cumulative GPA of 2.5 or above. This course is not a capstone course and students cannot use this course to fulfill the capstone requirement of the Earth System Science and Geology Majors. The earliest that a student is allowed to take this course is their year 3 study.</td>
<td>Y</td>
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<td>EASC4911</td>
<td>Earth system: contemporary issues</td>
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<td>EASC4955</td>
<td>Integrated field studies</td>
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<td>Earth sciences internship</td>
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<td>EASC4999</td>
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**List of BSc Courses**
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<td>Natural hazards and mitigation</td>
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<td>Modelling the environment</td>
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<td>Y</td>
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<tr>
<td>ENVS3401</td>
<td>Human dimensions of environmental science</td>
<td>6</td>
<td>N</td>
<td>---</td>
<td>---</td>
<td>N</td>
</tr>
<tr>
<td>ENVS3999</td>
<td>Directed studies in environmental science</td>
<td>6</td>
<td>Y</td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major. Cumulative GPA of 2.5 or above in Environmental Science Major. This capstone course is for Environmental Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Dr C Dingle, Biological Sciences</td>
<td>Y</td>
</tr>
<tr>
<td>ENVS4955</td>
<td>Environmental science in practice</td>
<td>6</td>
<td>N</td>
<td>Pass in at least 12 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major.</td>
<td>Dr M Yasuhara, Biological Sciences</td>
<td>N</td>
</tr>
<tr>
<td>ENVS4966</td>
<td>Environmental science internship</td>
<td>6</td>
<td>Y</td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major.</td>
<td>Dr C Dingle, Biological Sciences</td>
<td>Y</td>
</tr>
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</table>
This capstone course is for Environmental Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Pre-requisites</th>
<th>Y</th>
<th>Y</th>
<th>0</th>
<th>Exam</th>
<th>Instructor(s)</th>
<th>Major in Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV54999</td>
<td>Environmental science project</td>
<td>12</td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major, and Students must have a cumulative GPA of 3.0 or above in Environmental Science Major. This capstone course is for Environmental Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y</td>
<td>Y</td>
<td>0</td>
<td>No exam</td>
<td>Dr C Dingle, Dr A Davies</td>
<td>Environmental Science (2019,2018,2017,2016,2015,2014,2013,2012)</td>
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### Department of Mathematics

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Pre-requisites</th>
<th>Y</th>
<th>Y</th>
<th>1, 2</th>
<th>Dec, May</th>
<th>440</th>
<th>Instructor(s)</th>
<th>Major in Science</th>
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<tbody>
<tr>
<td>MATH1009</td>
<td>Basic mathematics for business and economics</td>
<td>6</td>
<td>Nil. The course has no pre-requisite, but students are expected to have already achieved Level 2 or above in HKDSE Mathematics or equivalent. Not for students who have passed MATH1011 or MATH1013, or have already enrolled in these courses. This course is exclusively for non-Science and non-Engineering students (i.e. not for students from the Faculty of Science or Engineering).</td>
<td>Y</td>
<td>Y</td>
<td>1, 2</td>
<td>Dec, May</td>
<td>440</td>
<td>Dr Y M Chan (1st sem); Dr K H Law (2nd sem), Mathematics</td>
<td>Mathematics</td>
</tr>
<tr>
<td>MATH1011</td>
<td>University mathematics I</td>
<td>6</td>
<td>Nil. The course has no pre-requisite, but students are expected to have achieved Level 2 or above in HKDSE Mathematics or equivalent before enrolling the course, and Not for students with Level 2 or above in Module 1 or Module 2 of HKDSE Mathematics or equivalent.</td>
<td>Y</td>
<td>Y</td>
<td>1, 2</td>
<td>Dec, May</td>
<td>440</td>
<td>Dr H Y Zhang, Mathematics</td>
<td>Mathematics</td>
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<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
<td>Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1009 or MATH1011; and Not for students who have passed MATH1821, or MATH1851 and MATH1853, or have already enrolled in this course.</td>
<td>Y</td>
<td>Y</td>
<td>1, 2</td>
<td>Dec, May</td>
<td>500</td>
<td>Dr C W Wong, Mathematics</td>
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List of BSc Courses

### List of BSc Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Level</th>
<th>Prerequisites</th>
<th>Year</th>
<th>Credits</th>
<th>Instructor(s)</th>
<th>Department</th>
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<tbody>
<tr>
<td>MATH1821</td>
<td>Mathematical methods for actuarial science I</td>
<td>6</td>
<td>Level 4 or above in HKDSE Mathematics plus Module 1, or Level 4 or above in HKDSE Mathematics plus Module 2, or equivalent; and Not for students who have passed MATH1013 or (MATH1851 and MATH1853), or have already enrolled in these courses. For BSc(ActuarSc) students only.</td>
<td>2019,2018,2017,2016,2015,2014,2013</td>
<td>20</td>
<td>Dr J T Chan, Mathematics</td>
<td>BSc in Actuarial Science</td>
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<tr>
<td>MATH1851</td>
<td>Calculus and ordinary differential equations</td>
<td>6</td>
<td>Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1011. (This course is exclusively for Engineering students.)</td>
<td>2019,2018,2017,2016,2015,2014,2013</td>
<td>20</td>
<td>Dr Y K Lau, Mathematics</td>
<td>Mathematics</td>
</tr>
<tr>
<td>MATH1853</td>
<td>Linear algebra, probability and statistics</td>
<td>6</td>
<td>Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1011. (This course is exclusively for Engineering students.)</td>
<td>2019,2018,2017,2016,2015,2014,2013</td>
<td>20</td>
<td>Dr G Han, Mathematics</td>
<td>Mathematics</td>
</tr>
<tr>
<td>MATH2012</td>
<td>Fundamental concepts of mathematics</td>
<td>6</td>
<td>Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853). Students with good grades in HKDSE Math Module 1 or Math Module 2 (or other equivalent qualifications) and have strong interests in math may also apply for taking this course concurrently with its prerequisites courses (subject to the approval from Course Selection Advisors).</td>
<td>2019,2018,2017,2016,2015,2014,2013</td>
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<td>Dr Y M Chan, Mathematics</td>
<td>Mathematics</td>
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<tr>
<td>MATH2014</td>
<td>Multivariable calculus and linear algebra</td>
<td>6</td>
<td>Pass in MATH1013 or (MATH1851 and MATH1853). Not for students who have passed MATH2822 or (MATH2101 or MATH2102) and MATH2211), or have already enrolled in these courses.</td>
<td>2019,2018,2017,2016,2015,2014,2013</td>
<td>20</td>
<td>Dr H Y Zhang, Mathematics</td>
<td>Mathematics</td>
</tr>
<tr>
<td>MATH2101</td>
<td>Linear algebra I</td>
<td>6</td>
<td>Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853)</td>
<td>2019,2018,2017,2016,2015,2014,2013</td>
<td>20</td>
<td>Dr K H Law, Mathematics</td>
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List of BSc Courses

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Year Offered</th>
<th>Lecturer</th>
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<tr>
<td>MATH2102</td>
<td>Linear algebra II</td>
<td>6</td>
<td>Pass in MATH2101 or (MATH1821 and MATH2822)</td>
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<td>Dr T W Ching, Mathematics</td>
</tr>
<tr>
<td>MATH2211</td>
<td>Multivariable calculus</td>
<td>6</td>
<td>Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853)</td>
<td></td>
<td>Dr T W Ching (1st sem); Dr Z Hua (2nd sem), Mathematics</td>
</tr>
<tr>
<td>MATH2241</td>
<td>Introduction to mathematical analysis</td>
<td>6</td>
<td>Pass in MATH1013 or (MATH1851 and MATH1853) or MATH2822. Students are strongly recommended to have taken MATH2012 if they wish to take this course.</td>
<td></td>
<td>Dr Y M Chan (1st sem); Dr T W Ching (2nd sem), Mathematics</td>
</tr>
<tr>
<td>MATH2822</td>
<td>Mathematical methods for actuarial science II</td>
<td>6</td>
<td>Pass in MATH1821. For BSc(ActuarSc) students only.</td>
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<td>Dr J T Chan, BSc in Actuarial Science</td>
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<tr>
<td>MATH3001</td>
<td>Development of mathematical ideas</td>
<td>6</td>
<td>Pass in MATH2101, MATH2102, MATH2211, MATH2241</td>
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<tr>
<td>MATH3002</td>
<td>Mathematics seminar</td>
<td>6</td>
<td>Pass in MATH2012, MATH2101, MATH2211 and MATH2241. Subject to approval by the Department.</td>
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For courses with specific prerequisites and prerequisites year offerings, please refer to the table above.
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Pre-requisites</th>
<th>Grade</th>
<th>Instructor</th>
<th>Major in Mathematics Or Mathematics (Intensive) Or Mathematics/Physics Or Operations Research &amp; Mathematical Programming</th>
<th>Year(s)</th>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Prerequisites</td>
<td>Credit Points</td>
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<tr>
<td>MATH3603</td>
<td>Probability theory</td>
<td>6</td>
<td>Pass MATH2101 and MATH2211 or MATH2014 or MATH2822</td>
<td>Y</td>
<td>Dr Z Qu, Mathematics</td>
<td>Major in Mathematics</td>
<td>Minor in Mathematics</td>
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<tr>
<td>MATH3901</td>
<td>Operations research I</td>
<td>6</td>
<td>Pass MATH2014 or MATH2101 or MATH2102</td>
<td>Y</td>
<td>Dr Z Qu, Mathematics</td>
<td>Minor in Operations Research &amp; Mathematical Programming</td>
<td>Minor in Operations Research &amp; Mathematical Programming</td>
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<tr>
<td>MATH3904</td>
<td>Introduction to optimization</td>
<td>6</td>
<td>Pass MATH2101 and MATH2211 or MATH2014 or MATH2822</td>
<td>Y</td>
<td>Prof W Zang, Mathematics</td>
<td>Bachelor of Arts and Sciences in Applied Artificial Intelligence</td>
<td>Major in Decision Analytics</td>
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<tr>
<td>MATH3905</td>
<td>Queueing theory and simulation</td>
<td>6</td>
<td>Pass MATH2101 and MATH2211 or MATH2014 or MATH2822</td>
<td>N</td>
<td>Dr G Han, Mathematics</td>
<td>Major in Mathematics</td>
<td>Minor in Mathematics</td>
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### List of BSc Courses

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<th>Code</th>
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<th>Exam</th>
<th>Week</th>
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<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<td>Course Code</td>
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<tr>
<td>MATH7504</td>
<td>Geometric topology</td>
<td>6</td>
<td>Pass in MATH3301 and MATH3401</td>
<td>Mathematics Major</td>
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<tr>
<td>MATH7505</td>
<td>Real analysis</td>
<td>6</td>
<td>A good grade in MATH3401 and approval by the course coordinator</td>
<td>Mathematics Major</td>
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<td>Y Y 2 May --- Prof W S Cheung, Mathematics</td>
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<tr>
<td>PHYS1000</td>
<td>Introduction to astronomy</td>
<td>6</td>
<td>Nil</td>
<td>Physics</td>
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<tr>
<td>PHYS1001</td>
<td>University physics</td>
<td>6</td>
<td>NIL</td>
<td>Physics</td>
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<tr>
<td>PHYS1050</td>
<td>Physics for engineering students</td>
<td>6 Level 3 or above in HKDSE Physics or Combined Science with Physics components or equivalent; and (Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1011)</td>
<td>Physics</td>
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<tr>
<td>PHYS1055</td>
<td>How things work</td>
<td>6</td>
<td>NIL</td>
<td>Physics</td>
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<tr>
<td>PHYS1056</td>
<td>Weather, climate and climate change</td>
<td>6 NIL</td>
<td>Y Y 1 Dec --- Dr K M Lee, Physics</td>
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<tr>
<td>PHYS1057</td>
<td>Kitchen science</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>PHYS1150</td>
<td>Problem solving in physics</td>
<td>6 Level 3 or above in HKDSE Physics or equivalent, or Pass in PHYS1240</td>
<td>Physics</td>
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<tr>
<td>PHYS1240</td>
<td>Physics by inquiry</td>
<td>6 Level 3 or above in HKDSE Physics or equivalent, or Pass in PHYS1240</td>
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<tr>
<td>PHYS1250</td>
<td>Fundamental physics</td>
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<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<td>Delivery Schedule</td>
<td>Instructor(s)</td>
<td>Level Requirements</td>
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<tr>
<td>PHYS1650</td>
<td>Nature of the universe</td>
<td>6</td>
<td>Pass in PHYS1240; and Not for students who have passed in PHYS1050, or already enrolled in this course; and Not for students who have passed in any level 2 PHYS course or above.</td>
<td>Dec, May</td>
<td>Dr K M Lee</td>
<td>Major in Astronomy (2017,2016,2015,2014, 2013,2012); Minor in Astronomy (2019,2018,2017,2016, 2015,2014,2013,2012)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Preconditions</td>
<td>Credits</td>
<td>Examination Period</td>
<td>Lecturer</td>
<td>Major in Astronomy (Years)</td>
<td>Major in Mathematics/Physics (Years)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credit Points</td>
<td>Prerequisites</td>
<td>Instructors</td>
<td>Major in</td>
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<tr>
<td>PHYS3350</td>
<td>Classical mechanics</td>
<td>6</td>
<td>Pass in PHYS2250</td>
<td>Y Y 1 Dec</td>
<td>--- Prof S Q Shen, Physics</td>
<td>Major in Mathematics/Physics</td>
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<tr>
<td>PHYS3351</td>
<td>Quantum mechanics</td>
<td>6</td>
<td>Pass in PHYS2265</td>
<td>Y Y 1 Dec</td>
<td>--- Prof W Yao, Physics</td>
<td>Major in Mathematics/Physics</td>
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<tr>
<td>PHYS3450</td>
<td>Electromagnetism</td>
<td>6</td>
<td>Pass in PHYS2255</td>
<td>Y Y 2 May</td>
<td>--- Prof X D Cui, Physics</td>
<td>Major in Mathematics/Physics</td>
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<td>PHYS3550</td>
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<td>PHYS7351</td>
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<td>Y</td>
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<td>PHYS7450</td>
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List of BSc Courses

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### List of BSc Courses

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<tr>
<td>PHYS7550</td>
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<td>PHYS7551</td>
<td>Graduate solid state physics</td>
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<td>PHYS7650</td>
<td>Stellar atmospheres</td>
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<td>PHYS7750</td>
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### Faculty of Science

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<th>Exam</th>
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<th>Major in</th>
<th>Minor in</th>
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**Faculty of Science**

**ENTR2001** Professional and leadership development 6 Any level 1 undergraduate course Y Y 1 No exam 24 Dr R Law, Faculty Minor in Science Entrepreneurship (2019,2018,2017)


**ENTR3002** Customer analysis and strategic marketing 6 Pass in IIMT1611 and ENTR2001 Y Y 2 No exam 20 Dr R Law, Faculty Minor in Science Entrepreneurship (2019,2018,2017)

**ENTR4996** Entrepreneurship internship 6 Pass in ENTR3001 and ENTR3002 Students must be in their Year 3 study or beyond, as well as minoring in Science Entrepreneurship. Y Y S No exam 20 Dr R Law, Faculty Minor in Science Entrepreneurship (2019,2018,2017)

**ENTR4999** Entrepreneurship project 6 Pass in ENTR3001 and ENTR3002 Students must be in their Year 3 study or beyond, as well as minoring in Science Entrepreneurship. N Y --- --- 20 Dr R Law, Faculty Minor in Science Entrepreneurship (2019,2018,2017)

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<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
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<td>Y Y 1, 2</td>
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(This course is compulsory for all students taking a Science major offered by the Faculty of Science. Students should take this course in their first year.)
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<th>Course Code</th>
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<tr>
<td>SCNC1113</td>
<td>The big history of our planet: a scientific perspective on everything that has ever happened</td>
<td>6</td>
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<td>Level 3 or above in at least one science subject at the pre-university level (HKDSE Physics, Chemistry, Biology, Combined/Integrated Science or equivalent). This course is not offered to students in the 6901 BSc or 6119 BEd&amp;BSc programmes.</td>
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<tr>
<td>SCNC2121</td>
<td>Sustainable food production</td>
<td>6</td>
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<td>Students are expected to have passed at least 30 credits of level 1 and/or level 2 science courses. Students will also</td>
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Students are expected to have passed at least 30 credits of level 1 and/or level 2 science courses. Students who participated or will participate in ORF/SRF must take this course.

**Department of Statistics & Actuarial Science**

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<td>Artificial intelligence: foundation,</td>
<td>6</td>
<td>Y Y</td>
<td>1 Dec</td>
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<td>philosophy and ethics</td>
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<td>APAI3001</td>
<td>Deep learning</td>
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<td>APAI3010</td>
<td>Image processing and computer vision</td>
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<tr>
<td>APAI3021</td>
<td>Modern biostatistics</td>
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<td>APAI3799</td>
<td>Directed studies in Applied AI</td>
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<tr>
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<td>Omics data analysis</td>
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<td>APAI4023</td>
<td>Medical image analysis</td>
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<td>APAI4099</td>
<td>Special topics of applied AI</td>
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<td>STAT2604</td>
<td>Introduction to R programming and elementary data analysis</td>
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<td>Pass or already enrolled in STAT1600 or MATH1821.</td>
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<tr>
<td>STAT2605</td>
<td>Demographic and socio-economic statistics</td>
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<td>(Level 2 or above in HKDSE Mathematics or Level 2 or above in HKDSE Mathematics Extended Module 1 or 2 or equivalent); and Pass or already enrolled in BIOL2102, ECON1280, STAT1601, STAT1602, STAT2601, STAT1603, STAT2901</td>
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<td>STAT2901</td>
<td>Probability and statistics: foundations of actuarial science</td>
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<td>Pass in MATH1821 [for BSc(ActuarSc) students] or already enrolled in this course, or Pass in MATH1013 or already enrolled in this course [for students outside the BSc(ActuarSc) programme]; and Not for students who have passed or enrolled in any of these courses: STAT1601, STAT1602, STAT1603, STAT2601</td>
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<td>STAT3606</td>
<td>Business logistics</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1603 and any University level 2 course) or STAT2601</td>
<td>Y</td>
<td>Y</td>
<td>1 Dec</td>
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<tr>
<td>STAT3609</td>
<td>The statistics of investment risk</td>
<td>Pass in STAT2602, or already enrolled in this course, or Pass in (STAT1603 and any University level 2 course) or STAT3611 or STAT3614; and Not for students who have passed in FINA2220, or have already enrolled in this course; and Not for BSc(Actuarial Science) students</td>
<td>Y</td>
<td>Y</td>
<td>1 Dec</td>
</tr>
<tr>
<td>STAT3610</td>
<td>Risk management and insurance</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1603 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2901. (Not available to Actuarial Science students)</td>
<td>Y</td>
<td>Y</td>
<td>2 May</td>
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<tr>
<td>STAT3611</td>
<td>Computer-aided data analysis</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1603 and any University level 2 course) or STAT3902</td>
<td>N</td>
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
<th>Exam</th>
<th>Offered</th>
<th>Instructor</th>
<th>Fee</th>
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</thead>
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<tr>
<td>STAT3612</td>
<td>Statistical machine learning</td>
<td>Pass in STAT2602 or (STAT1603 and any University level 2 course) or STAT3902, and STAT3600 or STAT3907, or already enrolled in these courses; and Not for students who have passed in STAT4904, or already enrolled in this course; and Not for BSc(A) students.</td>
<td>Y</td>
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<td>Dr A J Zhang, Statistics &amp; Actuarial Science</td>
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<tr>
<td>STAT3613</td>
<td>Marketing analytics</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2901</td>
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<td>Y</td>
<td>Dr C W Kwan, Statistics &amp; Actuarial Science</td>
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<tr>
<td>STAT3614</td>
<td>Business forecasting</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1603 and any University level 2 course), and Not for students who have passed or already enrolled in any of these courses: STAT2601, STAT2901, STAT3907, STAT4901, ECON2280.</td>
<td>N</td>
<td>N</td>
<td>Dr R W L Wong, Statistics &amp; Actuarial Science</td>
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<tr>
<td>STAT3615</td>
<td>Practical mathematics for investment</td>
<td>Pass in (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2902, and Not for students who have passed in STAT2902, or have already enrolled in this course.</td>
<td>Y</td>
<td>Y</td>
<td>Dr A G Benchimol, Statistics &amp; Actuarial Science</td>
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<tr>
<td>STAT3616</td>
<td>Advanced SAS programming</td>
<td>Pass in STAT2601 or STAT2901. Students are strongly recommended to take STAT2603 or STAT2604 prior to taking this course.</td>
<td>N</td>
<td>N</td>
<td>TBC, Statistics &amp; Actuarial Science</td>
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<tr>
<td>STAT3617</td>
<td>Sample survey methods</td>
<td>Pass or already enrolled in BIOL2102, or (ECON1280 and any University level 2 course), or (STAT1601 and any University level 2 course), or</td>
<td>Y</td>
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<td>Ms O T K Choi, Statistics &amp; Actuarial Science</td>
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List of BSc Courses

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<thead>
<tr>
<th>Course Code</th>
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<th>Requirements</th>
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<th>Instructor</th>
<th>Notes</th>
<th>Credits</th>
<th>Type</th>
<th>Time</th>
<th>Exam</th>
<th>Grade</th>
<th>Subject</th>
<th>Discipline/Field</th>
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<tbody>
<tr>
<td>STAT3618</td>
<td>Derivatives and risk management</td>
<td>6 Pass in STAT3615; and Not for students who have passed in STAT3910, or have already enrolled in this course; and Not for students who have passed in STAT3905, or have already enrolled in this course; and Not for students who have passed in FINA2222, or have already enrolled in this course; and Not for BSc(Actuarial Science) students.</td>
<td>Y Y 1 Dec --- Dr R W L Wong, Statistics &amp; Actuarial Science</td>
<td>Major in Risk Management (2019,2018,2017,2016,2015,2014,2013,2012); Minor in Statistics (2019,2018,2017,2016,2015,2014,2013,2012)</td>
<td>Dr R W L Wong</td>
<td>6</td>
<td>Pass</td>
<td>Dec</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Risk Management/New Actuarial Science</td>
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<tr>
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<td>Course Name</td>
<td>Prerequisites</td>
<td>Year Offered</td>
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<td>Department</td>
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<tr>
<td>STAT3909</td>
<td>Life contingencies II</td>
<td>(Pass in STAT3901, or already enrolled in this course; and For BSc(Actuarial Science) students only)</td>
<td>2019-2018, 2017-2016, 2015-2014, 2013</td>
<td>Dr. A. G. Benchimol</td>
<td>Statistics &amp; Actuarial Science</td>
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<td>Credits</td>
<td>Prerequisites</td>
<td>Grade(s)</td>
<td>Instructor(s)</td>
<td>Department</td>
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<tr>
<td>STAT3952</td>
<td>Investment and asset management</td>
<td>6</td>
<td>Pass in STAT3901; and Not for students who have passed in FINA2320, or have already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>N N ---</td>
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<td>TBC, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2012)</td>
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<tr>
<td>STAT3954</td>
<td>Current topics in actuarial science</td>
<td>6</td>
<td>Pass in STAT3901, or already enrolled in this course; or Pass in STAT3909, or already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>N N ---</td>
<td>---</td>
<td>TBC, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2019,2018,2017,2016,2015,2014,2013,2012)</td>
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<td>STAT4610</td>
<td>Bayesian learning</td>
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<td>N Y</td>
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<td>--- Statistics &amp; Actuarial Science</td>
<td>Bachelor of Arts and Sciences in Applied Artificial Intelligence (2019)</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Prerequisites</td>
<td>Year(s)</td>
<td>Course Coordinator</td>
<td>Notes</td>
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<tr>
<td>STAT4711</td>
<td>Capstone experience for actuarial science undergraduates</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective courses in BSc(Actuarial Science) programme including (Pass in STAT3901, or already enrolled in this course; or Pass in STAT3909, or already enrolled in this course); and This capstone course is only for BSc (Actuarial Science) students, and is mutually exclusive with STAT4767 and STAT4798. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>2013</td>
<td>Prof G Yin, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2019,2018,2017,2016, 2015,2014,2013,2012)</td>
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<tr>
<td>STAT4767</td>
<td>Actuarial science internship</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective courses in BSc(Actuarial Science) programme including STAT3901; and This capstone course is only for BSc (Actuarial Science) students, and is mutually exclusive with STAT4711. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>2015</td>
<td>Dr A G Benchimol, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2019,2018,2017,2016, 2015,2014,2013,2012)</td>
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<tr>
<td>STAT4798</td>
<td>Statistics and actuarial science project</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective courses in BSc(Actuarial Science) programme including STAT3902 and STAT3907; and Pass or already enrolled in at least one of the following courses: STAT3911, STAT4602, STAT4904; and This capstone course is only for BSc (Actuarial Science) students; and subject to the consent of course coordinator. This course is mutually exclusive with STAT4711. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>2016</td>
<td>Prof S M S Lee, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2019,2018,2017,2016, 2015,2014,2013,2012)</td>
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</table>
This capstone course is only for students majoring in Decision Analytics/Risk Management/Statistics; and subject to the consent of course coordinator. This course is mutually exclusive with STAT4710. The earliest that a student is allowed to take this capstone course is their year 3 study.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Pre-Requisites</th>
<th>Co-Requisites</th>
<th>Exams</th>
<th>Instructor</th>
<th>Co-ordinator</th>
<th>Year(s) Available</th>
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<tbody>
<tr>
<td>STAT4904</td>
<td>Statistical learning for risk modelling</td>
<td>6</td>
<td>Pass in STAT3907 or STAT3606; and Not for students who have passed in STAT3612, or already enrolled in this course; and For BSc/Actuarial Science students only.</td>
<td>Y, Y, May</td>
<td></td>
<td>Dr C Wang, Statistics &amp; Actuarial Science</td>
<td>STAT3907</td>
<td>2015-2012</td>
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<tr>
<td>STAT7610</td>
<td>Advanced probability</td>
<td>6</td>
<td>Pass in STAT3603 or STAT3903</td>
<td>Y, Y, Dec</td>
<td></td>
<td>Prof H L Yang, Statistics &amp; Actuarial Science</td>
<td>STAT3903</td>
<td>2015-2012</td>
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<tr>
<td>STAT7611</td>
<td>Computational statistics</td>
<td>6</td>
<td>Pass in STAT3600 or STAT3907</td>
<td>Y, Y, Dec</td>
<td></td>
<td>Prof G Yin, Statistics &amp; Actuarial Science</td>
<td>STAT3907</td>
<td>2015-2012</td>
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<tr>
<td>STAT7614</td>
<td>Advanced statistical modelling</td>
<td>6</td>
<td>Pass in STAT3600 or STAT3907</td>
<td>Y, Y, Dec</td>
<td></td>
<td>Dr Y K Chung, Statistics &amp; Actuarial Science</td>
<td>STAT3907</td>
<td>2015-2012</td>
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Common Core Courses

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<tr>
<th>Course Code</th>
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<th>Credit</th>
<th>Exams</th>
<th>Co-ordinator</th>
<th>Year(s) Available</th>
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<tbody>
<tr>
<td>CCCH9020</td>
<td>Science and Technology: Lessons from China</td>
<td>6</td>
<td>Dec</td>
<td>Dr W M Y Cheung, Faculty</td>
<td>2015-2012</td>
</tr>
<tr>
<td>CCCH9052</td>
<td>Arts, Science and Artifacts in Chinese Cultural Heritage</td>
<td>6</td>
<td>No exam</td>
<td>Prof G A Parker, Physics</td>
<td>2015-2012</td>
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<tr>
<td>CCGL9016</td>
<td>Feeding the World</td>
<td>6</td>
<td>No exam</td>
<td>Dr G V Akom, Faculty</td>
<td>2015-2012</td>
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<tr>
<td>CCGL9017</td>
<td>Food: Technology, Trade and Culture</td>
<td>6</td>
<td>Dec</td>
<td>Dr T Sobko, Biological Sciences</td>
<td>2015-2012</td>
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<tr>
<td>CCGL9033</td>
<td>Weapons of Mass Destruction: Science, Proliferation and Terrorism</td>
<td>6</td>
<td>No exam</td>
<td>Dr K H Lemke, Earth Sciences</td>
<td>2015-2012</td>
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<td>CCST9012</td>
<td>Our Place in the Universe</td>
<td>6</td>
<td>May</td>
<td>Dr T D Wotherspoon, Faculty</td>
<td>2015-2012</td>
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<tr>
<td>CCST9013</td>
<td>Our Living Environment</td>
<td>6</td>
<td>No exam</td>
<td>Dr S C Chang, Earth Sciences</td>
<td>2015-2012</td>
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<tr>
<td>CCST9014</td>
<td>Science and Music</td>
<td>6</td>
<td>No exam</td>
<td>Prof H F Chau,</td>
<td>2015-2012</td>
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<tr>
<td>Course Code</td>
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<tr>
<td>CCST9017</td>
<td>Hidden Order in Daily Life: A Mathematical Perspective</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9018</td>
<td>Origin and Evolution of Life</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9019</td>
<td>Understanding Climate Change</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
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<tr>
<td>CCST9021</td>
<td>Hong Kong: Our Marine Heritage</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9022</td>
<td>How the Mass Media Depicts Science, Technology and the Natural World</td>
<td>6</td>
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<td>CCST9023</td>
<td>The Oceans: Science and Society</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9026</td>
<td>Scientific Revolutions: Their Continuing Impact on Our World and Society</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9030</td>
<td>Forensic Science: Unmasking Evidence, Mysteries and Crimes</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9036</td>
<td>Material World: Past, Present, and Future</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9037</td>
<td>Mathematics: A Cultural Heritage</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9038</td>
<td>Science and Science Fiction</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9039</td>
<td>Statistics and Our Society</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9043</td>
<td>Time’s Arrow</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9045</td>
<td>The Science and Lore of Culinary Culture</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9048</td>
<td>Simplifying Complexity</td>
<td>6</td>
<td>NIL</td>
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<td>CCST9051</td>
<td>What are We Made of - the Fundamental Nature of Matter</td>
<td>6</td>
<td>NIL</td>
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<td>CCST9054</td>
<td>War, Peace, and the Natural World</td>
<td>6</td>
<td>NIL</td>
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<td>CCST9056</td>
<td>The Force is with You: How Things Work</td>
<td>6</td>
<td>NIL</td>
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<td>CCST9065</td>
<td>Women in Science</td>
<td>6</td>
<td>NIL</td>
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<tr>
<td>CCST9067</td>
<td>Leaving Earth: Our Future in Space</td>
<td>6</td>
<td>NIL</td>
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<td>CCST9068</td>
<td>Artificial Intelligence: Utopia or Dystopia?</td>
<td>6</td>
<td>NIL</td>
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</tbody>
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Equivalency of HKDSE and other qualifications

SCIENCE
### SECTION V   Equivalency of HKDSE and other qualifications

#### Table of Equivalence between HKDSE and Other Qualifications

<table>
<thead>
<tr>
<th>HKDSE</th>
<th>Grade</th>
<th>Equivalent Qualification to HKDSE</th>
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<tbody>
<tr>
<td>Biology</td>
<td>3 or above</td>
<td>IB: Biology (SL/HL) GCE: Biology (AL) SATII: Biology AP: Biology</td>
</tr>
<tr>
<td>Chemistry</td>
<td>3 or above</td>
<td>IB: Chemistry (SL/HL) GCE: Chemistry (AL) SATII: Chemistry AP: Chemistry</td>
</tr>
<tr>
<td>Physics</td>
<td>3 or above</td>
<td>IB: Physics (SL/HL) GCE: Physics (AL) SATII: Physics AP: Physics B or C</td>
</tr>
<tr>
<td>Mathematics</td>
<td>2 or above</td>
<td>IB: Mathematics (SL)/Mathematical Studies (SL) GCE: Mathematics (AL) SATII: Mathematics Level 1 or 2 AP: Pure Mathematics (AL) Further Mathematics (AL)</td>
</tr>
<tr>
<td>Mathematics + (M1 or M2)</td>
<td>2 or above</td>
<td>IB: Mathematics (HL)/Mathematical Studies (HL) GCE: Pure Mathematics (AL) Further Mathematics (AL) SATII: Calculus AB or BC AP: Calculus AB or BC</td>
</tr>
</tbody>
</table>

**Note:**
- HL: Higher Level
- SL: Standard Level
- AL: Advanced Level

**Remarks:**

For science students admitted through non-JUPAS scheme, the equivalent subject qualification(s) to HKDSE, if possessed, can be identified by the SIS for on-line course selection.

For other non-science students admitted through non-JUPAS scheme, they are still required to obtain the written approval from the Course Selection Adviser of the course offering department/school even they have possessed the equivalent HKDSE subject qualification(s) to meet the course prerequisite requirement. Once approval is given, they need to forward it to their home faculties to add the course on-line.
SECTION VI  Science Majors on offer in 2019/2020

Majors offered by Science Faculty

Majors

Astronomy (only for 2017 cohort or before)
Biochemistry
Biological Sciences
Chemistry
Chemistry (Intensive) (for 2015 cohort and thereafter)
Decision Analytics (not for BASc(AppliedAI) students)
Earth System Science
Ecology & Biodiversity
Ecology & Biodiversity (Intensive) (for 2015 cohort and thereafter)
Environmental Science
Food & Nutritional Science
Geology
Geology (Intensive) (for 2015 cohort and thereafter)
Mathematics
Mathematics (Intensive) (for 2016 cohort and thereafter)
Mathematics/Physics (only for 2017 cohort or before)
Molecular Biology & Biotechnology
Molecular Biology & Biotechnology (Intensive) (for 2015 cohort and thereafter)
Physics
Physics (Intensive) (for 2016 cohort and thereafter)
Risk Management
Statistics
Major Title: Major in Astronomy
Offered to students admitted to Year 1 in 2017

Objectives:
The 21st century is the golden age for astronomy as space-based telescopes are being used to explore the Universe in all parts of the electromagnetic spectrum, including X-ray, ultraviolet, and infrared. The Major in Astronomy is intended for the students who would like to acquire a solid foundation on the subject. A large selection of elective courses is provided for students to pursue their interested specialization in the subject, including observational astronomy, planetary science, stellar physics, and interstellar medium. Students will attain professional knowledge in astronomy, research experience and the training of analytical thinking and quantitative reasoning during their studies. In addition to preparing students for postgraduate studies as professional astronomers, astronomy training can lead to local careers in museums, weather services, and the education sectors. Beyond Hong Kong, astronomy graduates have challenging careers in aerospace, communications, energy, and computer industries, as well as in astronomical observatories and space research centers.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe astrophysical phenomena with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and frequent opportunities in field activities in the curriculum)

PLO 3: analyze astrophysical problems qualitatively and quantitatively, and recognize moral and ethical issues related to the discipline (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Minor in Astronomy

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (30 credits)
   PHYS1250 Fundamental physics (6)
   PHYS1650 Nature of the universe (6)
   EASC2408 Planetary geology (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2265 Introductory quantum physics (6)
   Disciplinary Electives (6 Credits)
   At least 6 credits selected from the following courses:
   PHYS1150 Problem solving in physics (6)
   PHYS2055 Introductory relativity (6)
   PHYS2150 Methods in physics I (6)
   PHYS2155 Methods in physics II (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2260 Heat and waves (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   PHYS3650 Observational astronomy (6)
   PHYS3651 The physical universe (6)
   PHYS3652 Principles of astronomy (6)
   Disciplinary Electives (24 credits)
   At least 12 credits selected from courses in List A:
   List A
   PHYS4650 Stellar physics (6)
   PHYS4651 Selected topics in astrophysics (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Cosmology (6)
   PHYS4655 Interstellar medium (6)
   PHYS4656 Stellar atmospheres (6)
   Plus at least 12 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List B and those courses not selected to fulfill the requirements in List A and the capstone requirement.
   List B
   PHYS3150 Theoretical physics (6)
   PHYS3151 Machine learning in physics (6)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE NAME</th>
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<tr>
<td>PHYS3450</td>
<td>Electromagnetism (6)</td>
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<td>PHYS3550</td>
<td>Statistical mechanics &amp; thermodynamics (6)</td>
</tr>
<tr>
<td>PHYS3551</td>
<td>Introductory solid state physics (6)</td>
</tr>
<tr>
<td>PHYS3750</td>
<td>Laser and spectroscopy (6)</td>
</tr>
<tr>
<td>PHYS3751</td>
<td>Physics of nanomaterials (6)</td>
</tr>
<tr>
<td>PHYS3850</td>
<td>Waves and optics (6)</td>
</tr>
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<td>PHYS3851</td>
<td>Atomic and nuclear physics (6)</td>
</tr>
<tr>
<td>PHYS4150</td>
<td>Computational physics (6)</td>
</tr>
<tr>
<td>PHYS4151</td>
<td>Data analysis and modeling in physics (6)</td>
</tr>
<tr>
<td>PHYS4350</td>
<td>Advanced classical mechanics (6)</td>
</tr>
<tr>
<td>PHYS4351</td>
<td>Advanced quantum mechanics (6)</td>
</tr>
<tr>
<td>PHYS4450</td>
<td>Advanced electromagnetism (6)</td>
</tr>
<tr>
<td>PHYS4550</td>
<td>Advanced statistical mechanics (6)</td>
</tr>
<tr>
<td>PHYS4551</td>
<td>Solid state physics (6)</td>
</tr>
<tr>
<td>PHYS4654</td>
<td>General relativity (6)</td>
</tr>
<tr>
<td>PHYS4750</td>
<td>Experimental physics (6)</td>
</tr>
<tr>
<td>PHYS4850</td>
<td>Particle physics (6)</td>
</tr>
<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics (6)</td>
</tr>
<tr>
<td>PHYS7351</td>
<td>Graduate quantum mechanics (6)</td>
</tr>
<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetism (6)</td>
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<tr>
<td>PHYS7550</td>
<td>Graduate statistical mechanics (6)</td>
</tr>
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<td>PHYS7551</td>
<td>Graduate solid state physics (6)</td>
</tr>
<tr>
<td>PHYS7750</td>
<td>Nanophysics (6)</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3999</td>
<td>Directed studies in physics (6)</td>
</tr>
<tr>
<td>PHYS4966</td>
<td>Physics internship (6)</td>
</tr>
<tr>
<td>PHYS4999</td>
<td>Physics project (12)</td>
</tr>
</tbody>
</table>

### Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

5. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Astronomy
Offered to students admitted to Year 1 in 2016

Objectives:
The 21st century is the golden age for astronomy as space-based telescopes are being used to explore the Universe in all parts of the electromagnetic spectrum, including X-ray, ultraviolet, and infrared. The Major in Astronomy is intended for the students who would like to acquire a solid foundation on the subject. A large selection of elective courses is provided for students to pursue their interested specialization in the subject, including observational astronomy, planetary science, stellar physics, and interstellar medium. Students will attain professional knowledge in astronomy, research experience and the training of analytical thinking and quantitative reasoning during their studies. In addition to preparing students for postgraduate studies as professional astronomers, astronomy training can lead to local careers in museums, weather services, and the education sectors. Beyond Hong Kong, astronomy graduates have challenging careers in aerospace, communications, energy, and computer industries, as well as in astronomical observatories and space research centers.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe astrophysical phenomena with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and frequent opportunities in field activities in the curriculum)

PLO 3: analyze astrophysical problems qualitatively and quantitatively, and recognize moral and ethical issues related to the discipline (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Minor in Astronomy

Required courses (96 credits)

1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111: Scientific method and reasoning (6)
- SCNC1112: Fundamentals of modern science (6)

Disciplinary Core Courses (30 credits)
- PHYS1250: Fundamental physics (6)
- PHYS1650: Nature of the universe (6)
- EASC2408: Planetary geology (6)
- PHYS2250: Introductory mechanics (6)
- PHYS2265: Introductory quantum physics (6)

Disciplinary Elective (6 credits)
At least 6 credits selected from the following courses:
- PHYS1150: Problem solving in physics (6)
- PHYS2055: Introductory relativity (6)
- PHYS2150: Methods in physics I (6)
- PHYS2155: Methods in physics II (6)
- PHYS2255: Introductory electricity and magnetism (6)
- PHYS2260: Heat and waves (6)

2. Advanced level courses (42 credits)

Disciplinary Core Courses (18 credits)
- PHYS3650: Observational astronomy (6)
- PHYS3651: The physical universe (6)
- PHYS3652: Principles of astronomy (6)

Disciplinary Electives (24 credits)
At least 12 credits selected from courses in List A:

List A
- PHYS4650: Stellar physics (6)
- PHYS4651: Selected topics in astrophysics (6)
- PHYS4652: Planetary science (6)
- PHYS4653: Cosmology (6)
- PHYS4655: Interstellar medium (6)
- PHYS7650: Stellar atmospheres (6)

Plus at least 12 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List B and those courses not selected to fulfill the requirements in List A and the capstone requirement.

List B
- PHYS3150: Theoretical physics (6)
- PHYS3151: Machine learning in physics (6)
- PHYS3350: Classical mechanics (6)
- PHYS3351: Quantum mechanics (6)
3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

PHYS3999 Directed studies in physics (6)
PHYS4966 Physics internship (6)
PHYS4999 Physics project (12)

Notes:
1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.
2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.
3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.
4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.
5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.
6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Major Title
Major in Astronomy

## Offered to students admitted to Year 1 in
2015

### Objectives:
The 21st century is the golden age for astronomy as space-based telescopes are being used to explore the Universe in all parts of the electromagnetic spectrum, including X-ray, ultraviolet, and infrared. The Major in Astronomy is intended for the students who would like to acquire a solid foundation on the subject. A large selection of elective courses is provided for students to pursue their interested specialization in the subject, including observational astronomy, planetary science, stellar physics, and interstellar medium. Students will attain professional knowledge in astronomy, research experience and the training of analytical thinking and quantitative reasoning during their studies. In addition to preparing students for postgraduate studies as professional astronomers, astronomy training can lead to local careers in museums, weather services, and the education sectors. Beyond Hong Kong, astronomy graduates have challenging careers in aerospace, communications, energy, and computer industries, as well as in astronomical observatories and space research centers.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: identify and describe astrophysical phenomena with their professional knowledge (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: have developed their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and frequent opportunities in field activities in the curriculum)
- **PLO 3**: analyze astrophysical problems qualitatively and quantitatively, and recognize moral and ethical issues related to the discipline (by means of coursework, tutorial classes and research-based projects in the curriculum)
- **PLO 4**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
- **PLO 5**: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

### Impermissible Combinations:
Minor in Astronomy

### Required courses (96 credits)

1. **Introductory level courses (48 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - **Disciplinary Core Courses (30 credits)**
     - PHYS1250 Fundamental physics (6)
     - PHYS1650 Nature of the universe (6)
     - EASC2408 Planetary geology (6)
     - PHYS2250 Introductory mechanics (6)
     - PHYS2265 Introductory quantum physics (6)
   - **Disciplinary Electives (6 credits)**
     - At least 6 credits selected from the following courses:
       - PHYS1150 Problem solving in physics (6)
       - PHYS2055 Introductory relativity (6)
       - PHYS2150 Methods in physics I (6)
       - PHYS2155 Methods in physics II (6)
       - PHYS2255 Introductory electricity and magnetism (6)
       - PHYS2260 Heat and waves (6)

2. **Advanced level courses (42 credits)**
   - **Disciplinary Core Courses (18 credits)**
     - PHYS3650 Observational astronomy (6)
     - PHYS3651 The physical universe (6)
     - PHYS3652 Principles of astronomy (6)
   - **Disciplinary Electives (24 credits)**
     - At least 12 credits selected from courses in List A:
       - **List A**
         - PHYS4650 Stellar physics (6)
         - PHYS4651 Selected topics in astrophysics (6)
         - PHYS4652 Planetary science (6)
         - PHYS4653 Cosmology (6)
         - PHYS4655 Interstellar medium (6)
         - PHYS4656 Stellar atmospheres (6)
       - **List B**
         - PHYS3150 Theoretical physics (6)
         - PHYS3151 Machine learning in physics (6)
         - PHYS3350 Classical mechanics (6)
         - PHYS3351 Quantum mechanics (6)
   - Plus at least 12 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List B and those courses not selected to fulfill the requirements in List A and the capstone requirement.
### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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<thead>
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<th>Course Title</th>
</tr>
</thead>
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<tr>
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<tr>
<td>PHYS4966</td>
<td>Physics internship (6)</td>
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<td>PHYS4999</td>
<td>Physics project (12)</td>
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</tbody>
</table>

**Notes:**

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title | Major in Astronomy
---|---
Offered to students | admits to Year 1 in 2014

**Objectives:**
The 21st century is the golden age for astronomy as space-based telescopes are being used to explore the Universe in all parts of the electromagnetic spectrum, including X-ray, ultraviolet, and infrared. The Major in Astronomy is intended for the students who would like to acquire a solid foundation on the subject. A large selection of elective courses is provided for students to pursue their interested specialization in the subject, including observational astronomy, planetary science, stellar physics, and interstellar medium. Students will attain professional knowledge in astronomy, research experience and the training of analytical thinking and quantitative reasoning during their studies. In addition to preparing students for postgraduate studies as professional astronomers, astronomy training can lead to local careers in museums, weather services, and the education sectors. Beyond Hong Kong, astronomy graduates have challenging careers in aerospace, communications, energy, and computer industries, as well as in astronomical observatories and space research centers.

**Learning Outcomes:**
By the end of this programme, students should be able to:

PLO 1: identify and describe astrophysical phenomena with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and frequent opportunities in field activities in the curriculum)

PLO 3: analyze astrophysical problems qualitatively and quantitatively, and recognize moral and ethical issues related to the discipline (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

**Impermissible Combinations:**
Minor in Astronomy

### Required courses (96 credits)

1. Introductory level courses (48 credits)

   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   - SCNC1111: Scientific method and reasoning (6)
   - SCNC1112: Fundamentals of modern science (6)

   **Disciplinary Core Courses (36 credits)**
   - PHYS1250: Fundamental physics (6)
   - PHYS1650: Nature of the universe (6)
   - EASC2408: Planetary geology (6)
   - PHYS2250: Introductory mechanics (6)
   - PHYS2255: Introductory electricity and magnetism (6)
   - PHYS2265: Introductory quantum physics (6)

2. Advanced level courses (42 credits)

   **Disciplinary Core Courses (18 credits)**
   - PHYS3650: Observational astronomy (6)
   - PHYS3651: The physical universe (6)
   - PHYS3652: Principles of astronomy (6)

   **Disciplinary Electives (24 credits)**
   At least 12 credits selected from courses in List A:

   **List A**
   - PHYS4650: Stellar physics (6)
   - PHYS4651: Selected topics in astrophysics (6)
   - PHYS4652: Planetary science (6)
   - PHYS4653: Cosmology (6)
   - PHYS4655: Interstellar medium (6)
   - PHYS7650: Stellar atmospheres (6)

   Plus at least 12 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List B and those courses not selected to fulfill the requirements in List A and the capstone requirement.

   **List B**
   - PHYS3150: Theoretical physics (6)
   - PHYS3350: Classical mechanics (6)
   - PHYS3351: Quantum mechanics (6)
   - PHYS3450: Electromagnetism (6)
   - PHYS3550: Statistical mechanics & thermodynamics (6)
   - PHYS3551: Introductory solid state physics (6)
   - PHYS3750: Laser and spectroscopy (6)
   - PHYS3751: Physics of nanomaterials (6)
   - PHYS3850: Waves and optics (6)
   - PHYS3851: Atomic and nuclear physics (6)
   - PHYS4150: Computational physics (6)
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<tbody>
<tr>
<td>PHYS4151</td>
<td>Data analysis and modeling in physics (6)</td>
<td></td>
</tr>
<tr>
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<td>PHYS7551</td>
<td>Graduate solid state physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS7750</td>
<td>Nanophysics (6)</td>
<td></td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
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<tr>
<td>PHYS4966</td>
<td>Physics internship (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4999</td>
<td>Physics project (12)</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Astronomy
Offered to students admitted to Year 1 in 2013

Objectives:
The 21st century is the golden age for astronomy as space-based telescopes are being used to explore the Universe in all parts of the electromagnetic spectrum, including X-ray, ultraviolet, and infrared. The Major in Astronomy is intended for the students who would like to acquire a solid foundation on the subject. A large selection of elective courses is provided for students to pursue their interested specialization in the subject, including observational astronomy, planetary science, stellar physics, and interstellar medium. Students will attain professional knowledge in astronomy, research experience and the training of analytical thinking and quantitative reasoning during their studies. In addition to preparing students for postgraduate studies as professional astronomers, astronomy training can lead to local careers in museums, weather services, and the education sectors. Beyond Hong Kong, astronomy graduates have challenging careers in aerospace, communications, energy, and computer industries, as well as in astronomical observatories and space research centers.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: identify and describe astrophysical phenomena with their professional knowledge (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: have developed their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and frequent opportunities in field activities in the curriculum)
- **PLO 3**: analyze astrophysical problems qualitatively and quantitatively, and recognize moral and ethical issues related to the discipline (by means of coursework, tutorial classes and research-based projects in the curriculum)
- **PLO 4**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
- **PLO 5**: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Minor in Astronomy

Required courses (96 credits)

1. Introductory level courses (48 credits)
   
   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   **Disciplinary Core Courses (36 credits)**
   
   PHYS1250 Fundamental physics (6)
   PHYS1650 Nature of the universe (6)
   EASC2408 Planetary geology (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2265 Introductory quantum physics (6)

2. Advanced level courses (42 credits)
   
   **Disciplinary Core Courses (18 credits)**
   
   PHYS3650 Observational astronomy (6)
   PHYS3651 The physical universe (6)
   PHYS3652 Principles of astronomy (6)

   **Disciplinary Electives (24 credits)**
   
   At least 12 credits selected from courses in List A:
   
   **List A**
   
   PHYS4650 Stellar physics (6)
   PHYS4651 Selected topics in astrophysics (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Cosmology (6)
   PHYS4655 Interstellar medium (6)
   PHYS7650 Stellar atmospheres (6)

   Plus at least 12 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List B and those courses not selected to fulfill the requirements in List A and the capstone requirement.

   **List B**
   
   PHYS3150 Theoretical physics (6)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS3450 Electromagnetism (6)
   PHYS3550 Statistical mechanics & thermodynamics (6)
   PHYS3551 Introductory solid state physics (6)
   PHYS3750 Laser and spectroscopy (6)
   PHYS3751 Physics of nanomaterials (6)
   PHYS3850 Waves and optics (6)
   PHYS3851 Atomic and nuclear physics (6)
   PHYS4150 Computational physics (6)
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>PHYS4151</td>
<td>Data analysis and modeling in physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4350</td>
<td>Advanced classical mechanics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4351</td>
<td>Advanced quantum mechanics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4450</td>
<td>Advanced electromagnetism</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4550</td>
<td>Advanced statistical mechanics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4551</td>
<td>Solid state physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4654</td>
<td>General relativity</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4750</td>
<td>Experimental physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4850</td>
<td>Particle physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4966</td>
<td>Directed studies in physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4999</td>
<td>Directed studies in physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4999</td>
<td>Physics internship</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics</td>
<td>(6)</td>
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<tr>
<td>PHYS7351</td>
<td>Graduate quantum mechanics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetism</td>
<td>(6)</td>
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<tr>
<td>PHYS7550</td>
<td>Graduate statistical mechanics</td>
<td>(6)</td>
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<td>PHYS7551</td>
<td>Graduate solid state physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7750</td>
<td>Nanophysics</td>
<td>(6)</td>
</tr>
</tbody>
</table>

3. **Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3999</td>
<td>Directed studies in physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4966</td>
<td>Physics internship</td>
<td>(6)</td>
</tr>
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<td>PHYS4999</td>
<td>Physics project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Astronomy
Offered to students admitted to Year 1 in 2012

Objectives:
The 21st century is the golden age for astronomy as space-based telescopes are being used to explore the Universe in all parts of the electromagnetic spectrum, including X-ray, ultraviolet, and infrared. The Major in Astronomy is intended for the students who would like to acquire a solid foundation on the subject. A large selection of elective courses is provided for students to pursue their interested specialization in the subject, including observational astronomy, planetary science, stellar physics, and interstellar medium. Students will attain professional knowledge in astronomy, research experience and the training of analytical thinking and quantitative reasoning during their studies. In addition to preparing students for postgraduate studies as professional astronomers, astronomy training can lead to local careers in museums, weather services, and the education sectors. Beyond Hong Kong, astronomy graduates have challenging careers in aerospace, communications, energy, and computer industries, as well as in astronomical observatories and space research centers.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe astrophysical phenomena with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and frequent opportunities in field activities in the curriculum)

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PLO 5: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Minor in Astronomy

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (36 credits)
   PHYS1250 Fundamental physics (6)
   PHYS1650 Nature of the universe (6)
   EASC2408 Planetary geology (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2265 Introductory quantum physics (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   PHYS3650 Observational astronomy (6)
   PHYS3651 The physical universe (6)
   PHYS3652 Principles of astronomy (6)
   Disciplinary Electives (24 credits)
   At least 12 credits selected from courses in List A:
   List A
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   Plus at least 12 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List B and those courses not selected to fulfill the requirements in List A and the capstone requirement.
   List B
   PHYS3150 Theoretical physics (6)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS3450 Electromagnetism (6)
   PHYS3550 Statistical mechanics & thermodynamics (6)
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   PHYS3751 Physics of nanomaterials (6)
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PHYS4850 Particle physics (6)
PHYS7350 Graduate classical mechanics (6)
PHYS7351 Graduate quantum mechanics (6)
PHYS7450 Graduate electromagnetism (6)
PHYS7550 Graduate statistical mechanics (6)
PHYS7551 Graduate solid state physics (6)
PHYS7750 Nanophysics (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   PHYS3999 Directed studies in physics (6)
   PHYS4966 Physics internship (6)
   PHYS4999 Physics project (12)

Notes:
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Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Objectives:
The Major in Biochemistry aims to provide students with both basic and advanced knowledge in contemporary biochemistry and molecular biology. Core courses in the curriculum emphasize equipping students with a general understanding of the fundamental ideas, principles and theories of biochemistry with particular focus on the relevance of biochemistry, molecular biology and genomics to biology, human health and disease. Elective courses extend this core knowledge to provide students with specialized insight into both basic and applied scientific endeavour in biochemistry, bioinformatics, molecular biology and molecular genetics. Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects. These experiences are designed to develop students’ ability to read and interpret scientific data, to integrate knowledge with wider scientific theory, and to improve logical thinking and communication skills. The ultimate goal is to provide a comprehensive degree-level biochemistry education that equips students with the critical thinking, communication and analytical skills essential for them to play a leading role in society in the future.

## Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology (by means of coursework and experiential learning)
- **PLO 2**: apply biochemical, bioinformatics and molecular genetics technologies for new observations, measurements and analyses; and to design experiments that bring discovery and insight into the unknown (by means of laboratory-based and research project-based learning)
- **PLO 3**: interpret and communicate scientific data and literature using appropriate scientific language (by means of literature-based coursework and debate)
- **PLO 4**: work effectively as a team and synergize with their colleagues in a supportive manner (by means of group-based learning and by group-based problem solving)
- **PLO 5**: recognize the interconnections of biochemistry with other disciplines in science, medicine and engineering, humanities and ethics, which are relevant for diverse working environment in the society (by means of multidisciplinary-based research projects, internship and debate)

## Impermissible Combinations:
Minor in Biochemistry

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<thead>
<tr>
<th>Required courses (96 credits)</th>
<th></th>
</tr>
</thead>
<tbody>
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<td><strong>1. Introductory level courses (42 credits)</strong></td>
<td><strong>Disciplinary Core Courses: Science Foundation Courses (12 credits)</strong></td>
</tr>
<tr>
<td></td>
<td>SCNC1111 Scientific method and reasoning (6)</td>
</tr>
<tr>
<td></td>
<td>SCNC1112 Fundamentals of modern science (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (24 credits)</strong></td>
<td>CHEM1042 General chemistry I (6)</td>
</tr>
<tr>
<td></td>
<td>CHEM1043 General chemistry II (6)</td>
</tr>
<tr>
<td></td>
<td>BIOC2600 Basic biochemistry (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL2220 Principles of biochemistry (6)</td>
</tr>
<tr>
<td></td>
<td>CHEM2441 Organic chemistry I (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (6 credits)</strong></td>
<td>BIOC1600 Perspectives in biochemistry (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL1110 From molecules to cells (6)</td>
</tr>
<tr>
<td><strong>2. Advanced level courses (48 credits)</strong></td>
<td><strong>Disciplinary Core Courses (30 credits)</strong></td>
</tr>
<tr>
<td></td>
<td>BIOC3601 Basic metabolism (6)</td>
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<tr>
<td></td>
<td>BIOC3604 Essential techniques in biochemistry and molecular biology (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL3401 Molecular biology (6)</td>
</tr>
<tr>
<td></td>
<td>BIOC4610 Advanced biochemistry (6)</td>
</tr>
<tr>
<td></td>
<td>BIOC4613 Advanced techniques in biochemistry &amp; molecular biology (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (18 credits)</strong></td>
<td><strong>At least 18 credits selected from the following courses:</strong></td>
</tr>
<tr>
<td></td>
<td>BIOC3605 Sequence bioinformatics (6)</td>
</tr>
<tr>
<td></td>
<td>BIOC3606 Molecular medicine (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL3202 Nutritional biochemistry (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL3402 Cell biology and cell technology (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL3403 Immunology (6)</td>
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<tr>
<td></td>
<td>BIOL3404 Protein structure and function (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL3408 Genetics (6)</td>
</tr>
<tr>
<td></td>
<td>CHEM3441 Organic chemistry II (6)</td>
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<tr>
<td></td>
<td>BIOC4612 Molecular biology of the gene (6)</td>
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</table>
### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC3999</td>
<td>Directed studies in biochemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOC4966</td>
<td>Biochemistry internship</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOC4999</td>
<td>Biochemistry project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Objectives:**
The Major in Biochemistry aims to provide students with both basic and advanced knowledge in contemporary biochemistry and molecular biology. Core courses in the curriculum emphasize equipping students with a general understanding of the fundamental ideas, principles and theories of biochemistry with particular focus on the relevance of biochemistry, molecular biology and genomics to biology, human health and disease. Elective courses extend this core knowledge to provide students with specialized insight into both basic and applied scientific endeavour in biochemistry, bioinformatics, molecular biology and molecular genetics. Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects. These experiences are designed to develop students’ ability to read and interpret scientific data, to integrate knowledge with wider scientific theory, and to improve logical thinking and communication skills. The ultimate goal is to provide a comprehensive degree-level biochemistry education that equips students with the critical thinking, communication and analytical skills essential for them to play a leading role in society in the future.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology (by means of coursework and experiential learning)
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- **PLO 4:** work effectively as a team and synergize with their colleagues in a supportive manner (by means of group-based learning and by group-based problem solving)
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**Impermissible Combinations:**
Minor in Biochemistry

**Required courses (96 credits)**

### 1. Introductory level courses (42 credits)

#### Disciplinary Core Courses: Science Foundation Courses (12 credits)

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6</td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
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#### Disciplinary Core Courses (24 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>6</td>
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<tr>
<td>CHEM1043</td>
<td>General chemistry II</td>
<td>6</td>
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<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2441</td>
<td>Organic chemistry I</td>
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#### Disciplinary Electives (6 credits)

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<tr>
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</tr>
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<tbody>
<tr>
<td>BIOC1600</td>
<td>Perspectives in biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
</tbody>
</table>

### 2. Advanced level courses (48 credits)

#### Disciplinary Core Courses (30 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC3601</td>
<td>Basic metabolism</td>
<td>6</td>
</tr>
<tr>
<td>BIOC3604</td>
<td>Essential techniques in biochemistry and molecular biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3401</td>
<td>Molecular biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOC4610</td>
<td>Advanced biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOC4613</td>
<td>Advanced techniques in biochemistry &amp; molecular biology</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Disciplinary Electives (18 credits)

- At least 18 credits selected from the following courses:
  - BIOC3605: Sequence bioinformatics (6)
  - BIOC3606: Molecular medicine (6)
  - BIOL3202: Nutritional biochemistry (6)
  - BIOL3402: Cell biology and cell technology (6)
  - BIOL3403: Immunology (6)
  - BIOL3404: Protein structure and function (6)
  - BIOL3408: Genetics (6)
  - CHEM3441: Organic chemistry II (6)
  - BIOC4612: Molecular biology of the gene (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4417</td>
<td>'Omics' and systems biology</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4145</td>
<td>Medicinal chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology</td>
<td>(6)</td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:
- BIOC3999 Directed studies in biochemistry (6)
- BIOC4966 Biochemistry internship (6)
- BIOC4999 Biochemistry project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biochemistry

Offered to students admitted to Year 1 in 2017

Objectives:
The Major in Biochemistry aims to provide students with both basic and advanced knowledge in contemporary biochemistry and molecular biology. Core courses in the curriculum emphasize equipping students with a general understanding of the fundamental ideas, principles and theories of biochemistry with particular focus on the relevance of biochemistry, molecular biology and genomics to biology, human health and disease. Elective courses extend this core knowledge to provide students with specialized insight into both basic and applied scientific endeavour in biochemistry, bioinformatics, molecular biology and molecular genetics. Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects. These experiences are designed to develop students' ability to read and interpret scientific data, to integrate knowledge with wider scientific theory, and to improve logical thinking and communication skills. The ultimate goal is to provide a comprehensive degree-level biochemistry education that equips students with the critical thinking, communication and analytical skills essential for them to play a leading role in society in the future.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology (by means of coursework and experiential learning)

PLO 2: apply biochemical, bioinformatics and molecular genetics technologies for new observations, measurements and analyses; and to design experiments that bring discovery and insight into the unknown (by means of laboratory-based and research project-based learning)

PLO 3: interpret and communicate scientific data and literature using appropriate scientific language (by means of literature-based coursework and debate)

PLO 4: work effectively as a team and synergize with their colleagues in a supportive manner (by means of group-based learning and by group-based problem solving)

PLO 5: recognize the interconnections of biochemistry with other disciplines in science, medicine and engineering, humanities and ethics, which are relevant for diverse working environment in the society (by means of multidisciplinary-based research projects, internship and debate)

Impermissible Combinations:

Minor in Biochemistry

Required courses (96 credits)

1. Introductory level courses (42 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111: Scientific method and reasoning (6)
- SCNC1112: Fundamentals of modern science (6)

Disciplinary Core Courses (24 credits)
- CHEM1042: General chemistry I (6)
- CHEM1043: General chemistry II (6)
- BIOC2600: Basic biochemistry (6)
- BIOL2220: Principles of biochemistry (6)

Disciplinary Electives (6 credits)
- BIOC1600: Perspectives in biochemistry (6)
- BIOL1110: From molecules to cells (6)

2. Advanced level courses (48 credits)

Disciplinary Core Courses (30 credits)
- BIOC3601: Basic metabolism (6)
- BIOC3604: Essential techniques in biochemistry and molecular biology (6)
- BIOL3401: Molecular biology (6)
- BIOC4610: Advanced biochemistry (6)
- BIOC4613: Advanced techniques in biochemistry & molecular biology (6)

Disciplinary Electives (18 credits)
At least 18 credits selected from the following courses:
- BIOC3605: Sequence bioinformatics (6)
- BIOC3606: Molecular medicine (6)
- BIOL3202: Nutritional biochemistry (6)
- BIOL3402: Cell biology and cell technology (6)
- BIOL3403: Immunology (6)
- BIOL3404: Protein structure and function (6)
- BIOL3408: Genetics (6)
- CHEM3441: Organic chemistry II (6)
- BIOC4612: Molecular biology of the gene (6)
### BIOL4417
'Omics' and systems biology (6)

### CHEM4145
Medicinal chemistry (6)

### CHEM4444
Chemical biology (6)

#### 3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
- BIOC3999 Directed studies in biochemistry (6)
- BIOC4966 Biochemistry internship (6)
- BIOC4999 Biochemistry project (12)

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The Major in Biochemistry aims to provide students with both basic and advanced knowledge in contemporary biochemistry and molecular biology. Core courses in the curriculum emphasize equipping students with a general understanding of the fundamental ideas, principles and theories of biochemistry with particular focus on the relevance of biochemistry, molecular biology and genomics to biology, human health and disease. Elective courses extend this core knowledge to provide students with specialized insight into both basic and applied scientific endeavour in biochemistry, bioinformatics, molecular biology and molecular genetics. Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects. These experiences are designed to develop students’ ability to read and interpret scientific data, to integrate knowledge with wider scientific theory, and to improve logical thinking and communication skills. The ultimate goal is to provide a comprehensive degree-level biochemistry education that equips students with the critical thinking, communication and analytical skills essential for them to play a leading role in society in the future.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology (by means of coursework and experiential learning)

PLO 2: apply biochemical, bioinformatics and molecular genetics technologies for new observations, measurements and analyses; and to design experiments that bring discovery and insight into the unknown (by means of laboratory-based and research project-based learning)

PLO 3: interpret and communicate scientific data and literature using appropriate scientific language (by means of literature-based coursework and debate)

PLO 4: work effectively as a team and synergize with their colleagues in a supportive manner (by means of group-based learning and by group-based problem solving)

PLO 5: recognize the interconnections of biochemistry with other disciplines in science, medicine and engineering, humanities and ethics, which are relevant for diverse working environment in the society (by means of multidisciplinary-based research projects, internship and debate)

Impermissible Combinations:
Minor in Biochemistry

Required courses (96 credits)

1. Introductory level courses (42 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (24 credits)
- CHEM1042 General chemistry I (6)
- CHEM1043 General chemistry II (6)
- BIOC2600 Basic biochemistry (6)
- BIOL2220 Principles of biochemistry (6)
- CHEM2441 Organic chemistry I (6)
- Disciplinary Electives (6 credits)
  - BIOC1600 Perspectives in biochemistry (6)
  - BIOL1110 From molecules to cells (6)

2. Advanced level courses (48 credits)

Disciplinary Core Courses (30 credits)
- BIOC3601 Basic metabolism (6)
- BIOC3604 Essential techniques in biochemistry and molecular biology (6)
- BIOL3401 Molecular biology (6)
- BIOC4610 Advanced biochemistry (6)
- BIOC4613 Advanced techniques in biochemistry & molecular biology (6)
- Disciplinary Electives (18 credits)
  - At least 18 credits selected from the following courses:
    - BIOC3605 Sequence bioinformatics (6)
    - BIOC3606 Molecular medicine (6)
    - BIOL3202 Nutritional biochemistry (6)
    - BIOL3402 Cell biology and cell technology (6)
    - BIOL3403 Immunology (6)
    - BIOL3404 Protein structure and function (6)
    - BIOL3408 Genetics (6)
    - CHEM3441 Organic chemistry II (6)
    - BIOC4612 Molecular biology of the gene (6)
Science Majors

1. BIOL4417 'Omics' and systems biology (6)
2. CHEM4145 Medicinal chemistry (6)
3. CHEM4444 Chemical biology (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - BIOC3999 Directed studies in biochemistry (6)
   - BIOC4966 Biochemistry internship (6)
   - BIOC4999 Biochemistry project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biochemistry

Offered to students admitted to Year 1 in 2015

Objectives:
The Major in Biochemistry aims to provide students with both basic and advanced knowledge in contemporary biochemistry and molecular biology. Core courses in the curriculum emphasize equipping students with a general understanding of the fundamental ideas, principles and theories of biochemistry with particular focus on the relevance of biochemistry, molecular biology and genomics to biology, human health and disease. Elective courses extend this core knowledge to provide students with specialized insight into both basic and applied scientific endeavour in biochemistry, bioinformatics, molecular biology and molecular genetics. Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects. These experiences are designed to develop students’ ability to read and interpret scientific data, to integrate knowledge with wider scientific theory, and to improve logical thinking and communication skills. The ultimate goal is to provide a comprehensive degree-level biochemistry education that equips students with the critical thinking, communication and analytical skills essential for them to play a leading role in society in the future.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology (by means of coursework and experiential learning)

PLO 2: apply biochemical, bioinformatics and molecular genetics technologies for new observations, measurements and analyses; and to design experiments that bring discovery and insight into the unknown (by means of laboratory-based and research project-based learning)

PLO 3: interpret and communicate scientific data and literature using appropriate scientific language (by means of laboratory-based coursework and debate)

PLO 4: work effectively as a team and synergize with their colleagues in a supportive manner (by means of group-based learning and by group-based problem solving)

PLO 5: recognize the interconnections of biochemistry with other disciplines in science, medicine and engineering, humanities and ethics, which are relevant for diverse working environment in the society (by means of multidisciplinary-based research projects, internship and debate)

Impermissible Combinations:
Minor in Biochemistry

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (24 credits)
   CHEM1042 General chemistry I (6)
   CHEM1043 General chemistry II (6)
   BIOC2600 Basic biochemistry (6)
   BIOL2220 Principles of biochemistry (6)
   CHEM2441 Organic chemistry I (6)
   Disciplinary Electives (6 credits)
   BIOC1600 Perspectives in biochemistry (6)
   BIOL1110 From molecules to cells (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (30 credits)
   BIOC3601 Basic metabolism (6)
   BIOC3604 Essential techniques in biochemistry and molecular biology (6)
   BIOL3401 Molecular biology (6)
   BIOC4610 Advanced biochemistry (6)
   BIOC4613 Advanced techniques in biochemistry & molecular biology (6)
   Disciplinary Electives (18 credits)
   At least 18 credits selected from the following courses:
   BIOC3605 Sequence bioinformatics (6)
   BIOC3606 Molecular medicine (6)
   BIOL3202 Nutritional biochemistry (6)
   BIOL3402 Cell biology and cell technology (6)
   BIOL3403 Immunology (6)
   BIOL3404 Protein structure and function (6)
   BIOL3408 Genetics (6)
   CHEM3441 Organic chemistry II (6)
   BIOC4612 Molecular biology of the gene (6)
BIOL4417 'Omics' and systems biology (6)
CHEM4145 Medicinal chemistry (6)
CHEM4444 Chemical biology (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   BIOC3999 Directed studies in biochemistry (6)
   BIOC4966 Biochemistry internship (6)
   BIOC4999 Biochemistry project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biochemistry
Offered to students admitted to Year 1 in 2014

Objectives:
The Major in Biochemistry aims to provide students with both basic and advanced knowledge in contemporary biochemistry and molecular biology. Core courses in the curriculum emphasize equipping students with a general understanding of the fundamental ideas, principles and theories of biochemistry with particular focus on the relevance of biochemistry, molecular biology and genomics to biology, human health and disease. Elective courses extend this core knowledge to provide students with specialized insight into both basic and applied scientific endeavour in biochemistry, bioinformatics, molecular biology and molecular genetics. Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects. These experiences are designed to develop students’ ability to read and interpret scientific data, to integrate knowledge with wider scientific theory, and to improve logical thinking and communication skills. The ultimate goal is to provide a comprehensive degree-level biochemistry education that equips students with the critical thinking, communication and analytical skills essential for them to play a leading role in society in the future.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology (by means of coursework and experiential learning)

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PLO 3: interpret and communicate scientific data and literature using appropriate scientific language (by means of literature-based coursework and debate)

PLO 4: work effectively as a team and synergize with their colleagues in a supportive manner (by means of group-based learning and by group-based problem solving)

PLO 5: recognize the interconnections of biochemistry with other disciplines in science, medicine and engineering, humanities and ethics, which are relevant for diverse working environment in the society (by means of multidisciplinary-based research projects, internship and debate)

Impermissible Combinations:
Minor in Biochemistry

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (30 credits)
   BIOC1600 Perspectives in biochemistry (6)
   BIOL1110 From molecules to cells (6)
   CHEM1042 General chemistry I (6)
   BIOC2600 Basic biochemistry (6)
   CHEM2541 Organic chemistry I (6)
   Disciplinary Electives (6 credits)
   CHEM1043 General chemistry II (6)
   CHEM2541 Introductory physical chemistry (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (30 credits)
   BIOC3601 Basic metabolism (6)
   BIOC3604 Essential techniques in biochemistry and molecular biology (6)
   BIOL3401 Molecular biology (6)
   BIOC4610 Advanced biochemistry (6)
   BIOC4613 Advanced techniques in biochemistry & molecular biology (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   BIOC3605 Sequence bioinformatics (6)
   BIOC3606 Molecular medicine (6)
   BIOL3202 Nutritional biochemistry (6)
   BIOL3402 Cell biology and cell technology (6)
   BIOL3403 Immunology (6)
   BIOL3404 Protein structure and function (6)
   BIOL3408 Genetics (6)
   CHEM3441 Organic chemistry II (6)
   BIOC4612 Molecular biology of the gene (6)
   BIOC4617 ‘Omics’ and systems biology (6)
   CHEM4145 Medicinal chemistry (6)
   CHEM4444 Chemical biology (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfil this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biochemistry
Offered to students admitted to Year 1 in 2013

Objectives:
The Major in Biochemistry aims to provide students with both basic and advanced knowledge in contemporary biochemistry and molecular biology. Core courses in the curriculum emphasize equipping students with a general understanding of the fundamental ideas, principles and theories of biochemistry with particular focus on the relevance of biochemistry, molecular biology and genomics to biology, human health and disease. Elective courses extend this core knowledge to provide students with specialized insight into both basic and applied scientific endeavour in biochemistry, bioinformatics, molecular biology and molecular genetics. Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects. These experiences are designed to develop students’ ability to read and interpret scientific data, to integrate knowledge with wider scientific theory, and to improve logical thinking and communication skills. The ultimate goal is to provide a comprehensive degree-level biochemistry education that equips students with the critical thinking, communication and analytical skills essential for them to play a leading role in society in the future.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology (by means of coursework and experiential learning)

PLO 2: apply biochemical, bioinformatics and molecular genetics technologies for new observations, measurements and analyses; and to design experiments that bring discovery and insight into the unknown (by means of laboratory-based and research project-based learning)

PLO 3: interpret and communicate scientific data and literature using appropriate scientific language (by means of literature-based coursework and debate)

PLO 4: work effectively as a team and synergize with their colleagues in a supportive manner (by means of group-based learning and by group-based problem solving)

PLO 5: recognize the interconnections of biochemistry with other disciplines in science, medicine and engineering, humanities and ethics, which are relevant for diverse working environment in the society (by means of multidisciplinary-based research projects, internship and debate)

Impermissible Combinations:
Minor in Biochemistry

Required courses (96 credits)
1. Introductory level courses (48 credits)
   - Disciplinary Core Courses: Science Foundation Courses (12 credits)
     SCNC1111 Scientific method and reasoning (6)
     SCNC1112 Fundamentals of modern science (6)

   - Disciplinary Core Courses (30 credits)
     BIOC1600 Perspectives in biochemistry (6)
     BIOL1110 From molecules to cells (6)
     CHEM1042 General chemistry I (6)
     BIOC2600 Basic biochemistry (6)
     CHEM2441 Organic chemistry I (6)

   - Disciplinary Electives (6 credits)
     CHEM1043 General chemistry II (6)
     CHEM2541 Introductory physical chemistry (6)

2. Advanced level courses (42 credits)
   - Disciplinary Core Courses (30 credits)
     BIOC3601 Basic metabolism (6)
     BIOC3604 Essential techniques in biochemistry and molecular biology (6)
     BIOL3401 Molecular biology (6)
     BIOC4610 Advanced biochemistry (6)
     BIOC4613 Advanced techniques in biochemistry & molecular biology (6)

   - Disciplinary Electives (12 credits)
     At least 12 credits selected from the following courses:
     BIOC3605 Sequence bioinformatics (6)
     BIOC3606 Molecular medicine (6)
     BIOL3202 Nutritional biochemistry (6)
     BIOL3402 Cell biology and cell technology (6)
     BIOL3403 Immunology (6)
     BIOL3404 Protein structure and function (6)
     BIOL3408 Genetics (6)
     CHEM3441 Organic chemistry II (6)
     BIOC4612 Molecular biology of the gene (6)
     BIOL4417 ‘Omics’ and systems biology (6)
     CHEM4145 Medicinal chemistry (6)
     CHEM4444 Chemical biology (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biochemistry
Offered to students admitted to Year 1 in 2012

Objectives: The Major in Biochemistry aims to provide students with both basic and advanced knowledge in contemporary biochemistry and molecular biology. Core courses in the curriculum emphasize equipping students with a general understanding of the fundamental ideas, principles and theories of biochemistry with particular focus on the relevance of biochemistry, molecular biology and genomics to biology, human health and disease. Elective courses extend this core knowledge to provide students with specialized insight into both basic and applied scientific endeavour in biochemistry, bioinformatics, molecular biology and molecular genetics. Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects. These experiences are designed to develop students' ability to read and interpret scientific data, to integrate knowledge with wider scientific theory, and to improve logical thinking and communication skills. The ultimate goal is to provide a comprehensive degree-level biochemistry education that equips students with the critical thinking, communication and analytical skills essential for them to play a leading role in society in the future.

Learning Outcomes: By the end of this programme, students should be able to:

PLO 1: describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology (by means of coursework and experiential learning)

PLO 2: apply biochemical, bioinformatics and molecular genetics technologies for new observations, measurements and analyses; and to design experiments that bring discovery and insight into the unknown (by means of laboratory-based and research project-based learning)

PLO 3: interpret and communicate scientific data and literature using appropriate scientific language (by means of literature-based coursework and debate)

PLO 4: work effectively as a team and synergize with their colleagues in a supportive manner (by means of group-based learning and by group-based problem solving)

PLO 5: recognize the interconnections of biochemistry with other disciplines in science, medicine and engineering, humanities and ethics, which are relevant for diverse working environment in the society (by means of multidisciplinary-based research projects, internship and debate)

Impermissible Combinations:
Minor in Biochemistry

Required courses (96 credits)
1. Introductory level courses (48 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6)
SCNC1112 Fundamentals of modern science (6)
Disciplinary Core Courses (30 credits)
BIOC1600 Perspectives in biochemistry (6)
BIOL1110 From molecules to cells (6)
CHEM1042 General chemistry I (6)
BIOC2600 Basic biochemistry (6)
CHEM2441 Organic chemistry I (6)
Disciplinary Electives (6 credits)
CHEM1043 General chemistry II (6)
CHEM2541 Introductory physical chemistry (6)

2. Advanced level courses (42 credits)
Disciplinary Core Courses (30 credits)
BIOC3601 Basic metabolism (6)
BIOC3604 Essential techniques in biochemistry and molecular biology (6)
BIOC3401 Molecular biology (6)
BIOC4610 Advanced biochemistry (6)
BIOC4613 Advanced techniques in biochemistry & molecular biology (6)
Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
BIOC3605 Sequence bioinformatics (6)
BIOC3606 Molecular medicine (6)
BIOC3202 Nutritional biochemistry (6)
BIOC3402 Cell biology and cell technology (6)
BIOC3403 Immunology (6)
BIOC3404 Protein structure and function (6)
BIOC3408 Genetics (6)
CHEM3441 Organic chemistry II (6)
BIOC4612 Molecular biology of the gene (6)
BIOC4417 'Omics' and systems biology (6)
CHEM4145 Medicinal chemistry (6)
CHEM4444 Chemical biology (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biological Sciences
Offered to students admitted to Year 1 in 2019

Objectives:
This Major is designed for students seeking a broad-based training in modern biology. Students are guided in an inquiry-driven learning environment to appreciate the major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The programme is highly flexible as students can select courses according to their own interests from a wide spectrum of elective courses. At the advanced level, students are further exposed to three fundamental areas of biological sciences (genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology) and will undertake experiential learning activities. The diverse learning experience exposes students to problem-based learning, and an exciting array of laboratory and field techniques. Students will also be able to acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major applies modern scientific inquiry to prepare graduates for employment as professionals in a variety of careers or for postgraduate study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand concepts underpinning advances in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: evaluate diverse threads of enquiry in science, and identify the value of datasets and written output (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: interpret scientific data from a range of sources and explain trends observed (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: demonstrate independent and critical thinking and appreciate moral and ethical issues related to biological sciences (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: communicate in a professional capacity with educators, business, media and the scientific community (by means of coursework, tutorial classes, project-based and presentation opportunities in the curriculum)

PLO 6: be prepared to enter employment as professional scientists, educators and managers (by means of coursework, tutorial classes, laboratory-based, project-based and capstone learning in the curriculum)

Impermissible Combinations:
- Major in Ecology & Biodiversity (Intensive)
- Major in Molecular Biology & Biotechnology (Intensive)

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

2. Advanced level courses (at least 42 credits)
   Disciplinary Electives (42 credits)
   (A) Genetics, molecular and cell biology (at least 12 credits selected from area A)
   BIOL3401 Molecular biology (6)
   BIOL3402 Cell biology and cell technology (6)
   BIOL3404 Protein structure and function (6)
   BIOL3408 Genetics (6)

   (B) Ecology, systematics and evolution (at least 12 credits selected from area B)
   BIOL3301 Marine biology (6)
   BIOL3302 Systematics and phylogenetics (6)
   BIOL3303 Conservation biology (6)
   BIOL3319 Tropical terrestrial ecology (6)
   BIOL3506 Evolutionary biology (6)

   (C) Physiology and organismic biology (at least 18 credits with 6 credits from each of List I, II & III)
   List I
   BIOL3105 Animal physiology and environmental adaptation (6)
   BIOL3205 Human physiology (6)
   BIOL3403 Immunology (6)
   BIOL3406 Reproduction and reproductive biotechnology (6)
   BIOL3503 Endocrinology: human physiology II (6)

   List II
   BIOL3319 Tropical terrestrial ecology (6)
   BIOL3506 Evolutionary biology (6)
<table>
<thead>
<tr>
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<td>BIOL3314</td>
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<td>BIOL4411</td>
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**List III**

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<td>BIOL3203</td>
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<td>6</td>
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<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology</td>
<td>6</td>
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3. **Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>BIOL3994</td>
<td>Directed studies in biological sciences</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4964</td>
<td>Biological sciences internship</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4994</td>
<td>Biological sciences project</td>
<td>12</td>
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</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biological Sciences
Offered to students admitted to Year 1 in 2018

Objectives:
This Major is designed for students seeking a broad-based training in modern biology. Students are guided in an inquiry-driven learning environment to appreciate the major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The programme is highly flexible as students can select courses according to their own interests from a wide spectrum of elective courses. At the advanced level, students are further exposed to three fundamental areas of biological sciences (genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology) and will undertake experiential learning activities. The diverse learning experience exposes students to problem-based learning, and an exciting array of laboratory and field techniques. Students will also be able to acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major applies modern scientific inquiry to prepare graduates for employment as professionals in a variety of careers or for postgraduate study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand concepts underpinning advances in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: evaluate diverse threads of enquiry in science, and identify the value of datasets and written output (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: interpret scientific data from a range of sources and explain trends observed (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: demonstrate independent and critical thinking and appreciate moral and ethical issues related to biological sciences (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: communicate in a professional capacity with educators, business, media and the scientific community (by means of coursework, tutorial classes, project-based and presentation opportunities in the curriculum)

PLO 6: be prepared to enter employment as professional scientists, educators and managers (by means of coursework, tutorial classes, laboratory-based, project-based and capstone learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity (Intensive)
Major in Molecular Biology & Biotechnology (Intensive)

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1309 Evolutionary diversity (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2220 Principles of biochemistry (6)
   Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.
   BIOL2306 Ecology and evolution (6)
   BIOC2600 Basic biochemistry (6)
   Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

2. Advanced level courses (at least 42 credits)
   Disciplinary Electives (42 credits)
   (A) Genetics, molecular and cell biology (at least 12 credits selected from area A)
   BIOL3401 Molecular biology (6)
   BIOL3402 Cell biology and cell technology (6)
   BIOL3404 Protein structure and function (6)
   BIOL3408 Genetics (6)
   (B) Ecology, systematics and evolution (at least 12 credits selected from area B)
   BIOL3301 Marine biology (6)
   BIOL3302 Systematics and phylogenetics (6)
   BIOL3303 Conservation biology (6)
   BIOL3419 Insect ecology: the little things that run the world (6)
   BIOL3501 Evolution (6)
   Take either BIOL3501 or BIOL3506 to fulfill this 12 credits requirement, but not both. BIOL3501 and BIOL3506 are mutually exclusive.
   BIOL3506 Evolutionary biology (6)
   Take either BIOL3501 or BIOL3506 to fulfill this 12 credits requirement, but not both. BIOL3501 and BIOL3506 are mutually exclusive.

   (C) Physiology and organismic biology (at least 18 credits with 6 credits from each of List I, II & III)
   List I

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### Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BIOL3105</td>
<td>Animal physiology and environmental adaptation (6)</td>
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<td>BIOL3205</td>
<td>Human physiology (6)</td>
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<tr>
<td>BIOL3403</td>
<td>Immunology (6)</td>
</tr>
<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology (6)</td>
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<td>Endocrinology: human physiology II (6)</td>
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<td>BIOL3107</td>
<td>Plant physiology (6)</td>
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<td>Plant structure and evolution (6)</td>
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<tr>
<td>BIOL3994</td>
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<td>BIOL4964</td>
<td>Biological sciences internship (6)</td>
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<tr>
<td>BIOL4994</td>
<td>Biological sciences project (12)</td>
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</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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<td>Biological sciences project (12)</td>
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</table>

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biological Sciences  
Offered to students admitted to Year 1 in 2017

Objectives:
This Major is designed for students seeking a broad-based training in modern biology. Students are guided in an inquiry-driven learning environment to appreciate the major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The programme is highly flexible as students can select courses according to their own interests from a wide spectrum of elective courses. At the advanced level, students are further exposed to three fundamental areas of biological sciences (genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology) and will undertake experiential learning activities. The diverse learning experience exposes students to problem-based learning, and an exciting array of laboratory and field techniques. Students will also be able to acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major applies modern scientific inquiry to prepare graduates for employment as professionals in a variety of careers or for postgraduate study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand concepts underpinning advances in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: evaluate diverse threads of enquiry in science, and identify the value of datasets and written output (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: interpret scientific data from a range of sources and explain trends observed (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: demonstrate independent and critical thinking and appreciate moral and ethical issues related to biological sciences (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: communicate in a professional capacity with educators, business, media and the scientific community (by means of coursework, tutorial classes, project-based and presentation opportunities in the curriculum)

PLO 6: be prepared to enter employment as professional scientists, educators and managers (by means of coursework, tutorial classes, laboratory-based, project-based and capstone learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity (Intensive)  
Major in Molecular Biology & Biotechnology (Intensive)

Required courses (96 credits)

1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

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<tbody>
<tr>
<td>SCNC1111</td>
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<tr>
<td>SCNC1112</td>
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Disciplinary Core Courses (36 credits)

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<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
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<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
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<tr>
<td>BIOL2102</td>
<td>Biostatistics</td>
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<td>BIOL2103</td>
<td>Biological sciences laboratory course</td>
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<td>BIOL2220</td>
<td>Principles of biochemistry</td>
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</tr>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
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Take either BIOL2220 or BIOL2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOL2600 are mutually exclusive.

2. Advanced level courses (at least 42 credits)

Disciplinary Electives (42 credits)

(A) Genetics, molecular and cell biology (at least 12 credits selected from area A)

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<tr>
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<tr>
<td>BIOL3401</td>
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<td>BIOL3402</td>
<td>Cell biology and cell technology</td>
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<td>BIOL3404</td>
<td>Protein structure and function</td>
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<td>BIOL3408</td>
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(B) Ecology, systematics and evolution (at least 12 credits selected from area B)

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<tr>
<td>BIOL3301</td>
<td>Marine biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3302</td>
<td>Systematics and phylogenetics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3303</td>
<td>Conservation biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3419</td>
<td>Insect ecology: the little things that run the world</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3501</td>
<td>Evolution</td>
<td>6</td>
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</table>

Take either BIOL3501 or BIOL3506 to fulfill this 12 credits requirement, but not both. BIOL3501 and BIOL3506 are mutually exclusive.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>BIOL3506</td>
<td>Evolutionary biology</td>
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</tbody>
</table>

Take either BIOL3501 or BIOL3506 to fulfill this 12 credits requirement, but not both. BIOL3501 and BIOL3506 are mutually exclusive.

(C) Physiology and organismic biology (at least 18 credits with 6 credits from each of List I, II & III)

List I

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</table>

List II

<table>
<thead>
<tr>
<th>Course</th>
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<th>Credits</th>
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List III

<table>
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<tr>
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115
<table>
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<tr>
<th>Course Code</th>
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<tr>
<td>BIOL3105</td>
<td>Animal physiology and environmental adaptation (6)</td>
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<tr>
<td>BIOL3205</td>
<td>Human physiology (6)</td>
</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology (6)</td>
</tr>
<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology (6)</td>
</tr>
<tr>
<td>BIOL3503</td>
<td>Endocrinology: human physiology II (6)</td>
</tr>
<tr>
<td>List II</td>
<td></td>
</tr>
<tr>
<td>BIOL3107</td>
<td>Plant physiology (6)</td>
</tr>
<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution (6)</td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology (6)</td>
</tr>
<tr>
<td>List III</td>
<td></td>
</tr>
<tr>
<td>BIOL3109</td>
<td>Environmental microbiology (6)</td>
</tr>
<tr>
<td>BIOL3203</td>
<td>Food microbiology (6)</td>
</tr>
<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology (6)</td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology (6)</td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3994</td>
<td>Directed studies in biological sciences (6)</td>
</tr>
<tr>
<td>BIOL4964</td>
<td>Biological sciences internship (6)</td>
</tr>
<tr>
<td>BIOL4994</td>
<td>Biological sciences project (12)</td>
</tr>
</tbody>
</table>

Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biological Sciences
Offered to students admitted to Year 1 in 2016

Objectives:
This Major is designed for students seeking a broad-based training in modern biology. Students are guided in an inquiry-driven learning environment to appreciate the major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The programme is highly flexible as students can select courses according to their own interests from a wide spectrum of elective courses. At the advanced level, students are further exposed to three fundamental areas of biological sciences (genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology) and will undertake experiential learning activities. The diverse learning experience exposes students to problem-based learning, and an exciting array of laboratory and field techniques. Students will also be able to acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major applies modern scientific inquiry to prepare graduates for employment as professionals in a variety of careers or for postgraduate study.

Learning Outcomes:
By the end of this programme, students should be able to:

1. Understand concepts underpinning advances in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

2. Evaluate diverse threads of enquiry in science, and identify the value of datasets and written output (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

3. Interpret scientific data from a range of sources and explain trends observed (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

4. Demonstrate independent and critical thinking and appreciate moral and ethical issues related to biological sciences (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

5. Communicate in a professional capacity with educators, business, media and the scientific community (by means of coursework, tutorial classes, project-based and presentation opportunities in the curriculum)

6. Be prepared to enter employment as professional scientists, educators and managers (by means of coursework, tutorial classes, laboratory-based, project-based and capstone learning in the curriculum)

Impermissible Combinations:
- Major in Ecology & Biodiversity (Intensive)
- Major in Molecular Biology & Biotechnology (Intensive)

Required courses (96 credits)

1. Introductory level courses (48 credits)

   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   - BIOL1110 From molecules to cells (6)
   - BIOL1309 Evolutionary diversity (6)
   - BIOL2102 Biostatistics (6)
   - BIOL2103 Biological sciences laboratory course (6)
   - BIOL2220 Principles of biochemistry (6)  
     Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.
   - BIOL2306 Ecology and evolution (6)
   - BIOC2600 Basic biochemistry (6)  
     Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

2. Advanced level courses (at least 42 credits)

   Disciplinary Electives (42 credits)

   (A) Genetics, molecular and cell biology (at least 12 credits selected from area A)
   - BIOL3401 Molecular biology (6)
   - BIOL3402 Cell biology and cell technology (6)
   - BIOL3404 Protein structure and function (6)
   - BIOL3408 Genetics (6)

   (B) Ecology, systematics and evolution (at least 12 credits selected from area B)
   - BIOL3301 Marine biology (6)
   - BIOL3302 Systematics and phylogenetics (6)
   - BIOL3303 Conservation biology (6)
   - BIOL3419 Insect ecology: the little things that run the world (6)
   - BIOL3501 Evolution (6)  
     Take either BIOL3501 or BIOL3506 to fulfill this 12 credits requirement, but not both. BIOL3501 and BIOL3506 are mutually exclusive.

   - BIOL3506 Evolutionary biology (6)  
     Take either BIOL3501 or BIOL3506 to fulfill this 12 credits requirement, but not both. BIOL3501 and BIOL3506 are mutually exclusive.

   (C) Physiology and organismic biology (at least 18 credits with 6 credits from each of List I, II & III)

   List I
### Science Majors

| BIOL3105 | Animal physiology and environmental adaptation (6) |
| BIOL3205 | Human physiology (6) |
| BIOL3403 | Immunology (6) |
| BIOL3406 | Reproduction and reproductive biotechnology (6) |
| BIOL3503 | Endocrinology: human physiology II (6) |

*List II*

| BIOL3107 | Plant physiology (6) |
| BIOL3314 | Plant structure and evolution (6) |
| BIOL4411 | Plant and food biotechnology (6) |

*List III*

| BIOL3109 | Environmental microbiology (6) |
| BIOL3203 | Food microbiology (6) |
| BIOL3508 | Microbial physiology and biotechnology (6) |
| BIOL4401 | Medical microbiology and applied immunology (6) |

#### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3994 Directed studies in biological sciences (6)
- BIOL4964 Biological sciences internship (6)
- BIOL4994 Biological sciences project (12)

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biological Sciences
Offered to students admitted to Year 1 in 2015

Objectives:
This Major is designed for students seeking a broad-based training in modern biology. Students are guided in an inquiry-driven learning environment to appreciate the major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The programme is highly flexible as students can select courses according to their own interests from a wide spectrum of elective courses. At the advanced level, students are further allowed to specialize in areas such as microbiology, genetics & cytology, physiology & homeostasis, or diversity of life & environmental biology and undertake experiential learning activities. The diverse learning experience exposes students to problem-based learning, and an exciting array of laboratory and field techniques. Students will also be able to acquire valuable transferrable skills in analysis, organization and communication. The Biological Sciences Major applies modern scientific inquiry to prepare graduates for employment as professionals in a variety of careers or for postgraduate study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand concepts underpinning advances in cell biology and genetics, physiology and systems biology, diversity of life and environmental biology, and applied biology (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: evaluate diverse threads of enquiry in science, and identify the value of datasets and written output (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: interpret scientific data from a range of sources and explain trends observed (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: demonstrate independent and critical thinking and appreciate moral and ethical issues related to biological sciences (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: communicate in a professional capacity with educators, business, media and the scientific community (by means of coursework, tutorial classes, project-based and presentation opportunities in the curriculum)

PLO 6: be prepared to enter employment as professional scientists, educators and managers (by means of coursework, tutorial classes, laboratory-based, project-based and capstone learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity (Intensive)
Major in Molecular Biology & Biotechnology (Intensive)

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1309 Evolutionary diversity (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2220 Principles of biochemistry (6)
   Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both.
   BIOL2220 and BIOC2600 are mutually exclusive.
   BIOL2306 Ecology and evolution (6)
   BIOL2600 Basic biochemistry (6)
   Take either BIOL2220 and BIOC2600 to fulfill this 42 credits requirement, but not both.
   BIOL2220 and BIOC2600 are mutually exclusive.

2. Advanced level courses (at least 42 credits)
   Disciplinary Electives (42 credits)
   Students must select at least 6 credits from each of the following area A, B, C & D:
   (A) Genetics and cell biology
   BIOL3401 Molecular biology (6)
   BIOL3402 Cell biology and cell technology (6)
   BIOL3403 Immunology (6)
   BIOL3408 Genetics (6)
   (B) Physiology and systems biology
   BIOL3105 Animal physiology and environmental adaptation (6)
   BIOL3107 Plant physiology (6)
   BIOL3108 Microbial physiology (6)
   Take either BIOL3108 or BIOL3508 to fulfill this 42 credits requirement, but not both.
   BIOL3108 and BIOL3508 are mutually exclusive.
   BIOL3205 Human physiology (6)
   BIOL3508 Microbial physiology and biotechnology (6)
   Take either BIOL3108 or BIOL3508 to fulfill this 42 credits requirement, but not both.
   BIOL3108 and BIOL3508 are mutually exclusive.
   (C) Diversity of life and environmental biology
   BIOL3109 Environmental microbiology (6)
### Science Majors

<table>
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<th>Course Title</th>
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<tbody>
<tr>
<td>BIOL3110</td>
<td>Environmental Toxicology</td>
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<tr>
<td>BIOL3301</td>
<td>Marine Biology</td>
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<tr>
<td>BIOL3302</td>
<td>Systematics and Phylogenetics</td>
<td>6</td>
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<td>BIOL3303</td>
<td>Conservation Biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3409</td>
<td>Business Aspects of Biotechnology</td>
<td>6</td>
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<tr>
<td>BIOL4301</td>
<td>Fish and Fisheries</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical Microbiology and Applied Immunology</td>
<td>6</td>
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**D) Applied Biology**

<table>
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<tr>
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#### 3. Capstone Requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3994</td>
<td>Directed Studies in Biological Sciences</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4964</td>
<td>Biological Sciences Internship</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4994</td>
<td>Biological Sciences Project</td>
<td>12</td>
</tr>
</tbody>
</table>

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) ('disciplinary electives') in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course ('disciplinary electives') in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course ('disciplinary electives') in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biological Sciences
Offered to students admitted to Year 1 in 2014

Objectives:
This Major is designed for students seeking a broad-based training in modern biology. Students are guided in an inquiry-driven learning environment to appreciate the major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The programme is highly flexible as students can select courses according to their own interests from a wide spectrum of elective courses. At the advanced level, students are further allowed to specialize in areas such as microbiology, genetics & cytology, physiology & homeostasis, or diversity of life & environmental biology and undertake experiential learning activities. The diverse learning experience exposes students to problem-based learning, and an exciting array of laboratory and field techniques. Students will also be able to acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major applies modern scientific inquiry to prepare graduates for employment as professionals in a variety of careers or for postgraduate study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand concepts underpinning advances in cell biology and genetics, physiology and systems biology, diversity of life and environmental biology, and applied biology (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: evaluate diverse threads of enquiry in science, and identify the value of datasets and written output (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: interpret scientific data from a range of sources and explain trends observed (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: demonstrate independent and critical thinking and appreciate moral and ethical issues related to biological sciences (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: communicate in a professional capacity with educators, business, media and the scientific community (by means of coursework, tutorial classes, project-based and presentation opportunities in the curriculum)

PLO 6: be prepared to enter employment as professional scientists, educators and managers (by means of coursework, tutorial classes, laboratory-based, project-based and capstone learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity (Intensive)
Major in Molecular Biology & Biotechnology (Intensive)

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1111 Introductory microbiology (6)
   BIOL1309 Evolutionary diversity (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2306 Ecology and evolution (6)

2. Advanced level courses (at least 42 credits)
   Disciplinary Electives (42 credits)
   Students must select at least 6 credits from each of the following area A, B, C & D:
   (A) Genetics and cell biology
      BIOL3401 Molecular biology (6)
      BIOL3402 Cell biology and cell technology (6)
      BIOL3403 Immunology (6)
   (B) Physiology and systems biology
      BIOL3105 Animal physiology and environmental adaptation (6)
      BIOL3107 Plant physiology (6)
      BIOL3108 Microbial physiology (6)
      BIOL3205 Human physiology (6)
   (C) Diversity of life and environmental biology
      BIOL3109 Environmental microbiology (6)
      BIOL3110 Environmental toxicology (6)
      BIOL3301 Marine biology (6)
      BIOL3302 Systematics and phylogenetics (6)
   (D) Applied biology
      BIOL3303 Conservation biology (6)
      BIOL3409 Business aspects of biotechnology (6)

Take either BIOL3108 or BIOL3508 to fulfill this 42 credits requirement, but not both. BIOL3108 and BIOL3508 are mutually exclusive.

Take either BIOL3108 or BIOL3508 to fulfill this 42 credits requirement, but not both. BIOL3108 and BIOL3508 are mutually exclusive.
3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3994 Directed studies in biological sciences (6)
- BIOL4964 Biological sciences internship (6)
- BIOL4994 Biological sciences project (12)

Notes:
1. BIOL1111 Introductory Microbiology is not offered from 2015-16. Students should take either BIOL2220 Principles of biochemistry or BIOC2600 Basic biochemistry as a replacement, both BIOL2220 and BIOC2600 are mutually exclusive.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biological Sciences
Offered to students admitted to Year 1 in 2013

Objectives:
This Major is designed for students seeking a broad-based training in modern biology. Students are guided in an inquiry-driven learning environment to appreciate the major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The programme is highly flexible as students can select courses according to their own interests from a wide spectrum of elective courses. At the advanced level, students are further allowed to specialize in areas such as microbiology, genetics & cytology, physiology & homeostasis, or diversity of life & environmental biology and undertake experiential learning activities. The diverse learning experience exposes students to problem-based learning, and an exciting array of laboratory and field techniques. Students will also be able to acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major applies modern scientific inquiry to prepare graduates for employment as professionals in a variety of careers or for postgraduate study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand concepts underpinning advances in cell biology and genetics, physiology and systems biology, diversity of life and environmental biology, and applied biology (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: evaluate diverse threads of enquiry in science, and identify the value of datasets and written output (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: interpret scientific data from a range of sources and explain trends observed (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: demonstrate independent and critical thinking and appreciate moral and ethical issues related to biological sciences (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: communicate in a professional capacity with educators, business, media and the scientific community (by means of coursework, tutorial classes, project-based and presentation opportunities in the curriculum)

PLO 6: be prepared to enter employment as professional scientists, educators and managers (by means of coursework, tutorial classes, laboratory-based, project-based and capstone learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity (Intensive)
Major in Molecular Biology & Biotechnology (Intensive)

Required courses (96 credits)

1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6</td>
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<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6</td>
</tr>
</tbody>
</table>

Disciplinary Core Courses (36 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1111</td>
<td>Introductory microbiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2102</td>
<td>Biostatistics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2103</td>
<td>Biological sciences laboratory course</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution</td>
<td>6</td>
</tr>
</tbody>
</table>

2. Advanced level courses (at least 42 credits)

Disciplinary Electives (42 credits)

Students must select at least 6 credits from each of the following area A, B, C & D:

(A) Genetics and cell biology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3401</td>
<td>Molecular biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3408</td>
<td>Genetics</td>
<td>6</td>
</tr>
</tbody>
</table>

(B) Physiology and systems biology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3105</td>
<td>Animal physiology and environmental adaptation</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3107</td>
<td>Plant physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3108</td>
<td>Microbial physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL3108 or BIOL3508 to fulfill this 42 credits requirement, but not both. BIOL3108 and BIOL3508 are mutually exclusive.

(C) Diversity of life and environmental biology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3109</td>
<td>Environmental microbiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3110</td>
<td>Environmental toxicology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3301</td>
<td>Marine biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3302</td>
<td>Systematics and phylogenetics</td>
<td>6</td>
</tr>
</tbody>
</table>

(D) Applied biology

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3303</td>
<td>Conservation biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3409</td>
<td>Business aspects of biotechnology</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL3108 or BIOL3508 to fulfill this 42 credits requirement, but not both. BIOL3108 and BIOL3508 are mutually exclusive.
3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - BIOL3994 Directed studies in biological sciences (6)
   - BIOL4964 Biological sciences internship (6)
   - BIOL4994 Biological sciences project (12)

Notes:
1. BIOL1111 Introductory Microbiology is not offered from 2015-16. Students should take either BIOL2220 Principles of biochemistry or BIOC2600 Basic biochemistry as a replacement, both BIOL2220 and BIOC2600 are mutually exclusive.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Biological Sciences
Offered to students admitted to Year 1 in 2012

Objectives:
This Major is designed for students seeking a broad-based training in modern biology. Students are guided in an inquiry-driven learning environment to appreciate the major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The programme is highly flexible as students can select courses according to their own interests from a wide spectrum of elective courses. At the advanced level, students are further allowed to specialize in areas such as microbiology, genetics & cytology, physiology & homeostasis, or diversity of life & environmental biology and undertake experiential learning activities. The diverse learning experience exposes students to problem-based learning, and an exciting array of laboratory and field techniques. Students will also be able to acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major applies modern scientific inquiry to prepare graduates for employment as professionals in a variety of careers or for postgraduate study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand concepts underpinning advances in cell biology and genetics, physiology and systems biology, diversity of life and environmental biology, and applied biology (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: evaluate diverse threads of enquiry in science, and identify the value of datasets and written output (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: interpret scientific data from a range of sources and explain trends observed (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: demonstrate independent and critical thinking and appreciate moral and ethical issues related to biological sciences (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: communicate in a professional capacity with educators, business, media and the scientific community (by means of coursework, tutorial classes, project-based and presentation opportunities in the curriculum)

PLO 6: be prepared to enter employment as professional scientists, educators and managers (by means of coursework, tutorial classes, laboratory-based, project-based and capstone learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity (Intensive)
Major in Molecular Biology & Biotechnology (Intensive)

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1111 Introductory microbiology (6)
   BIOL1309 Evolutionary diversity (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2306 Ecology and evolution (6)

2. Advanced level courses (at least 42 credits)
   Disciplinary Electives (42 credits)
   Students must select at least 6 credits from each of the following area A, B, C & D:

   (A) Genetics and cell biology
   BIOL3401 Molecular biology (6)
   BIOL3402 Cell biology and cell technology (6)
   BIOL3403 Immunology (6)
   BIOL3408 Genetics (6)

   (B) Physiology and systems biology
   BIOL3105 Animal physiology and environmental adaptation (6)
   BIOL3107 Plant physiology (6)
   BIOL3108 Microbial physiology (6)
   BIOL3205 Human physiology (6)
   BIOL3508 Microbial physiology and biotechnology (6)

   (C) Diversity of life and environmental biology
   BIOL3109 Environmental microbiology (6)
   BIOL3110 Environmental toxicology (6)
   BIOL3301 Marine biology (6)
   BIOL3302 Systematics and phylogenetics (6)

   (D) Applied biology
   BIOL3303 Conservation biology (6)
   BIOL3409 Business aspects of biotechnology (6)

Take either BIOL3108 or BIOL3508 to fulfill this 42 credits requirement, but not both. BIOL3108 and BIOL3508 are mutually exclusive.

Take either BIOL3108 or BIOL3508 to fulfill this 42 credits requirement, but not both. BIOL3108 and BIOL3508 are mutually exclusive.
3. Capstone requirement (6 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4301</td>
<td>Fish and fisheries (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology (6)</td>
<td></td>
</tr>
</tbody>
</table>

**At least 6 credits selected from the following courses:**
- BIOL3994 Directed studies in biological sciences (6)
- BIOL4964 Biological sciences internship (6)
- BIOL4994 Biological sciences project (12)

**Notes:**
1. BIOL1111 Introductory Microbiology is not offered from 2015-16. Students should take either BIOL2220 Principles of biochemistry or BIOC2600 Basic biochemistry as a replacement, both BIOL2220 and BIOC2600 are mutually exclusive.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
The Major in Chemistry aims to provide students with a solid training in major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. A wide selection of elective courses in chemical biology, chemical analysis, computational chemistry, environmental chemistry, industrial chemistry, interfacial science, material, and medicinal chemistry, is also available to provide students with knowledge and training to help them meet the dynamic and ever-changing challenges in science and technology. Graduates of the Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences that are crucial for their future careers in a knowledge-based economy. It is expected that our graduates will be able to meet local and regional requirements in the industrial, commercial, government or education sectors and will become future leaders of these sectors.

**Learning Outcomes:**

By the end of this programme, students should be able to:

- **PLO 1:** Demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum).

- **PLO 2:** Demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum).

- **PLO 3:** Have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum).

- **PLO 4:** Have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 100 hours of laboratory classes in the curriculum).

- **PLO 5:** Demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum).

- **PLO 6:** Gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories).

**Impermissible Combinations:**

- Major in Chemistry (Intensive)
- Minor in Chemistry

### Required courses (96 credits)

1. **Introductory level courses (48 credits)**

   **SCNC1111** Scientific method and reasoning (6)
   **SCNC1112** Fundamentals of modern science (6)

2. **Disciplinary Core Courses (36 credits)**

   - CHEM1042 General chemistry I (6)
   - CHEM1043 General chemistry II (6)
   - CHEM2241 Analytical chemistry I (6)
   - CHEM2341 Inorganic chemistry I (6)
   - CHEM2441 Organic chemistry I (6)
   - CHEM2541 Introductory physical chemistry (6)

3. **Disciplinary Electives (12 credits)**

   At least 12 credits of any level 4 Chemistry (CHEM4XXX) courses. The current list include courses in List A.

   - CHEM4142 Symmetry, group theory and applications (6)
   - CHEM4143 Interfacial science and technology (6)
   - CHEM4144 Advanced materials (6)
   - CHEM4145 Medicinal chemistry (6)
   - CHEM4147 Supramolecular chemistry (6)
   - CHEM4148 Frontiers in Modern Chemical Science (6)
   - CHEM4241 Modern chemical instrumentation and applications (6)
   - CHEM4242 Analytical chemistry (6)
   - CHEM4341 Advanced inorganic chemistry (6)
   - CHEM4342 Organometallic chemistry (6)
   - CHEM4441 Advanced organic chemistry (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM4443</td>
<td>Integrated organic synthesis</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4542</td>
<td>Computational chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4543</td>
<td>Advanced physical chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology</td>
<td>(6)</td>
</tr>
</tbody>
</table>

**3. Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3999</td>
<td>Directed studies in chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4910</td>
<td>Chemistry literacy and research</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4911</td>
<td>Capstone experience for chemistry undergraduates: HKUtopia</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4966</td>
<td>Chemistry internship</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4999</td>
<td>Chemistry project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (“disciplinary core”) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (“disciplinary core”) in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Chemistry

Offered to students admitted to Year 1 in 2018

Objectives:
The Major in Chemistry aims to provide students with a solid training in major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. A wide selection of elective courses in chemical biology, chemical analysis, computational chemistry, environmental chemistry, industrial chemistry, interfacial science, material, and medicinal chemistry, is also available to provide students with knowledge and training to help them meet the dynamic and ever-changing challenges in science and technology. Graduates of the Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences that are crucial for their future careers in a knowledge-based economy. It is expected that our graduates will be able to meet local and regional requirements in the industrial, commercial, government or education sectors and will become future leaders of these sectors.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 2: demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 3: have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 4: have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 100 hours of laboratory classes in the curriculum)

PLO 5: demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)

PLO 6: gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

Impermissible Combinations:
Major in Chemistry (Intensive)
Minor in Chemistry

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   CHEM1042 General chemistry I (6)
   CHEM1043 General chemistry II (6)
   CHEM2241 Analytical chemistry I (6)
   CHEM2341 Inorganic chemistry I (6)
   CHEM2441 Organic chemistry I (6)
   CHEM2541 Introductory physical chemistry (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Course (30 credits)
   CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   CHEM3341 Advanced inorganic chemistry (6)
   CHEM3441 Advanced organic chemistry (6)
   CHEM3541 Physical chemistry: Introduction to quantum chemistry (6)

   Disciplinary Electives (12 credits)
   At least 12 credits of any level 4 Chemistry (CHEM4XXX) courses. The current list includes courses in List A.
   List A
   CHEM4142 Symmetry, group theory and applications (6)
   CHEM4143 Interfacial science and technology (6)
   CHEM4144 Advanced materials (6)
   CHEM4145 Medicinal chemistry (6)
   CHEM4147 Supramolecular chemistry (6)
   CHEM4148 Frontiers in Modern Chemical Science (6)
   CHEM4241 Modern chemical instrumentation and applications (6)
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   CHEM4342 Organometallic chemistry (6)
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<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology (6)</td>
<td></td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- **CHEM3999** Directed studies in chemistry (6)
- **CHEM4910** Chemistry literacy and research (6)
- **CHEM4911** Capstone experience for chemistry undergraduates: HKUtopia (6)
- **CHEM4966** Chemistry internship (6)
- **CHEM4999** Chemistry project (12)

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Chemistry
Offered to students admitted to Year 1 in 2017

Objectives:
The Major in Chemistry aims to provide students with a solid training in major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. A wide selection of elective courses in chemical biology, chemical analysis, computational chemistry, environmental chemistry, industrial chemistry, interfacial science, material, and medicinal chemistry, is also available to provide students with knowledge and training to help them meet the dynamic and ever-changing challenges in science and technology. Graduates of the Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferrable skills in both theoretical and experimental investigations in sciences that are crucial for their future careers in a knowledge-based economy. It is expected that our graduates will be able to meet local and regional requirements in the industrial, commercial, government or education sectors and will become future leaders of these sectors.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 2: demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 3: have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 4: have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 100 hours of laboratory classes in the curriculum)

PLO 5: demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)

PLO 6: gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

Impermissible Combinations:
Major in Chemistry (Intensive)
Minor in Chemistry

Required courses (96 credits)

1. Introductory level courses (48 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (36 credits)
   CHEM1041 General chemistry I (6)
   CHEM1043 General chemistry II (6)
   CHEM2241 Analytical chemistry I (6)
   CHEM2341 Inorganic chemistry I (6)
   CHEM2441 Organic chemistry I (6)
   CHEM2541 Introductory physical chemistry (6)

Disciplinary Electives (12 credits)
   At least 12 credits of any level 4 Chemistry (CHEM4XXX) courses. The current list include courses in List A.
   List A
   CHEM4142 Symmetry, group theory and applications (6)
   CHEM4143 Interfacial science and technology (6)
   CHEM4144 Advanced materials (6)
   CHEM4145 Medicinal chemistry (6)
   CHEM4147 Supramolecular chemistry (6)
   CHEM4148 Frontiers in Modern Chemical Science (6)
   CHEM4241 Modern chemical instrumentation and applications (6)
   CHEM4242 Analytical chemistry (6)
   CHEM4341 Advanced inorganic chemistry (6)
   CHEM4342 Organometallic chemistry (6)
   CHEM4441 Advanced organic chemistry (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM4443</td>
<td>Integrated organic synthesis</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4542</td>
<td>Computational chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4543</td>
<td>Advanced physical chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology</td>
<td>(6)</td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3999</td>
<td>Directed studies in chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4910</td>
<td>Chemistry literacy and research</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4911</td>
<td>Capstone experience for chemistry undergraduates: HKUtopia</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4966</td>
<td>Chemistry internship</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4999</td>
<td>Chemistry project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Objectives:**
The Major in Chemistry aims to provide students with a solid training in major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. A wide selection of elective courses in chemical biology, chemical analysis, computational chemistry, environmental chemistry, industrial chemistry, interfacial science, material, and medicinal chemistry, is also available to provide students with knowledge and training to help them meet the dynamic and ever-changing challenges in science and technology. Graduates of the Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences that are crucial for their future careers in a knowledge-based economy. It is expected that our graduates will be able to meet local and regional requirements in the industrial, commercial, government or education sectors and will become future leaders of these sectors.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)
- **PLO 2**: demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)
- **PLO 3**: have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)
- **PLO 4**: have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 100 hours of laboratory classes in the curriculum)
- **PLO 5**: demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)
- **PLO 6**: gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

**Impermissible Combinations:**
Major in Chemistry (Intensive)
Minor in Chemistry

**Required courses (96 credits)**

1. **Introductory level courses (48 credits)**
   - **SCNC1111**: Scientific method and reasoning (6)
   - **SCNC1112**: Fundamentals of modern science (6)

2. **Disciplinary Core Courses (36 credits)**
   - **CHEM1042**: General chemistry I (6)
   - **CHEM1043**: General chemistry II (6)
   - **CHEM2241**: Analytical chemistry I (6)
   - **CHEM2341**: Inorganic chemistry I (6)
   - **CHEM2441**: Organic chemistry I (6)
   - **CHEM2541**: Introductory physical chemistry (6)

3. **Disciplinary Electives (12 credits)**
   - At least 12 credits of any level 4 Chemistry (CHEM4XXX) courses. The current list include courses in List A. 
   - **CHEM4142**: Symmetry, group theory and applications (6)
   - **CHEM4143**: Interfacial science and technology (6)
   - **CHEM4144**: Advanced materials (6)
   - **CHEM4145**: Medicinal chemistry (6)
   - **CHEM4147**: Supramolecular chemistry (6)
   - **CHEM4148**: Frontiers in Modern Chemical Science (6)
   - **CHEM4241**: Modern chemical instrumentation and applications (6)
   - **CHEM4242**: Analytical chemistry (6)
   - **CHEM4341**: Advanced inorganic chemistry (6)
   - **CHEM4342**: Organometallic chemistry (6)
   - **CHEM4441**: Advanced organic chemistry (6)
### Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM4443</td>
<td>Integrated organic synthesis</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4542</td>
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</tr>
<tr>
<td>CHEM4543</td>
<td>Advanced physical chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology</td>
<td>(6)</td>
</tr>
</tbody>
</table>

#### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- CHEM3999  Directed studies in chemistry (6)
- CHEM4910  Chemistry literacy and research (6)
- CHEM4911  Capstone experience for chemistry undergraduates: HKUtopia (6)
- CHEM4966  Chemistry internship (6)
- CHEM4999  Chemistry project (12)

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BE&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Chemistry  
Offered to students admitted to Year 1 in 2015

**Objectives:**  
The Major in Chemistry aims to provide students with a solid training in major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. A wide selection of elective courses in chemical biology, chemical analysis, computational chemistry, environmental chemistry, industrial chemistry, interfacial science, material, and medicinal chemistry, is also available to provide students with knowledge and training to help them meet the dynamic and ever-changing challenges in science and technology. Graduates of the Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences that are crucial for their future careers in a knowledge-based economy. It is expected that our graduates will be able to meet local and regional requirements in the industrial, commercial, government or education sectors and will become future leaders of these sectors.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

- **PLO 1:** demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

- **PLO 2:** demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

- **PLO 3:** have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

- **PLO 4:** have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 100 hours of laboratory classes in the curriculum)

- **PLO 5:** demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)

- **PLO 6:** gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

**Impermissible Combinations:**  
Major in Chemistry (Intensive)  
Minor in Chemistry

**Required courses (96 credits)**

<table>
<thead>
<tr>
<th>1. Introductory level courses (48 credits)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disciplinary Core Courses: Science Foundation Courses (12 credits)</strong></td>
<td></td>
</tr>
<tr>
<td>SCNC1111 Scientific method and reasoning (6)</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>CHEM2241 Analytical chemistry I (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM2341 Inorganic chemistry I (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM2441 Organic chemistry I (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM2541 Introductory physical chemistry (6)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Advanced level courses (42 credits)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disciplinary Core Course (30 credits)</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM3241 Analytical chemistry II: chemical instrumentation (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM3341 Inorganic chemistry II (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM3441 Organic chemistry II (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM3443 Organic chemistry laboratory (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM3541 Physical chemistry: Introduction to quantum chemistry (6)</td>
<td></td>
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<tr>
<td><strong>Disciplinary Electives (12 credits)</strong></td>
<td></td>
</tr>
<tr>
<td>At least 12 credits of any level 4 Chemistry (CHEM4XXX) courses. The current list include courses in List A.</td>
<td></td>
</tr>
<tr>
<td><strong>List A</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM4142 Symmetry, group theory and applications (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4143 Interfacial science and technology (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4144 Advanced materials (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4145 Medicinal chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4147 Supramolecular chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4148 Frontiers in Modern Chemical Science (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4241 Modern chemical instrumentation and applications (6)</td>
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<td>CHEM4242 Analytical chemistry (6)</td>
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<tr>
<td>CHEM4341 Advanced inorganic chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4342 Organometallic chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4441 Advanced organic chemistry (6)</td>
<td></td>
</tr>
</tbody>
</table>
### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
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<td>CHEM3999</td>
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<tr>
<td>CHEM4966</td>
<td>Chemistry internship (6)</td>
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<tr>
<td>CHEM4999</td>
<td>Chemistry project (12)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Chemistry
Offered to students: admitted to Year 1 in 2014

Objectives:
The Major in Chemistry aims to provide students with a solid training in major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. A wide selection of elective courses in chemical biology, chemical analysis, computational chemistry, environmental chemistry, industrial chemistry, interfacial science, material, and medicinal chemistry, is also available to provide students with knowledge and training to help them meet the dynamic and ever-changing challenges in science and technology. Graduates of the Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences that are crucial for their future careers in a knowledge-based economy. It is expected that our graduates will be able to meet local and regional requirements in the industrial, commercial, government or education sectors and will become future leaders of these sectors.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 2: demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 3: have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 4: have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 100 hours of laboratory classes in the curriculum)

PLO 5: demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)

PLO 6: gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

Impermissible Combinations:
Major in Chemistry (Intensive)
Minor in Chemistry

Required courses (96 credits)
1. Introductory level courses (42 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6)
SCNC1112 Fundamentals of modern science (6)
Disciplinary Core Courses (30 credits)
CHEM1042 General chemistry I (6) [ previous title: General chemistry (6) ]
CHEM2241 Analytical chemistry I (6)
CHEM2341 Inorganic chemistry I (6)
CHEM2441 Organic chemistry I (6)
CHEM2541 Introductory physical chemistry (6) [ previous title: Physical chemistry I (6) ]

2. Advanced level courses (48 credits)
Disciplinary Core Course (30 credits)
CHEM3146 Principles and applications of spectroscopic and analytical techniques (6)
CHEM3241 Analytical chemistry II: chemical instrumentation (6)
CHEM3341 Inorganic chemistry II (6)
CHEM3441 Organic chemistry II (6)
CHEM3541 Physical chemistry: Introduction to quantum chemistry (6) [ previous title: Physical chemistry II: Introduction to quantum chemistry (6) ]
Disciplinary Electives (12 credits)
At least 12 credits selected from the following 18 credits of courses in two different areas in List A:
List A
CHEM3542 Physical chemistry: statistical thermodynamics and kinetics (6)
CHEM4341 Advanced inorganic chemistry (6)
CHEM4441 Advanced organic chemistry (6)
CHEM4443 Integrated organic synthesis (6)
Take either CHEM4443 or CHEM4441 to fulfill this 12 credits requirement, but not both.

Disciplinary Electives (6 credits)
At least 6 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level, excluding CHEM3999 Directed studies in chemistry, CHEM4910 Chemistry literacy and research, CHEM4911 Capstone experience for chemistry undergraduates: HKUtopia, CHEM4966 Chemistry internship and CHEM4999 Chemistry project), subject to pre-requisite requirements. The current list include courses in List B and those course not selected to fulfill the requirements in List A.

List B

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3141</td>
<td>Environmental chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3142</td>
<td>Chemical process industries and analysis</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3143</td>
<td>Introduction to materials chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3242</td>
<td>Food and water analysis</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3342</td>
<td>Bioinorganic chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3442</td>
<td>Organic chemistry of biomolecules</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3443</td>
<td>Organic chemistry laboratory</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3445</td>
<td>Integrated laboratory</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4142</td>
<td>Symmetry, group theory and applications</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4143</td>
<td>Interfacial science and technology</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4144</td>
<td>Advanced materials</td>
<td>6</td>
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<tr>
<td>CHEM4145</td>
<td>Medicinal chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4147</td>
<td>Supramolecular chemistry</td>
<td>6</td>
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<tr>
<td>CHEM4148</td>
<td>Frontiers in Modern Chemical Science</td>
<td>6</td>
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<tr>
<td>CHEM4241</td>
<td>Modern chemical instrumentation and applications</td>
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<tr>
<td>CHEM4242</td>
<td>Analytical chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4342</td>
<td>Organometallic chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4542</td>
<td>Computational chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4543</td>
<td>Advanced physical chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology</td>
<td>6</td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3999</td>
<td>Directed studies in chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4910</td>
<td>Chemistry literacy and research</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4911</td>
<td>Capstone experience for chemistry undergraduates: HKUtopia</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4966</td>
<td>Chemistry internship</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4999</td>
<td>Chemistry project</td>
<td>12</td>
</tr>
</tbody>
</table>

Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

6. CHEM3146 Principles and applications of spectroscopic and analytical techniques is not offered from 2016-17. Students should consult the course selection advisers for course replacement.

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Major Title
Major in Chemistry

## Offered to students admitted to Year 1 in
2013

## Objectives:
The Major in Chemistry aims to provide students with a solid training in major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. A wide selection of elective courses in chemical biology, chemical analysis, computational chemistry, environmental chemistry, industrial chemistry, interfacial science, material, and medicinal chemistry, is also available to provide students with knowledge and training to help them meet the dynamic and ever-changing challenges in science and technology. Graduates of the Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences that are crucial for their future careers in a knowledge-based economy. It is expected that our graduates will be able to meet local and regional requirements in the industrial, commercial, government or education sectors and will become future leaders of these sectors.

## Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1:** demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

**PLO 2:** demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

**PLO 3:** have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

**PLO 4:** have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 100 hours of laboratory classes in the curriculum)

**PLO 5:** demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)

**PLO 6:** gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

## Impermissible Combinations:
Major in Chemistry (Intensive)
Minor in Chemistry

## Required courses (96 credits)
### 1. Introductory level courses (42 credits)
#### Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

#### Disciplinary Core Courses (30 credits)
- CHEM1042 General chemistry I (6)  
  [previous title: General chemistry (6)]
- CHEM2241 Analytical chemistry I (6)
- CHEM2341 Inorganic chemistry I (6)
- CHEM2441 Organic chemistry I (6)
- CHEM2541 Introductory physical chemistry (6)  
  [previous title: Physical chemistry I (6)]

### 2. Advanced level courses (48 credits)
#### Disciplinary Core Courses (30 credits)
- CHEM3146 Principles and applications of spectroscopic and analytical techniques (6)
- CHEM3241 Analytical chemistry II: chemical instrumentation (6)
- CHEM3341 Inorganic chemistry II (6)
- CHEM3441 Organic chemistry II (6)
- CHEM3541 Physical chemistry: Introduction to quantum chemistry (6)  
  [previous title: Physical chemistry II: Introduction to quantum chemistry (6)]

#### Disciplinary Electives (12 credits)
At least 12 credits selected from the following 18 credits of courses in two different areas in List A:

**List A**
- CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory (6)
  Take either CHEM3542 or CHEM4541 to fulfill this 12 credits requirement, but not both.
- CHEM4341 Advanced inorganic chemistry (6)
  Take either CHEM4443 or CHEM4441 to fulfill this 12 credits requirement, but not both.
- CHEM4441 Advanced organic chemistry (6)
  Take either CHEM4443 or CHEM4441 to fulfill this 12 credits requirement, but not both.
- CHEM4443 Integrated organic synthesis (6)
  Take either CHEM4443 or CHEM4441 to fulfill this 12 credits requirement, but not both.
- CHEM4541 Physical chemistry III: statistical thermodynamics and kinetics theory (6)
  Take either CHEM3542 or CHEM4541 to fulfill this 12 credits requirement, but not both.

#### Disciplinary Electives (6 credits)
- List A
At least 6 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level, excluding CHEM3999 Direct studies in chemistry, CHEM4910 Chemistry literacy and research, CHEM4911 Capstone experience for chemistry undergraduates: HKUtopia, CHEM4966 Chemistry internship and CHEM4999 Chemistry project), subject to pre-requisite requirements. The current list include courses in List B and those courses not selected to fulfill the requirements in List A.

List B

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3141</td>
<td>Environmental chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3142</td>
<td>Chemical process industries and analysis</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3143</td>
<td>Introduction to materials chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3242</td>
<td>Food and water analysis</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3342</td>
<td>Bioinorganic chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3443</td>
<td>Organic chemistry laboratory</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3445</td>
<td>Integrated laboratory</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4142</td>
<td>Symmetry, group theory and applications</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4143</td>
<td>Interfacial science and technology</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4144</td>
<td>Advanced materials</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4145</td>
<td>Medicinal chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4147</td>
<td>Supramolecular chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4148</td>
<td>Food and water analysis</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4241</td>
<td>Modern chemical instrumentation and applications</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4242</td>
<td>Analytical chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4342</td>
<td>Organometallic chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology</td>
<td>6</td>
</tr>
<tr>
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<td>6</td>
</tr>
<tr>
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<td>CHEM4544</td>
<td>Electrochemical science and technology</td>
<td>6</td>
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</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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<td>CHEM4999</td>
<td>Chemistry project</td>
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</tr>
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</table>

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

6. CHEM3146 Principles and applications of spectroscopic and analytical techniques is not offered from 2016-17. Students should consult the course selection advisers for course replacement.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title**: Major in Chemistry  
**Offered to students admitted to Year 1 in**: 2012

**Objectives:**
The Major in Chemistry aims to provide students with a solid training in major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. A wide selection of elective courses in chemical biology, chemical analysis, computational chemistry, environmental chemistry, industrial chemistry, interfacial science, material, and medicinal chemistry, is also available to provide students with knowledge and training to help them meet the dynamic and ever-changing challenges in science and technology. Graduates of the Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences that are crucial for their future careers in a knowledge-based economy. It is expected that our graduates will be able to meet local and regional requirements in the industrial, commercial, government or education sectors and will become future leaders of these sectors.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)
- **PLO 2**: demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)
- **PLO 3**: have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)
- **PLO 4**: have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 100 hours of laboratory classes in the curriculum)
- **PLO 5**: demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)
- **PLO 6**: gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

**Impermissible Combinations:**
Major in Chemistry (Intensive)  
Minor in Chemistry

**Required courses (96 credits)**

1. **Introductory level courses (42 credits)**
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

2. **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   - CHEM104 [previous title: General chemistry (6)]
   - CHEM2241 Analytical chemistry I (6)
   - CHEM2341 Inorganic chemistry I (6)
   - CHEM2441 Organic chemistry I (6)
   - CHEM2541 Introductory physical chemistry (6) [previous title: Physical chemistry I (6)]

3. **Disciplinary Core Courses (30 credits)**
   - CHEM3146 Principles and applications of spectroscopic and analytical techniques (6)
   - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   - CHEM3341 Inorganic chemistry II (6)
   - CHEM3441 Organic chemistry II (6)
   - CHEM3541 Physical chemistry: Introduction to quantum chemistry (6) [previous title: Physical chemistry II: Introduction to quantum chemistry (6)]

4. **Disciplinary Electives (12 credits)**
   - At least 12 credits selected from the following 18 credits of courses in two different areas in List A:
     - **List A**
       - CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory (6)
       - CHEM4341 Advanced inorganic chemistry (6)
       - CHEM4441 Advanced organic chemistry (6)
       - CHEM4443 Integrated organic synthesis (6)
       - CHEM4541 Physical chemistry III: statistical thermodynamics and kinetics theory (6)
   - Take either CHEM3542 or CHEM4541 to fulfill this 12 credits requirement, but not both.
   - Take either CHEM4443 or CHEM4441 to fulfill this 12 credits requirement, but not both.
   - Take either CHEM4443 or CHEM4441 to fulfill this 12 credits requirement, but not both.
   - Take either CHEM3542 or CHEM4541 to fulfill this 12 credits requirement, but not both.

5. **Disciplinary Electives (6 credits)**
At least 6 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level, excluding CHEM3999 Directed studies in chemistry, CHEM4910 Chemistry literacy and research, CHEM4911 Capstone experience for chemistry undergraduates: HKUtopia, CHEM4966 Chemistry internship and CHEM4999 Chemistry project), subject to pre-requisite requirements. The current list includes courses in List B and those courses not selected to fulfill the requirements in List A.

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<td>(6)</td>
</tr>
<tr>
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<td>CHEM3242</td>
<td>Food and water analysis</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM3442</td>
<td>Organic chemistry of biomolecules</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM3443</td>
<td>Organic chemistry laboratory</td>
<td>(6)</td>
</tr>
<tr>
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</tr>
<tr>
<td>CHEM4145</td>
<td>Medicinal chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4147</td>
<td>Supramolecular chemistry</td>
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<tr>
<td>CHEM4241</td>
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<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology</td>
<td>(6)</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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<td>Chemistry project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

6. CHEM3146 Principles and applications of spectroscopic and analytical techniques is not offered from 2016-17. Students should consult the course selection advisers for course replacement.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Chemistry (Intensive)
Offered to students: admitted to Year 1 in 2019

Objectives:
The Intensive Major in Chemistry aims to provide students with a strong foundation on major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. The curriculum emphasizes comprehensive coverage in theoretical knowledge, laboratory skills, and research experience. A wide selection of elective courses is also available for student preparation to pursue learning in specializations such as chemical biology, computation chemistry, and materials. Graduates of the Intensive Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences. Graduates are expected to be well-prepared for further studies in chemistry and related disciplines and to pursue professional careers in scientific and technical fields.

This intensive major has been accredited by the Royal Society of Chemistry (RSC), UK.

Learning Outcomes:
By the end of this programme, students should be able to:

1. Demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)
2. Demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)
3. Have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)
4. Have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 300 hours of laboratory classes in the curriculum)
5. Demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)
6. Gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

Impermissible Combinations:
Major in Chemistry
Minor in Chemistry

Required courses (144 credits)

1. Introductory level courses (54 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   - CHEM1042 General chemistry I (6)
   - CHEM1043 General chemistry II (6)
   - CHEM2241 Analytical chemistry I (6)
   - CHEM2341 Inorganic chemistry I (6)
   - CHEM2441 Organic chemistry I (6)
   - CHEM2541 Introductory physical chemistry (6)

   Disciplinary Electives (6 credits)
   (Students are encouraged to meet with a Chemistry Course Selection Advisor in the course selection period to discuss which of the following courses they should take based on their previous background in Mathematics.)
   - CHEM1044 Mathematics in chemistry (6)
   - COMP1117 Computer programming (6)
   - MATH1011 University mathematics I (6)
   - MATH1013 University mathematics II (6)
   - STAT1601 Elementary statistical methods (6)
   - STAT1603 Introductory statistics (6)

2. Advanced level courses (78 credits)
   Disciplinary Core Course (66 credits)
   - CHEM3143 Introduction to materials chemistry (6)
   - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   - CHEM3341 Inorganic chemistry II (6)
   - CHEM3441 Organic chemistry II (6)
   - CHEM3443 Organic chemistry laboratory (6)
   - CHEM3445 Integrated laboratory (6)
   - CHEM3541 Physical chemistry: Introduction to quantum chemistry (6)
   - CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory (6)

   Science Majors

143
<table>
<thead>
<tr>
<th>Course Code</th>
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<td>Advanced materials (6)</td>
</tr>
<tr>
<td>CHEM4241</td>
<td>Modern chemical instrumentation and applications (6)</td>
</tr>
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</table>

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses:

(Note that one of the two elective courses selected must contain a laboratory component. Courses marked with (lab) have a laboratory component. The list of electives given below may be subject to change.)

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<td>Advanced physical chemistry (6)</td>
</tr>
<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology (6) (lab)</td>
</tr>
</tbody>
</table>

**3. Capstone requirement (12 credits)**

At least 12 credits selected from the following courses:

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<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>CHEM3999</td>
<td>Directed studies in chemistry (6)</td>
</tr>
<tr>
<td>CHEM4966</td>
<td>Chemistry internship (6)</td>
</tr>
<tr>
<td>CHEM4999</td>
<td>Chemistry project (12)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

2. These are core courses in the regular Chemistry Major (96 credits) curriculum.

3. As this curriculum is accredited by the Royal Society of Chemistry (RSC), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this accredited programme. For students who have credit transfer from exchange studies, for example) a student took CHEM3A and CHEM3B in a host university during his/her exchange studies and these two courses have been approved by the Faculty of Science to be considered equivalent as CHEM3241 and CHEM3341, they will be considered taking those HKU-version courses and in the example shown here, the student is deemed to have taken CHEM3241 and CHEM3341 to fulfil the accredited curriculum.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title:** Major in Chemistry (Intensive)  
**Offered to students admitted to Year 1 in:** 2018

**Objectives:**  
The Intensive Major in Chemistry aims to provide students with a strong foundation on major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. The curriculum emphasizes comprehensive coverage in theoretical knowledge, laboratory skills, and research experience. A wide selection of elective courses is also available for student preparation to pursue learning in specializations such as chemical biology, computation chemistry, and materials. Graduates of the Intensive Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences. Graduates are expected to be well-prepared for further studies in chemistry and related disciplines and to pursue professional careers in scientific and technical fields.

This intensive major has been accredited by the Royal Society of Chemistry (RSC), UK.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

- **PLO 1:** demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

- **PLO 2:** demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

- **PLO 3:** have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

- **PLO 4:** have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 300 hours of laboratory classes in the curriculum)

- **PLO 5:** demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)

- **PLO 6:** gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

**Impermissible Combinations:**  
Major in Chemistry  
Minor in Chemistry

**Required courses (144 credits)**

1. **Introductory level courses (54 credits)**

   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**

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</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
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2. **Disciplinary Core Courses (36 credits)**

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</tr>
<tr>
<td>STAT1601</td>
<td>Elementary statistical methods</td>
<td>6</td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics</td>
<td>6</td>
</tr>
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3. **Disciplinary Electives (6 credits)**

   (Students are encouraged to meet with a Chemistry Course Selection Advisor in the course selection period to discuss which of the following courses they should take based on their previous background in Mathematics.)

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</tr>
<tr>
<td>CHEM3241</td>
<td>Analytical chemistry II: chemical instrumentation</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3341</td>
<td>Inorganic chemistry II</td>
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<td>CHEM3441</td>
<td>Organic chemistry II</td>
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<td>CHEM3443</td>
<td>Organic chemistry laboratory</td>
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<td>CHEM3445</td>
<td>Integrated laboratory</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3541</td>
<td>Physical chemistry: Introduction to quantum chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3542</td>
<td>Physical chemistry: statistical thermodynamics and kinetics theory</td>
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2. **Advanced level courses (78 credits)**

   **Disciplinary Core Course (66 credits)**

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**Disciplinary Electives (12 credits)**

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(Note that one of the two elective courses selected must contain a laboratory component. Courses marked with (lab) have a laboratory component. The list of electives given below may be subject to change.)

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<td>6</td>
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<td>CHEM4242</td>
<td>Analytical chemistry (lab)</td>
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**3. Capstone requirement (12 credits)**

At least 12 credits selected from the following courses:

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**Notes:**

1. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

2. These are core courses in the regular Chemistry Major (96 credits) curriculum.

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**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The Intensive Major in Chemistry aims to provide students with a strong foundation on major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. The curriculum emphasizes comprehensive coverage in theoretical knowledge, laboratory skills, and research experience. A wide selection of elective courses is also available for student preparation to pursue learning in specializations such as chemical biology, computation chemistry, and materials. Graduates of the Intensive Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences. Graduates are expected to be well-prepared for further studies in chemistry and related disciplines and to pursue professional careers in scientific and technical fields.

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Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

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Impermissible Combinations:
Major in Chemistry
Minor in Chemistry

Required courses (144 credits)

1. Introductory level courses (54 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6)
SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (36 credits)
CHEM1042 General chemistry I (6)
CHEM1043 General chemistry II (6)
CHEM2241 Analytical chemistry I (6)
CHEM2243 Inorganic chemistry I (6)
CHEM2441 Organic chemistry I (6)
CHEM2541 Introductory physical chemistry (6)

Disciplinary Electives (6 credits)
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COMP1117 Computer programming (6)
MATH1011 University mathematics I (6)
MATH1013 University mathematics II (6)
STAT1601 Elementary statistical methods (6)
STAT1603 Introductory statistics (6)

2. Advanced level courses (78 credits)

Disciplinary Core Course (66 credits)
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CHEM3243 Analytical chemistry II: chemical instrumentation (6)
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#### Disciplinary Electives (12 credits)

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#### 3. Capstone requirement (12 credits)

At least 12 credits selected from the following courses:

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### Notes:

1. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

2. These are core courses in the regular Chemistry Major (96 credits) curriculum.

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### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title
Major in Chemistry (Intensive)
Offered to students admitted to Year 1 in 2016

Objectives:
The Intensive Major in Chemistry aims to provide students with a strong foundation on major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. The curriculum emphasizes comprehensive coverage in theoretical knowledge, laboratory skills, and research experience. A wide selection of elective courses is also available for student preparation to pursue learning in specializations such as chemical biology, computation chemistry, and materials. Graduates of the Intensive Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences. Graduates are expected to be well-prepared for further studies in chemistry and related disciplines and to pursue professional careers in scientific and technical fields.

This intensive major has been accredited by the Royal Society of Chemistry (RSC), UK.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

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Impermissible Combinations:
Major in Chemistry
Minor in Chemistry

Required courses (144 credits)

1. Introductory level courses (54 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

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<td>Introduction to materials chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3241</td>
<td>Analytical chemistry II: chemical instrumentation</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3341</td>
<td>Inorganic chemistry II</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3441</td>
<td>Organic chemistry II</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3443</td>
<td>Organic chemistry laboratory</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3445</td>
<td>Integrated laboratory</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3541</td>
<td>Physical chemistry: Introduction to quantum chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3542</td>
<td>Physical chemistry: statistical thermodynamics and kinetics theory</td>
<td>6</td>
</tr>
</tbody>
</table>
**CHEM4142** Symmetry, group theory and applications (6)
**CHEM4144** Advanced materials (6)
**CHEM4241** Modern chemical instrumentation and applications (6)

**Disciplinary Electives (12 credits)**
At least 12 credits selected from the following courses:
(Note that one of the two elective courses selected must contain a laboratory component. Courses marked with (lab) have a laboratory component. The list of electives given below may be subject to change.)

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CHEM4143</td>
<td>Interfacial science and technology (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4145</td>
<td>Medicinal chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4147</td>
<td>Supramolecular chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4148</td>
<td>Frontiers in Modern Chemical Science (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4242</td>
<td>Analytical chemistry (6) (lab)</td>
<td></td>
</tr>
<tr>
<td>CHEM4341</td>
<td>Advanced inorganic chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4342</td>
<td>Organometallic chemistry (6) (lab)</td>
<td></td>
</tr>
<tr>
<td>CHEM4441</td>
<td>Advanced organic chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4443</td>
<td>Integrated organic synthesis (6) (lab)</td>
<td></td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology (6) (lab)</td>
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</tr>
<tr>
<td>CHEM4542</td>
<td>Computational chemistry (6) (lab)</td>
<td></td>
</tr>
<tr>
<td>CHEM4543</td>
<td>Advanced physical chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology (6) (lab)</td>
<td></td>
</tr>
</tbody>
</table>

**3. Capstone requirement (12 credits)**
At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>CHEM3999</td>
<td>Directed studies in chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4966</td>
<td>Chemistry internship (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4999</td>
<td>Chemistry project (12)</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

2. These are core courses in the regular Chemistry Major (96 credits) curriculum.

3. As this curriculum is accredited by the Royal Society of Chemistry (RSC), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this accredited programme. For students who have credit transfer from exchange studies, for example) a student took CHEM3A and CHEM3B in a host university during his/her exchange studies and these two courses have been approved by the Faculty of Science to be considered equivalent as CHEM3241 and CHEM3341, they will be considered taking those HKU-version courses and in the example shown here, the student is deemed to have taken CHEM3241 and CHEM3341 to fulfill the accredited curriculum.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major in Chemistry (Intensive)

Offered to students admitted to Year 1 in 2015

Objectives:
The Intensive Major in Chemistry aims to provide students with a strong foundation on major areas of chemistry. The curriculum includes core courses covering topics in physical, inorganic, organic, and analytical chemistry. The curriculum emphasizes comprehensive coverage in theoretical knowledge, laboratory skills, and research experience. A wide selection of elective courses is also available for student preparation to pursue learning in specializations such as chemical biology, computation chemistry, and materials. Graduates of the Intensive Chemistry Major programme will be proficient in the principles and experimental skills of chemistry. The programme will also equip students with transferable skills in both theoretical and experimental investigations in sciences. Graduates are expected to be well-prepared for further studies in chemistry and related disciplines and to pursue professional careers in scientific and technical fields.

This intensive major has been accredited by the Royal Society of Chemistry (RSC), UK.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate an understanding across a wide range of topics in chemistry, from basic areas such as analytical, inorganic, organic & physical chemistry, to advanced topics related to current research in chemistry (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 2: demonstrate an in-depth understanding of fundamental physicochemical principles with the ability to apply that knowledge to the solution of theoretical & practical problems (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 3: have developed an awareness & understanding of scientific and ethical issues where chemistry relates to other disciplines, and an appreciation of the impact of chemistry in the modern world (by means of coursework, laboratory-based and/or research-based learning in the curriculum)

PLO 4: have substantially developed advanced experimental skills including chemical synthesis, analysis & operation of modern instrumentation, and data analysis skills with the ability to interpret experimental information & infer appropriate conclusions (by requiring of no less than 300 hours of laboratory classes in the curriculum)

PLO 5: demonstrate problem-solving skills, critical thinking, creativity & effective written & oral communication skills, and to co-operate with other people & participate as an effective team member (by means of coursework, laboratory-based learning, group project & presentation opportunities in the curriculum)

PLO 6: gain experience in working in the real-life industrial or research environment, and enhance their initiative, interpersonal skills, time management skills & project organization skills (by arrangement for student internship opportunities or directed studies of no less than three weeks with chemistry-related companies or research laboratories)

Impermissible Combinations:
Major in Chemistry
Minor in Chemistry

Required courses (144 credits)

1. Introductory level courses (54 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

SCNC1111 Scientific method and reasoning (6) (Note 2)
SCNC1112 Fundamentals of modern science (6) (Note 2)

Disciplinary Core Courses (36 credits)

CHEM1042 General chemistry I (6) (Note 2)
CHEM1043 General chemistry II (6) (Note 2)
CHEM2241 Analytical chemistry I (6) (Note 2)
CHEM2341 Inorganic chemistry I (6) (Note 2)
CHEM2441 Organic chemistry I (6) (Note 2)
CHEM2541 Introductory physical chemistry (6) (Note 2)

Disciplinary Electives (6 credits)

Students are encouraged to meet with a Chemistry Course Selection Advisor in the course selection period to discuss which of the following courses they should take based on their previous background in Mathematics.

CHEM1044 Mathematics in chemistry (6)
COMP1117 Computer programming (6)
MATH1011 University mathematics I (6)
MATH1013 University mathematics II (6)
STAT1601 Elementary statistical methods (6)
STAT1603 Introductory statistics (6)

2. Advanced level courses (78 credits)

Disciplinary Core Course (66 credits)

CHEM3143 Introduction to materials chemistry (6)
CHEM3241 Analytical chemistry II: chemical instrumentation (6) (Note 2)
CHEM3341 Inorganic chemistry II (6) (Note 2)
CHEM3441 Organic chemistry II (6) (Note 2)
CHEM3443 Organic chemistry laboratory (6) (Note 2)
CHEM3445 Integrated laboratory (6)
CHEM3541 Physical chemistry: Introduction to quantum chemistry (6) (Note 2)
CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory (6)
CHEM4142  Symmetry, group theory and applications (6)
CHEM4144  Advanced materials (6)
CHEM4241  Modern chemical instrumentation and applications (6)

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses:

(Note that one of the two elective courses selected must contain a laboratory component. Courses marked with (lab) have a laboratory component. The list of electives given below may be subject to change.)

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</table>

**3. Capstone requirement (12 credits)**

At least 12 credits selected from the following courses:

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</table>

**Notes:**

1. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

2. These are core courses in the regular Chemistry Major (96 credits) curriculum.

3. As this curriculum is accredited by the Royal Society of Chemistry (RSC), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this accredited programme. For students who have credit transfer from exchange studies, for example) a student took CHEM3A and CHEM3B in a host university during his/her exchange studies and these two courses have been approved by the Faculty of Science to be considered equivalent as CHEM3241 and CHEM3341, they will be considered taking those HKU-version courses and in the example shown here, the student is deemed to have taken CHEM3241 and CHEM3341 to fulfil the accredited curriculum.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Decision Analytics
Offered to students admitted to Year 1 in 2019

Objectives:
Amidst an upsurge of digital data produced worldwide nowadays, the Major in Decision Analytics aims to equip students with the skills and expertise in leveraging and managing big data in real time, and provide them with solid training in making digitized information a strategic part of critical decision-making and resource allocation with greater clarity and accuracy. Core courses in the curriculum emphasize the fundamental concepts and methodologies of decision analytics which include but not limited to statistical analysis, data mining and data visualization, programming, data structuring, mathematical and statistical modelling and implementation of database systems. Elective courses focus on diverse and applied techniques of decision analytics in multidisciplinary fields.

Learning Outcomes:
By the end of this programme, students should be able to:

1. PLO 1: apprehend the concepts of decision analytics and its underlying theory in relation to a broad range of related disciplinary academic or professional areas (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
2. PLO 2: identify and adopt appropriate analytical techniques and tools to extract and classify critical information from structured or unstructured data (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
3. PLO 3: be proficient with the design and implementation of advanced modelling techniques and database management, and offer effective recommendations for analytic initiatives and solutions (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
4. PLO 4: evaluate the quality of information from different sources in support of critical decision making, process streamlining and the optimization of resources, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
5. PLO 5: communicate to people effectively and efficiently with professionalism and accuracy using interactive and dynamic tools to translate technical information and present collaborative and strategic ideas (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)
6. PLO 6: gain insights into current advances in decision analytics and confidence to solve real-life problems through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
- BASc in Applied Artificial Intelligence
- BEng in Computer Science
- Major in Computing and Data Analytics
- Major in Computer Science
- Minor in Computer Science
- Major in Risk Management
- Major in Statistics
- Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (48 credits)
   - Disciplinary Core Courses: Science Foundation Courses (12 credits)
     - SCNC1111: Scientific method and reasoning (6)
     - SCNC1112: Fundamentals of modern science (6)
   - Disciplinary Core Courses (36 credits)
     - COMP1117: Computer programming (6)
     - COMP2119: Introduction to data structures and algorithms (6)
     - MATH1013: University mathematics II (6)
     - MATH2014: Multivariable calculus and linear algebra (6)
     - STAT2601: Probability and statistics I (6)
     - STAT2602: Probability and statistics II (6)

2. Advanced level courses (42 credits)
   - Disciplinary Core Courses (30 credits)
     - COMP3278: Introduction to database management systems (6)
     - MATH3904: Introduction to optimization (6)
     - STAT3600: Linear statistical analysis (6)
     - STAT3612: Statistical machine learning (6)
     - STAT4609: Big data analytics (6)
   - Disciplinary Electives (12 credits)
     - At least 12 credits selected from the following courses:
       - COMP3250: Design and analysis of algorithms (6)
       - COMP3270: Artificial intelligence (6)
       - COMP3323: Advanced database systems (6)
       - COMP3407: Scientific computing (6)
       - MATH3408: Computational methods and differential equations with applications (6)
       - MATH3600: Discrete mathematics (6)
       - MATH3601: Numerical analysis (6)
       - MATH3901: Operations research I (6)
STAT3620  Modern nonparametric statistics (6)
STAT3621  Statistical data analysis (6)
STAT3622  Data visualization (6)
STAT4601  Time-series analysis (6)
STAT4602  Multivariate data analysis (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
STAT3799  Directed studies in statistics (6)
STAT4710  Capstone experience for statistics undergraduates (6)
STAT4766  Statistics internship (6)
STAT4799  Statistics project (12)

Notes:
1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:
   a. Biomedical Analytics
      BIOL4417  'Omics' and systems biology
      STAT3607  Statistics in clinical medicine and bio-medical research
      STAT3608  Statistical genetics
      STAT3620  Modern nonparametric statistics
      STAT3621  Statistical data analysis
      STAT4602  Multivariate data analysis
   b. Financial and Risk Analytics
      STAT3621  Statistical data analysis
      STAT4601  Time series analysis
      Plus advanced level courses listed for the Major in Risk Management
   c. Operational Analytics
      COMP3250  Design and analysis of algorithms
      MATH3600  Discrete mathematics
      MATH3901  Operations research I
      MATH3943  Network models in operations research
      MATH4902  Operations research II
      STAT3606  Business logistics

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Decision Analytics

Offered to students admitted to Year 1 in 2018

Objectives:

Amidst an upsurge of digital data produced worldwide nowadays, the Major in Decision Analytics aims to equip students with the skills and expertise in leveraging and managing big data in real time, and provide them with solid training in making digitized information a strategic part of critical decision-making and resource allocation with greater clarity and accuracy. Core courses in the curriculum emphasize the fundamental concepts and methodologies of decision analytics which include but not limited to statistical analysis, data mining and data visualization, programming, data structuring, mathematical and statistical modelling and implementation of database systems. Elective courses focus on diverse and applied techniques of decision analytics in multidisciplinary fields.

Learning Outcomes:

By the end of this programme, students should be able to:

- PLO 1: apprehend the concepts of decision analytics and its underlying theory in relation to a broad range of related disciplinary academic or professional areas (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
- PLO 2: identify and adopt appropriate analytical techniques and tools to extract and classify critical information from structured or unstructured data (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
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- PLO 6: gain insights into current advances in decision analytics and confidence to solve real-life problems through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:

- BEng in Computer Science
- Major in Computing and Data Analytics
- Major in Computer Science
- Minor in Computer Science
- Major in Risk Management
- Major in Statistics
- Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (48 credits)

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</table>

Disciplinary Core Courses (36 credits)

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<td>Introduction to data structures and algorithms</td>
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<td>MATH1013</td>
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2. Advanced level courses (42 credits)

Disciplinary Core Courses (30 credits)

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<tr>
<td>COMP3278</td>
<td>Introduction to database management systems</td>
<td>6</td>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization</td>
<td>6</td>
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<td>STAT3600</td>
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<td>STAT4609</td>
<td>Big data analytics</td>
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Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

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<td>Design and analysis of algorithms</td>
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### Notes:
1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:

a. Biomedical Analytics
   - BIOL4417 'Omics' and systems biology
   - STAT3607 Statistics in clinical medicine and bio-medical research
   - STAT3608 Statistical genetics
   - STAT3620 Modern nonparametric statistics
   - STAT3621 Statistical data analysis
   - STAT4602 Multivariate data analysis

b. Financial and Risk Analytics
   - STAT3621 Statistical data analysis
   - STAT4601 Time series analysis
   - Plus advanced level courses listed for the Major in Risk Management

c. Operational Analytics
   - COMP3250 Design and analysis of algorithms
   - MATH3600 Discrete mathematics
   - MATH3901 Operations research I
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   - MATH4902 Operations research II
   - STAT3606 Business logistics

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Decision Analytics

Offered to students admitted to Year 1 in 2017

Objectives:
Amidst an upsurge of digital data produced worldwide nowadays, the Major in Decision Analytics aims to equip students with the skills and expertise in leveraging and managing big data in real time, and provide them with solid training in making digitized information a strategic part of critical decision-making and resource allocation with greater clarity and accuracy. Core courses in the curriculum emphasize the fundamental concepts and methodologies of decision analytics which include but not limited to statistical analysis, data mining and data visualization, programming, data structuring, mathematical and statistical modelling and implementation of database systems. Elective courses focus on diverse and applied techniques of decision analytics in multidisciplinary fields.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: apprehend the concepts of decision analytics and its underlying theory in relation to a broad range of related disciplinary academic or professional areas (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: identify and adopt appropriate analytical techniques and tools to extract and classify critical information from structured or unstructured data (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: be proficient with the design and implementation of advanced modelling techniques and database management, and offer effective recommendations for analytic initiatives and solutions (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: evaluate the quality of information from different sources in support of critical decision making, process streamlining and the optimization of resources, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate to people effectively and efficiently with professionalism and accuracy using interactive and dynamic tools to translate technical information and present collaborative and strategic ideas (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 6: gain insights into current advances in decision analytics and confidence to solve real-life problems through either project or industrial training (by means of coursework, tutorial classes and/or capstone learning in the curriculum)

Impermissible Combinations:
BEng in Computer Science
Major in Computing and Data Analytics
Major in Computer Science
Minor in Computer Science
Major in Risk Management
Major in Statistics
Minor in Statistics

Required courses (96 credits)
1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (36 credits)
- COMP1117 Computer programming (6)
- COMP2119 Introduction to data structures and algorithms (6)
- MATH1013 University mathematics II (6)
- MATH2014 Multivariable calculus and linear algebra (6)
- STAT2601 Probability and statistics I (6)
- STAT2602 Probability and statistics II (6)

2. Advanced level courses (42 credits)

Disciplinary Core Courses (30 credits)
- COMP3278 Introduction to database management systems (6)
- MATH3904 Introduction to optimization (6)
- STAT3600 Linear statistical analysis (6)
- STAT3612 Statistical machine learning (6)
- STAT4609 Big data analytics (6)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- COMP3250 Design and analysis of algorithms (6)
- COMP3270 Artificial intelligence (6)
- COMP3323 Advanced database systems (6)
- COMP3407 Scientific computing (6)
- MATH3408 Computational methods and differential equations with applications (6)
- MATH3600 Discrete mathematics (6)
- MATH3601 Numerical analysis (6)
- MATH3901 Operations research I (6)
- STAT3616 Advanced SAS programming (6)
STAT3620  Modern nonparametric statistics (6)
STAT3621  Statistical data analysis (6)
STAT3622  Data visualization (6)
STAT4601  Time-series analysis (6)
STAT4602  Multivariate data analysis (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   STAT3799  Directed studies in statistics (6)
   STAT4710  Capstone experience for statistics undergraduates (6)
   STAT4766  Statistics internship (6)
   STAT4799  Statistics project (12)

Notes:
1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:
   a. Biomedical Analytics
      BIOL4417 'Omics' and systems biology
      STAT3607 Statistics in clinical medicine and bio-medical research
      STAT3608 Statistical genetics
      STAT3620 Modern nonparametric statistics
      STAT3621 Statistical data analysis
      STAT4602 Multivariate data analysis
   b. Financial and Risk Analytics
      STAT3616 Advanced SAS programming
      STAT3621 Statistical data analysis
      STAT4601 Time series analysis
      Plus advanced level courses listed for the Major in Risk Management
   c. Operational Analytics
      COMP3250 Design and analysis of algorithms
      MATH3600 Discrete mathematics
      MATH3901 Operations research I
      MATH3943 Network models in operations research
      MATH4902 Operations research II
      STAT3606 Business logistics

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre requisites and co-requisite of selected courses are fulfilled.
Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Decision Analytics
Offered to students admitted to Year 1 in 2016

Objectives:
Amidst an upsurge of digital data produced worldwide nowadays, the Major in Decision Analytics aims to equip students with the skills and expertise in leveraging and managing big data in real time, and provide them with solid training in making digitized information a strategic part of critical decision-making and resource allocation with greater clarity and accuracy. Core courses in the curriculum emphasize the fundamental concepts and methodologies of decision analytics which include but not limited to statistical analysis, data mining and data visualization, programming, data structuring, mathematical and statistical modelling and implementation of database systems. Elective courses focus on diverse and applied techniques of decision analytics in multidisciplinary fields.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: apprehend the concepts of decision analytics and its underlying theory in relation to a broad range of related disciplinary academic or professional areas (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: identify and adopt appropriate analytical techniques and tools to extract and classify critical information from structured or unstructured data (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: be proficient with the design and implementation of advanced modelling techniques and database management, and offer effective recommendations for analytic initiatives and solutions (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: evaluate the quality of information from different sources in support of critical decision making, process streamlining and the optimization of resources, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate to people effectively and efficiently with professionalism and accuracy using interactive and dynamic tools to translate technical information and present collaborative and strategic ideas (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in decision analytics and confidence to solve real-life problems through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
BEng in Computer Science
Major in Computing and Data Analytics
Major in Computer Science
Minor in Computer Science
Major in Risk Management
Major in Statistics
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (48 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)

SCNC1111 Scientific method and reasoning (6)  
SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (36 credits)

COMP1117 Computer programming (6)  
COMP2119 Introduction to data structures and algorithms (6)  
MATH1013 University mathematics II (6)  
MATH2014 Multivariable calculus and linear algebra (6)  
STAT2601 Probability and statistics I (6)  
STAT2602 Probability and statistics II (6)

2. Advanced level courses (42 credits)
Disciplinary Core Courses (30 credits)

COMP3278 Introduction to database management systems (6)  
MATH3904 Introduction to optimization (6)  
STAT3600 Linear statistical analysis (6)  
STAT3612 Statistical machine learning (6)  
STAT4609 Big data analytics (6)  

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

COMP3250 Design and analysis of algorithms (6)  
COMP3270 Artificial intelligence (6)  
COMP3323 Advanced database systems (6)  
COMP3407 Scientific computing (6)  
MATH3408 Computational methods and differential equations with applications (6)  
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MATH3901 Operations research I (6)  
STAT3616 Advanced SAS programming (6)
STAT3620 Modern nonparametric statistics (6)
STAT3621 Statistical data analysis (6)
STAT3622 Data visualization (6)
STAT4601 Time-series analysis (6)
STAT4602 Multivariate data analysis (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
STAT3799 Directed studies in statistics (6)
STAT4710 Capstone experience for statistics undergraduates (6)
STAT4766 Statistics internship (6)
STAT4799 Statistics project (12)

Notes:
1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:
   a. Biomedical Analytics
      BIOL4417 'Omics' and systems biology
      STAT3607 Statistics in clinical medicine and bio-medical research
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      STAT3616 Advanced SAS programming
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   c. Operational Analytics
      COMP3250 Design and analysis of algorithms
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      MATH3901 Operations research I
      MATH3943 Network models in operations research
      MATH4902 Operations research II
      STAT3606 Business logistics

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4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
### Objectives:
Amidst an upsurge of digital data produced worldwide nowadays, the Major in Decision Analytics aims to equip students with the skills and expertise in leveraging and managing big data in real time, and provide them with solid training in making digitized information a strategic part of critical decision-making and resource allocation with greater clarity and accuracy. Core courses in the curriculum emphasize the fundamental concepts and methodologies of decision analytics which include but not limited to statistical analysis, data mining and data visualization, programming, data structuring, mathematical and statistical modelling and implementation of database systems. Elective courses focus on diverse and applied techniques of decision analytics in multidisciplinary fields.

### Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1:** apprehend the concepts of decision analytics and its underlying theory in relation to a broad range of related disciplinary academic or professional areas (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 2:** identify and adopt appropriate analytical techniques and tools to extract and classify critical information from structured or unstructured data (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

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**PLO 6:** gain insights into current advances in decision analytics and confidence to solve real-life problems through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

### Impermissible Combinations:
- BEng in Computer Science
- Major in Computing and Data Analytics
- Major in Computer Science
- Minor in Computer Science
- Major in Risk Management
- Major in Statistics
- Minor in Statistics

### Required courses (96 credits)
1. **Introductory level courses (48 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - **Disciplinary Core Courses (36 credits)**
     - COMP1117 Computer programming (6)
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     - STAT2601 Probability and statistics I (6)
     - STAT2602 Probability and statistics II (6)

2. **Advanced level courses (42 credits)**
   - **Disciplinary Core Courses (30 credits)**
     - COMP3278 Introduction to database management systems (6)
     - MATH3904 Introduction to optimization (6)
     - STAT3600 Linear statistical analysis (6)
     - STAT3612 Statistical machine learning (6)
     - STAT4609 Big data analytics (6)
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - COMP3250 Design and analysis of algorithms (6)
       - COMP3270 Artificial intelligence (6)
       - COMP3332 Advanced database systems (6)
       - COMP3407 Scientific computing (6)
       - MATH3408 Computational methods and differential equations with applications (6)
       - MATH3600 Discrete mathematics (6)
       - MATH3601 Numerical analysis (6)
       - MATH3901 Operations research I (6)
       - STAT3616 Advanced SAS programming (6)
STAT3620  Modern nonparametric statistics (6)
STAT3621  Statistical data analysis (6)
STAT3622  Data visualization (6)
STAT4601  Time-series analysis (6)
STAT4602  Multivariate data analysis (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
STAT3799  Directed studies in statistics (6)
STAT4710  Capstone experience for statistics undergraduates (6)
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STAT4799  Statistics project (12)

Notes:
1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:
   a. Biomedical Analytics
      BIOL4417 'Omics' and systems biology
      STAT3607 Statistics in clinical medicine and bio-medical research
      STAT3608 Statistical genetics
      STAT3620 Modern nonparametric statistics
      STAT3621 Statistical data analysis
      STAT4602 Multivariate data analysis
   b. Financial and Risk Analytics
      STAT3616 Advanced SAS programming
      STAT4601 Time series analysis
      Plus advanced level courses listed for the Major in Risk Management
   c. Operational Analytics
      COMP3250 Design and analysis of algorithms
      MATH3600 Discrete mathematics
      MATH3901 Operations research I
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2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title
Major in Decision Analytics

Offered to students admitted to Year 1 in 2014

Objectives:
Amidst an upsurge of digital data produced worldwide nowadays, the Major in Decision Analytics aims to equip students with the skills and expertise in leveraging and managing big data in real time, and provide them with solid training in making digitized information a strategic part of critical decision-making and resource allocation with greater clarity and accuracy. Core courses in the curriculum emphasize the fundamental concepts and methodologies of decision analytics which include but not limited to statistical analysis, data mining and data visualization, programming, data structuring, mathematical and statistical modelling and implementation of database systems. Elective courses focus on diverse and applied techniques of decision analytics in multidisciplinary fields.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: apprehend the concepts of decision analytics and its underlying theory in relation to a broad range of related disciplinary academic or professional areas (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: identify and adopt appropriate analytical techniques and tools to extract and classify critical information from structured or unstructured data (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

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PLO 6: gain insights into current advances in decision analytics and confidence to solve real-life problems through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
BEng in Computer Science
Major in Computing and Data Analytics
Major in Computer Science
Minor in Computer Science
Major in Risk Management
Major in Statistics
Minor in Statistics

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (36 credits)
   COMP1117 Computer programming (6)
   COMP2119 Introduction to data structures and algorithms (6)
   MATH1013 University mathematics II (6)
   MATH2014 Multivariable calculus and linear algebra (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)
2. Advanced level courses (42 credits)
   Disciplinary Core Courses (30 credits)
   COMP3278 Introduction to database management systems (6)
   MATH3904 Introduction to optimization (6)
   STAT3600 Linear statistical analysis (6)
   STAT3612 Statistical machine learning (6)
   STAT4609 Big data analytics (6)
   [previous title: Data mining (6)]
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   COMP3250 Design and analysis of algorithms (6)
   COMP3270 Artificial intelligence (6)
   COMP3323 Advanced database systems (6)
   COMP3407 Scientific computing (6)
   MATH3408 Computational methods and differential equations with applications (6)
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3. **Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

- STAT3799 Directed studies in statistics (6)
- STAT4710 Capstone experience for statistics undergraduates (6)
- STAT4766 Statistics internship (6)
- STAT4799 Statistics project (12)

**Notes:**

1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:

   a. **Biomedical Analytics**
      - BIOL4417 'Omics' and systems biology
      - STAT3607 Statistics in clinical medicine and bio-medical research
      - STAT3608 Statistical genetics
      - STAT3620 Modern nonparametric statistics
      - STAT3621 Statistical data analysis
      - STAT4602 Multivariate data analysis

   b. **Financial and Risk Analytics**
      - STAT3616 Advanced SAS programming
      - STAT3621 Statistical data analysis
      - STAT4601 Time series analysis
      - Plus advanced level courses listed for the Major in Risk Management

   c. **Operational Analytics**
      - COMP3250 Design and analysis of algorithms
      - MATH3600 Discrete mathematics
      - MATH3901 Operations research I
      - MATH3943 Network models in operations research
      - MATH4902 Operations research II
      - STAT3606 Business logistics

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title Major in Decision Analytics
Offered to students admitted to Year 1 in 2013

Objectives:
Amidst an upsurge of digital data produced worldwide nowadays, the Major in Decision Analytics aims to equip students with the skills and expertise in leveraging and managing big data in real time, and provide them with solid training in making digitized information a strategic part of critical decision-making and resource allocation with greater clarity and accuracy. Core courses in the curriculum emphasize the fundamental concepts and methodologies of decision analytics which include but not limited to statistical analysis, data mining and data visualization, programming, data structuring, mathematical and statistical modelling and implementation of database systems. Elective courses focus on diverse and applied techniques of decision analytics in multidisciplinary fields.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: apprehend the concepts of decision analytics and its underlying theory in relation to a broad range of related disciplinary academic or professional areas (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

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PLO 6: gain insights into current advances in decision analytics and confidence to solve real-life problems through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
BEng in Computer Science
Major in Computing and Data Analytics
Major in Computer Science
Minor in Computer Science
Major in Risk Management
Major in Statistics
Minor in Statistics

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
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   Disciplinary Core Courses (36 credits)
   COMP1117 Computer programming (6)
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   MATH1013 University mathematics II (6)
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   Disciplinary Core Courses (30 credits)
   COMP3278 Introduction to database management systems (6)
   MATH3904 Introduction to optimization (6)
   STAT3600 Linear statistical analysis (6)
   STAT3612 Statistical machine learning (6)
   STAT4609 Big data analytics (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   COMP3250 Design and analysis of algorithms (6)
   COMP3270 Artificial intelligence (6)
   COMP3323 Advanced database systems (6)
   COMP3407 Scientific computing (6)
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Science Majors

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<td>(6)</td>
</tr>
<tr>
<td>STAT3622</td>
<td>Data visualization</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4601</td>
<td>Time-series analysis</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4602</td>
<td>Multivariate data analysis</td>
<td>(6)</td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3799</td>
<td>Directed studies in statistics</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4710</td>
<td>Capstone experience for statistics undergraduates</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4766</td>
<td>Statistics internship</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4799</td>
<td>Statistics project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

Notes:

1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:
   a. Biomedical Analytics
      BIOL4417 'Omics' and systems biology
      STAT3607 Statistics in clinical medicine and bio-medical research
      STAT3608 Statistical genetics
      STAT3620 Modern nonparametric statistics
      STAT3621 Statistical data analysis
      STAT4502 Multivariate data analysis
   b. Financial and Risk Analytics
      STAT3616 Advanced SAS programming
      STAT3621 Statistical data analysis
      STAT4601 Time series analysis
      Plus advanced level courses listed for the Major in Risk Management
   c. Operational Analytics
      COMP3250 Design and analysis of algorithms
      MATH3600 Discrete mathematics
      MATH3901 Operations research I
      MATH3943 Network models in operations research
      MATH4902 Operations research II
      STAT3606 Business logistics

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Decision Analytics

Offered to students admitted to Year 1 in 2012

Objectives:
Amidst an upsurge of digital data produced worldwide nowadays, the Major in Decision Analytics aims to equip students with the skills and expertise in leveraging and managing big data in real time, and provide them with solid training in making digitized information a strategic part of critical decision-making and resource allocation with greater clarity and accuracy. Core courses in the curriculum emphasize the fundamental concepts and methodologies of decision analytics which include but not limited to statistical analysis, data mining and data visualization, programming, data structuring, mathematical and statistical modelling and implementation of database systems. Elective courses focus on diverse and applied techniques of decision analytics in multidisciplinary fields.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: apprehend the concepts of decision analytics and its underlying theory in relation to a broad range of related disciplinary academic or professional areas (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: identify and adopt appropriate analytical techniques and tools to extract and classify critical information from structured or unstructured data (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: be proficient with the design and implementation of advanced modelling techniques and database management, and offer effective recommendations for analytic initiatives and solutions (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: evaluate the quality of information from different sources in support of critical decision making, process streamlining and the optimization of resources, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate to people effectively and efficiently with professionalism and accuracy using interactive and dynamic tools to translate technical information and present collaborative and strategic ideas (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in decision analytics and confidence to solve real-life problems through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
BEng in Computer Science
Major in Computing and Data Analytics
Major in Computer Science
Minor in Computer Science
Major in Risk Management
Major in Statistics
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
    SCNC1111 Scientific method and reasoning (6)
    SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (36 credits)
    COMP1117 Computer programming (6)
    COMP2119 Introduction to data structures and algorithms (6)
    MATH1013 University mathematics II (6)
    MATH2014 Multivariable calculus and linear algebra (6)
    STAT2601 Probability and statistics I (6)
    STAT2602 Probability and statistics II (6)

2. Advanced level courses (42 credits)

Disciplinary Core Courses (30 credits)
    COMP3278 Introduction to database management systems (6)
    MATH3904 Introduction to optimization (6)
    STAT3600 Linear statistical analysis (6)
    STAT3612 Statistical machine learning (6)
    STAT4609 Big data analytics (6)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
    COMP3250 Design and analysis of algorithms (6)
    COMP3270 Artificial intelligence (6)
    COMP3323 Advanced database systems (6)
    COMP3407 Scientific computing (6)
    MATH3408 Computational methods and differential equations with applications (6)
    MATH3600 Discrete mathematics (6)
    MATH3601 Numerical analysis (6)
    MATH3901 Operations research I (6)
    STAT3616 Advanced SAS programming (6)
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### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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**Notes:**

1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:

   a. Biomedical Analytics
   - BIOL4417 'Omics' and systems biology
   - STAT3607 Statistics in clinical medicine and bio-medical research
   - STAT3608 Statistical genetics
   - STAT3620 Modern nonparametric statistics
   - STAT3621 Statistical data analysis
   - STAT4602 Multivariate data analysis

   b. Financial and Risk Analytics
   - STAT3616 Advanced SAS programming
   - STAT3621 Statistical data analysis
   - STAT4601 Time series analysis
   - Plus advanced level courses listed for the Major in Risk Management

   c. Operational Analytics
   - COMP3250 Design and analysis of algorithms
   - MATH3600 Discrete mathematics
   - MATH3901 Operations research I
   - MATH3943 Network models in operations research
   - MATH4902 Operations research II
   - STAT3606 Business logistics

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ('disciplinary core') in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title:** Major in Earth System Science  
**Offered to students admitted to Year 1 in:** 2019

**Objectives:**
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth's interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students' ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2:** have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3:** provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 4:** equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 5:** identify real life problems pertaining to the physical environment and find solutions to those problems (by means of capstone learning experience in the form of internship, field learning, and project-based learning in the curriculum)
- **PLO 6:** work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

**Impermissible Combinations:**
Minor in Earth Sciences

**Required courses (96 credits)**

1. Introductory level courses (48 credits)
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - **Disciplinary Core Courses (36 credits)**
     - EASC1401 Blue Planet (6)
     - EASC1406 Introduction to the earth-life system (6)
     - EASC2401 Fluid/solid interactions in earth processes (6)
     - EASC2402 Field and laboratory methods (6)
     - EASC2404 Introduction to atmosphere and hydrosphere (6)
     - EASC2410 Data analysis and modeling in earth sciences (6)

2. Advanced level courses (42 credits)
   - **Disciplinary Core Courses (6 credits)**
     - EASC4403 Biogeochemical cycles (6)
   - **Disciplinary Electives (36 credits)**
     - At least 36 credits selected from Lists A and B, among which at least 18 credits from List A:
       - **List A**
         - EASC3410 Hydrogeology (6)
         - EASC3415 Meteorology (6)
         - EASC3418 Coasts and coastal change (6)
         - ENV3313 Environmental oceanography (6)
       - **List B**
         - EASC3020 Global change: anthropogenic impacts (6)
         - EASC3403 Sedimentary environments (6)
         - EASC3405 Environmental remote sensing (6)
         - EASC3406 Reconstruction of past climate (6)
         - EASC3412 Earth resources (6)
         - EASC3417 Earth through time (6)
         - EASC3419 Earth System Science Field Studies (6)
         - EASC3999 Directed studies in earth sciences (6)
         - ENV3307 Natural hazards and mitigation (6)
         - EASC4408 Special topics in earth sciences (6)
         - EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   - EASC4911 Earth system: contemporary issues (6)

**Notes:**
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

6. Students are recommended to take PHYS1240 Physics by Inquiry and CHEM1041 Foundations of Chemistry if they do not have level 3 or above in HKDSE Physics and Chemistry, respectively, or equivalent.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Earth System Science  
Offered to students: admitted to Year 1 in 2018  

Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth's interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students' ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: identify real life problems pertaining to the physical environment and find solutions to those problems (by means capstone learning experience in the form of internship, field learning, and project-based learning in the curriculum)

PLO 6: work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

Impermissible Combinations:
Minor in Earth Sciences

Required courses (96 credits)
1. Introductory level courses (48 credits)
   | Disciplinary Core Courses: Science Foundation Courses (12 credits) |
   | SCNC1111 Scientific method and reasoning (6) |
   | SCNC1112 Fundamentals of modern science (6) |
   | Disciplinary Core Courses (36 credits) |
   | EASC1401 Blue Planet (6) |
   | EASC1406 Introduction to the earth-life system (6) |
   | EASC2401 Fluid/solid interactions in earth processes (6) |
   | EASC2402 Field and laboratory methods (6) |
   | EASC2404 Introduction to atmosphere and hydrosphere (6) |
   | EASC2410 Data analysis and modeling in earth sciences (6) |
2. Advanced level courses (42 credits)
   | Disciplinary Core Courses (6 credits) |
   | EASC4403 Biogeochemical cycles (6) |
   | Disciplinary Electives (36 credits) |
   | At least 36 credits selected from Lists A and B, among which at least 18 credits from List A: |
   | List A |
   | EASC3410 Hydrogeology (6) |
   | EASC3415 Meteorology (6) |
   | EASC3418 Coasts and coastal change (6) |
   | ENV3313 Environmental oceanography (6) |
   | List B |
   | EASC3020 Global change: anthropogenic impacts (6) |
   | EASC3403 Sedimentary environments (6) |
   | EASC3405 Environmental remote sensing (6) |
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   | EASC3412 Earth resources (6) |
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   | EASC4999 Earth sciences project (12) |
3. Capstone requirement (6 credits)
   | EASC4911 Earth system: contemporary issues (6) |

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Earth System Science
Offered to students admitted to Year 1 in 2017

Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth's interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students' ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

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Impermissible Combinations:
Minor in Earth Sciences

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
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   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4911 Earth system: contemporary issues (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
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Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Earth System Science
Offered to students admitted to Year 1 in 2016

Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth's interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students' ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: identify real life problems pertaining to the physical environment and find solutions to those problems (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 6: work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

Impermissible Combinations:
Minor in Earth Sciences

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (30 credits)
   EASC1401 Blue Planet (6)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)
   EASC2402 Field and laboratory methods (6)
   EASC2404 Introduction to atmosphere and hydrosphere (6)
   Disciplinary Electives (6 credits)
   BIOL1309 Evolutionary diversity (6)
   EASC1406 Introduction to the earth-life system (6)
2. Advanced level courses (42 credits)
   Disciplinary Core Courses (6 credits)
   EASC4403 Biogeochemical cycles (6)
   Disciplinary Electives (36 credits)
   At least 36 credits selected from Lists A and B, among which at least 12 credits from List A:
   List A
   EASC3410 Hydrogeology (6)
   EASC3415 Meteorology (6)
   ENV2313 Environmental oceanography (6)
   List B
   EASC3403 Sedimentary environments (6)
   EASC3405 Environmental remote sensing (6)
   EASC3406 Reconstruction of past climate (6)
   EASC3408 Geophysics (6)
   EASC3412 Earth resources (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENV3307 Natural hazards and mitigation (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)
3. Capstone requirement (6 credits)
   EASC4911 Earth system: contemporary issues (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Earth System Science
Offered to students admitted to Year 1 in 2015

Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth's interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students' ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
PLO 2: have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
PLO 3: provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
PLO 4: equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
PLO 5: identify real life problems pertaining to the physical environment and find solutions to those problems (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
PLO 6: work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

Impermissible Combinations:
Minor in Earth Sciences

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   EASC1401 Blue Planet (6)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)
   EASC2402 Field and laboratory methods (6)
   EASC2404 Introduction to atmosphere and hydrosphere (6)

   Disciplinary Electives (6 credits)
   BIOL1309 Evolutionary diversity (6)
   EASC1406 Introduction to the earth-life system (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (6 credits)
   EASC4403 Biogeochemical cycles (6)

   Disciplinary Electives (36 credits)
   At least 36 credits selected from Lists A and B, among which at least 12 credits from List A:
   List A
   EASC3410 Hydrogeology (6)
   EASC3415 Meteorology (6)
   ENV5313 Environmental oceanography (6)

   List B
   EASC3403 Sedimentary environments (6)
   EASC3405 Environmental remote sensing (6)
   EASC3406 Reconstruction of past climate (6)
   EASC3408 Geophysics (6)
   EASC3412 Earth resources (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENV5307 Natural hazards and mitigation (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4911 Earth system: contemporary issues (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth's interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students’ ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: identify real life problems pertaining to the physical environment and find solutions to those problems (by means of capstone learning experience in the form of internship, field learning, and project-based learning in the curriculum)

PLO 6: work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

Impermissible Combinations:
Minor in Earth Sciences

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   BIOL1309 Evolutionary diversity (6)
   EASC1401 Blue Planet (6)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)
   EASC2402 Field and laboratory methods (6)
   EASC2404 Introduction to atmosphere and hydrosphere (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (6 credits)
   EASC4403 Biogeochemical cycles (6)

   Disciplinary Electives (36 credits)
   At least 36 credits from Lists A and B, among which at least 12 credits from List A:
   List A
   EASC3410 Hydrogeology (6)
   EASC3415 Meteorology (6)
   ENV3313 Environmental oceanography (6)
   List B
   EASC3403 Sedimentary environments (6)
   EASC3405 Environmental remote sensing (6)
   EASC3406 Reconstruction of past climate (6)
   EASC3408 Geophysics (6)
   EASC3412 Earth resources (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENV3007 Natural hazards and mitigation (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4911 Earth system: contemporary issues (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112
Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Major Title
Major in Earth System Science

## Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth’s interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students’ ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

## Learning Outcomes:
By the end of this programme, students should be able to:

1. **PLO 1:** describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
2. **PLO 2:** have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
3. **PLO 3:** provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
4. **PLO 4:** equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
5. **PLO 5:** identify real life problems pertaining to the physical environment and find solutions to those problems (by means of capstone learning experience in the form of internship, field learning, and project-based learning in the curriculum)
6. **PLO 6:** work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

## Impermissible Combinations:
Minor in Earth Sciences

## Required courses (96 credits)

### 1. Introductory level courses (48 credits)

#### Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

#### Disciplinary Core Courses (36 credits)
- BIOL1309 Evolutionary diversity (6)
- EASC1401 Blue Planet (6)
- EASC1402 Principles of geology (6)
- EASC2401 Fluid/solid interactions in earth processes (6)
- EASC2402 Field and laboratory methods (6)
- EASC2404 Introduction to atmosphere and hydrosphere (6)

### 2. Advanced level courses (42 credits)

#### Disciplinary Core Courses (6 credits)
- EASC4403 Biogeochemical cycles (6)

#### Disciplinary Electives (36 credits)
At least 36 credits from Lists A and B, among which at least 12 credits from List A:

**List A**
- EASC3410 Hydrogeology (6)
- EASC3415 Meteorology (6)
- ENV5313 Environmental oceanography (6)

**List B**
- EASC3403 Sedimentary environments (6)
- EASC3405 Environmental remote sensing (6)
- EASC3406 Reconstruction of past climate (6)
- EASC3408 Geophysics (6)
- EASC3412 Earth resources (6)
- EASC3416 Advanced geochemistry and geochronology (6)
- EASC3417 Earth through time (6)
- EASC3999 Directed studies in earth sciences (6)
- ENV5307 Natural hazards and mitigation (6)
- EASC4408 Special topics in earth sciences (6)
- EASC4999 Earth sciences project (12)

### 3. Capstone requirement (6 credits)
- EASC4911 Earth system: contemporary issues (6)

## Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112...
Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Major Title: Major in Earth System Science

Offered to students admitted to Year 1 in 2012

### Objectives:

Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth’s interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students’ ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

### Learning Outcomes:

By the end of this programme, students should be able to:

- **PLO 1**: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2**: have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3**: provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 4**: equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 5**: identify real life problems pertaining to the physical environment and find solutions to those problems (by means of capstone learning experience in the form of internship, field learning, and project-based learning in the curriculum)
- **PLO 6**: work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

### Impermissible Combinations:

Minor in Earth Sciences

### Required courses (96 credits)

#### 1. Introductory level courses (48 credits)

**Disciplinary Core Courses: Science Foundation Courses (12 credits)**

- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

**Disciplinary Core Courses (36 credits)**

- BIOL1309 Evolutionary diversity (6)
- EASC1401 Blue Planet (6)
- EASC1402 Principles of geology (6)
- EASC2401 Fluid/solid interactions in earth processes (6)
- EASC2402 Field and laboratory methods (6)
- EASC2404 Introduction to atmosphere and hydrosphere (6)

#### 2. Advanced level courses (42 credits)

**Disciplinary Core Courses (6 credits)**

- EASC4403 Biogeochemical cycles (6)

**Disciplinary Electives (36 credits)**

At least 36 credits from Lists A and B, among which at least 12 credits from List A:

**List A:**

- EASC3410 Hydrogeology (6)
- EASC3415 Meteorology (6)
- ENV3313 Environmental oceanography (6)

**List B:**

- EASC3403 Sedimentary environments (6)
- EASC3405 Environmental remote sensing (6)
- EASC3406 Reconstruction of past climate (6)
- EASC3408 Geophysics (6)
- EASC3412 Earth resources (6)
- EASC3416 Advanced geochemistry and geochronology (6)
- EASC3417 Earth through time (6)
- EASC3999 Directed studies in earth sciences (6)
- ENV3307 Natural hazards and mitigation (6)
- EASC4408 Special topics in earth sciences (6)
- EASC4999 Earth sciences project (12)

#### 3. Capstone requirement (6 credits)

- EASC4911 Earth system: contemporary issues (6)

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits).
Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title**: Major in Ecology & Biodiversity  
**Offered to students**: admitted to Year 1 in 2019

### Objectives:
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal biology and includes a compulsory week-long residential field trip. Advanced courses in the major teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial and freshwater environments) with an emphasis on field work, introduces the use of statistical and molecular techniques in ecology, and focuses on certain applied topics such as environmental impact assessment, ecotoxicology, fisheries and mariculture, and biodiversity conservation. Students have an opportunity to conduct independent research in ecology and biodiversity as a final year project or a dissertation under the close supervision of an individual staff member. Apart from the fundamental knowledge and skills in understanding and managing biodiversity offered in the core courses of this major, strong emphasis is placed upon experiential learning such as overseas field expedition and work placement in the environmental sector. Biodiversity conservation requires scientific input as well as passion. Through the range of formal field-based courses as well as extra-curricular activities offered, students taking this major will have opportunities to participate in research, field conservation and education projects both locally and internationally. Assistance will be provided so that students can develop expertise in one or a few groups of plants or animals, as familiarity with species identification is an essential prerequisite for biodiversity scientists or conservation biologists.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: understand and appreciate the major living and non-living components of the regional and global environment, and how they interact; identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 2**: understand and appreciate the variety of life in Hong Kong's and Southeast Asia's natural habitats, become equipped to study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 3**: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 4**: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 5**: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)

- **PLO 6**: have the skill and knowledge to pursue postgraduate ecological research or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)

- **PLO 7**: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

### Impermissible Combinations:

- Major in Ecology & Biodiversity (Intensive)
- Minor in Ecology & Biodiversity

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### Required courses (96 credits)

#### 1. Introductory level courses (48 credits)

**Disciplinary Core Courses: Science Foundation Courses (12 credits)**

- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

**Disciplinary Core Courses (36 credits)**

- BIOL1110 From molecules to cells (6)
- BIOL1309 Evolutionary diversity (6)
- BIOL2102 Biostatistics (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2306 Ecology and evolution (6)
- ENV52002 Environmental data analysis (6)

#### 2. Advanced level courses (36 credits)

**Disciplinary Core Courses (18 credits)**

- BIOL3301 Marine biology (6)
- BIOL3302 Systematics and phylogenetics (6)
- BIOL3319 Tropical terrestrial ecology (6)

**Disciplinary Electives (18 credits)**

At least 18 credits selected from the following courses:

- BIOL3101 Animal behaviour (6)
- BIOL3303 Conservation biology (6)
- BIOL3305 Tropical and temperate marine ecology field course (6)
- BIOL3313 Freshwater ecology (6)
- BIOL3314 Plant structure and evolution (6)
- BIOL3318 Experimental intertidal ecology (6)
- BIOL3322 Marine invertebrate zoology (6)
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<td>ENVS3020</td>
<td>Global change ecology</td>
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3. **Capstone requirement (12 credits)**

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<tr>
<th>Course Code</th>
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<tr>
<td>BIOL4991</td>
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**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, two 6-credit or a 12-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional two 6-credit or a 12-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title**: Major in Ecology & Biodiversity  
**Offered to students**: admitted to Year 1 in 2018  

**Objectives:**
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal biology and includes a compulsory week-long residential field trip. Advanced courses in the major teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial and freshwater environments) with an emphasis on field work, introduces the use of statistical and molecular techniques in ecology, and focuses on certain applied topics such as environmental impact assessment, ecotoxicology, fisheries and mariculture, and biodiversity conservation. Students have an opportunity to conduct independent research in ecology and biodiversity as a final year project or a dissertation under the close supervision of an individual staff member. Apart from the fundamental knowledge and skills in understanding and managing biodiversity offered in the core courses of this major, strong emphasis is placed upon experiential learning such as overseas field expedition and work placement in the environmental sector. Biodiversity conservation requires scientific input as well as passion. Through the range of formal field-based courses as well as extra-curricular activities offered, students taking this major will have opportunities to participate in research, field conservation and education projects both locally and internationally. Assistance will be provided so that students can develop expertise in one or a few groups of plants or animals, as familiarity with species identification is an essential prerequisite for biodiversity scientists or conservation biologists.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: understand and appreciate the major living and non-living components of the regional and global environment, and how they interact; identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 2**: understand and appreciate the variety of life in Hong Kong’s and Southeast Asia’s natural habitats, become equipped to understand, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 3**: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 4**: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 5**: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)

- **PLO 6**: have the skill and knowledge to pursue postgraduate ecological research or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)

- **PLO 7**: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

**Impermissible Combinations:**
- Major in Ecology & Biodiversity (Intensive)
- Minor in Ecology & Biodiversity

### Required courses (96 credits)

#### 1. Introductory level courses (48 credits)
- **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
  - SCNC1111: Scientific method and reasoning (6)
  - SCNC1112: Fundamentals of modern science (6)
- **Disciplinary Core Courses (36 credits)**
  - BIOL1110: From molecules to cells (6)
  - BIOL1309: Evolutionary diversity (6)
  - BIOL2102: Biostatistics (6)
  - BIOL2103: Biological sciences laboratory course (6)
  - BIOL2306: Ecology and evolution (6)
  - ENV52002: Environmental data analysis (6)

#### 2. Advanced level courses (42 credits)
- **Disciplinary Core Courses (18 credits)**
  - BIOL3301: Marine biology (6)
  - BIOL3302: Systematics and phylogenetics (6)
  - BIOL3319: Tropical terrestrial ecology (6)
- **Disciplinary Electives (24 credits)**
  - At least 24 credits selected from the following courses:
    - BIOL3101: Animal behaviour (6)
    - BIOL3303: Conservation biology (6)
    - BIOL3305: Tropical and temperate marine ecology field course (6)
    - BIOL3313: Freshwater ecology (6)
    - BIOL3314: Plant structure and evolution (6)
    - BIOL3318: Experimental intertidal ecology (6)
    - BIOL3322: Marine invertebrate zoology (6)
### Science Majors

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<td>(6)</td>
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</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3991 Directed studies in ecology & biodiversity (6)
- BIOL4911 Conservation science in practice (6)
- BIOL4991 Ecology & biodiversity project (12)

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabus.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Science Majors

Major Title: Major in Ecology & Biodiversity
Offered to students: 2017
Admitted to Year 1 in:

Objectives:
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal biology and includes a compulsory week-long residential field trip. Advanced courses in the major teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial and freshwater environments) with an emphasis on field work, introduces the use of statistical and molecular techniques in ecology, and focuses on certain applied topics such as environmental impact assessment, ecotoxicology, fisheries and mariculture, and biodiversity conservation. Students have an opportunity to conduct independent research in ecology and biodiversity as a final year project or a dissertation under the close supervision of an individual staff member. Apart from the fundamental knowledge and skills in understanding and managing biodiversity offered in the core courses of this major, strong emphasis is placed upon experiential learning such as overseas field expedition and work placement in the environmental sector. Biodiversity conservation requires scientific input as well as passion. Through the range of formal field-based courses as well as extra-curricular activities offered, students taking this major will have opportunities to participate in research, field conservation and education projects both locally and internationally. Assistance will be provided so that students can develop expertise in one or a few groups of plants or animals, as familiarity with species identification is an essential prerequisite for biodiversity scientists or conservation biologists.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and appreciate the major living and non-living components of the regional and global environment, and how they interact; identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 2: understand and appreciate the variety of life in Hong Kong’s and Southeast Asia’s natural habitats, become equipped to understand, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 3: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 4: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 5: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)

PLO 6: have the skill and knowledge to pursue postgraduate ecological research or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)

PLO 7: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity (Intensive)
Minor in Ecology & Biodiversity

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1309 Evolutionary diversity (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2306 Ecology and evolution (6)
   ENV52002 Environmental data analysis (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   BIOL3301 Marine biology (6)
   BIOL3302 Systematics and phylogenetics (6)
   BIOL3319 Tropical terrestrial ecology (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   BIOL3101 Animal behaviour (6)
   BIOL3303 Conservation biology (6)
   BIOL3305 Tropical and temperate marine ecology field course (6)
   BIOL3313 Freshwater ecology (6)
   BIOL3314 Plant structure and evolution (6)
   BIOL3318 Experimental intertidal ecology (6)
   BIOL3322 Marine invertebrate zoology (6)
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#### 3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
- BIOL3991 Directed studies in ecology & biodiversity (6)
- BIOL4911 Conservation science in practice (6)
- BIOL4991 Ecology & biodiversity project (12)

### Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

### Remarks:
- Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled.
- Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title**: Major in Ecology & Biodiversity  
**Offered to students**: 2016  
**Admitted to Year 1 in**:  

**Objectives:**  
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal biology and includes a compulsory week-long residential field trip. Advanced courses in the major teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial and freshwater environments) with an emphasis on field work, introduces the use of statistical and molecular techniques in ecology, and focuses on certain applied topics such as environmental impact assessment, ecotoxicology, fisheries and mariculture, and biodiversity conservation. Students have an opportunity to conduct independent research in ecology and biodiversity as a final year project or a dissertation under the close supervision of an individual staff member. Apart from the fundamental knowledge and skills in understanding and managing biodiversity offered in the core courses of this major, strong emphasis is placed upon experiential learning such as overseas field expedition and work placement in the environmental sector. Biodiversity conservation requires scientific input as well as passion. Through the range of formal field-based courses as well as extra-curricular activities offered, students taking this major will have opportunities to participate in research, field conservation and education projects both locally and internationally. Assistance will be provided so that students can develop expertise in one or a few groups of plants or animals, as familiarity with species identification is an essential prerequisite for biodiversity scientists or conservation biologists.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

- **PLO 1**: understand and appreciate the major living and non-living components of the regional and global environment, and how they interact; identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 2**: understand and appreciate the variety of life in Hong Kong’s and Southeast Asia’s natural habitats, become equipped to study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 3**: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 4**: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 5**: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)
- **PLO 6**: have the skill and knowledge to pursue postgraduate ecological research or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)
- **PLO 7**: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

**Impermissible Combinations:**  
Major in Ecology & Biodiversity (Intensive)  
Minor in Ecology & Biodiversity

**Required courses (96 credits)**

1. **Introductory level courses (48 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - **Disciplinary Core Courses (36 credits)**
     - BIOL1110 From molecules to cells (6)
     - BIOL1309 Evolutionary diversity (6)
     - BIOL2102 Biostatistics (6)
     - BIOL2103 Biological sciences laboratory course (6)
     - BIOL2306 Ecology and evolution (6)
     - ENV52002 Environmental data analysis (6)

2. **Advanced level courses (42 credits)**
   - **Disciplinary Core Courses (12 credits)**
     - BIOL3302 Systematics and phyletogenics (6)
     - BIOL3303 Conservation biology (6) [previous title: Conservation ecology (6)]
   - **Disciplinary Electives (30 credits)**
     - At least 30 credits selected from the following courses:
       - BIOL3101 Animal behaviour (6)
       - BIOL3103 Environmental microbiology (6)
       - BIOL3301 Marine biology (6)
       - BIOL3305 Tropical and temperate marine ecology field course (6)
       - BIOL3313 Freshwater ecology (6)
       - BIOL3314 Plant structure and evolution (6)
       - BIOL3318 Experimental intertidal ecology (6)
       - BIOL3319 Tropical terrestrial ecology (6) [previous title: Terrestrial ecology (6)
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<td>BIOL3322</td>
<td>Marine invertebrate zoology</td>
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<td>BIOL3328</td>
<td>Nearshore marine and estuarine ecology</td>
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<td>BIOL3419</td>
<td>Insect ecology: the little things that run the world</td>
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<td>Oyster aquaculture and restoration</td>
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<td>BIOL4451</td>
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**3. Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

- BIOL3991 Directed studies in ecology & biodiversity (6)
- BIOL4911 Conservation science in practice (6)
- BIOL4921 Animal behaviour and behavioural ecology: field course (6)
- BIOL4991 Ecology & biodiversity project (12)

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal ecology and biodiversity of different ecosystems (e.g. marine, terrestrial and freshwater environments) with an emphasis on field work, introduces the use of statistical and molecular techniques in ecology, and focuses on certain applied topics such as environmental impact assessment, ecotoxicology, fisheries and mariculture, and biodiversity conservation. Students have an opportunity to conduct independent research in ecology and biodiversity as a final year project or a dissertation under the close supervision of an individual staff member. Apart from the fundamental knowledge and skills in understanding and managing biodiversity offered in the core courses of this major, strong emphasis is placed upon experiential learning such as overseas field expedition and work placement in the environmental sector. Biodiversity conservation requires scientific input as well as passion. Through the range of formal field-based courses as well as extra-curricular activities offered, students taking this major will have opportunities to participate in research, field conservation and education projects both locally and internationally. Assistance will be provided so that students can develop expertise in one or a few groups of plants or animals, as familiarity with species identification is an essential prerequisite for biodiversity scientists or conservation biologists.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: understand and appreciate the major living and non-living components of the regional and global environment, and how they interact; identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 2**: understand and appreciate the variety of life in Hong Kong's and Southeast Asia's natural habitats, become equipped to understand, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 3**: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 4**: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 5**: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)
- **PLO 6**: have the skill and knowledge to pursue postgraduate ecological research or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)
- **PLO 7**: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

Impermissible Combinations:

<table>
<thead>
<tr>
<th>Minor in Ecology &amp; Biodiversity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Science Majors</td>
<td></td>
</tr>
</tbody>
</table>

### Required courses (96 credits)

#### 1. Introductory level courses (48 credits)

<table>
<thead>
<tr>
<th>Disciplinary Core Courses: Science Foundation Courses (12 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111 Scientific method and reasoning (6)</td>
</tr>
<tr>
<td>SCNC1112 Fundamentals of modern science (6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disciplinary Core Courses (36 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1110 From molecules to cells (6)</td>
</tr>
<tr>
<td>BIOL1309 Evolutionary diversity (6)</td>
</tr>
<tr>
<td>BIOL2102 Biostatistics (6)</td>
</tr>
<tr>
<td>BIOL2103 Biological sciences laboratory course (6)</td>
</tr>
<tr>
<td>BIOL2306 Ecology and evolution (6)</td>
</tr>
<tr>
<td>ENV52002 Environmental data analysis (6)</td>
</tr>
</tbody>
</table>

#### 2. Advanced level courses (42 credits)

<table>
<thead>
<tr>
<th>Disciplinary Core Courses (12 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3302 Systematics and phylogenetics (6)</td>
</tr>
<tr>
<td>BIOL3303 Conservation biology (6)</td>
</tr>
</tbody>
</table>

At least 30 credits selected from the following courses:

- **BIOL3101 Animal behaviour (6)**
- **BIOL3109 Environmental microbiology (6)**
- **BIOL3301 Marine biology (6)**
- **BIOL3305 Tropical and temperate marine ecology field course (6)**
- **BIOL3313 Freshwater ecology (6)**

Take either BIOL3101 or BIOL4303 to fulfill this 30 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution (6)</td>
</tr>
<tr>
<td>BIOL3318</td>
<td>Experimental intertidal ecology (6)</td>
</tr>
<tr>
<td>BIOL3319</td>
<td>Tropical terrestrial ecology (6)</td>
</tr>
<tr>
<td>BIOL3320</td>
<td>The biology of marine mammals (6)</td>
</tr>
<tr>
<td>BIOL3322</td>
<td>Marine invertebrate zoology (6)</td>
</tr>
<tr>
<td>BIOL3326</td>
<td>Nearshore marine and estuarine ecology (6)</td>
</tr>
<tr>
<td>BIOL3419</td>
<td>Insect ecology: the little things that run the world (6)</td>
</tr>
<tr>
<td>BIOL3505</td>
<td>Oyster aquaculture and restoration (6)</td>
</tr>
<tr>
<td>BIOL3506</td>
<td>Evolutionary biology (6)</td>
</tr>
<tr>
<td>BIOL4301</td>
<td>Fish and fisheries (6)</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment (6)</td>
</tr>
<tr>
<td>BIOL4303</td>
<td>Animal behaviour (6)</td>
</tr>
<tr>
<td>BIOL4304</td>
<td>Ecosystem functioning and services (6)</td>
</tr>
<tr>
<td>BIOL4451</td>
<td>Cetacean behaviour, ecology and conservation: field research experience (6)</td>
</tr>
<tr>
<td>BIOL4505</td>
<td>Oyster aquaculture (6)</td>
</tr>
<tr>
<td>BIOL4861</td>
<td>Ecology &amp; biodiversity internship (6)</td>
</tr>
<tr>
<td>ENV53019</td>
<td>Urban ecology (6)</td>
</tr>
<tr>
<td>ENV53020</td>
<td>Global change ecology (6)</td>
</tr>
</tbody>
</table>

3. **Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3951</td>
<td>Ecology &amp; biodiversity field course (6)</td>
</tr>
<tr>
<td>BIOL3991</td>
<td>Directed studies in ecology &amp; biodiversity (6)</td>
</tr>
<tr>
<td>BIOL4911</td>
<td>Conservation science in practice (6)</td>
</tr>
<tr>
<td>BIOL4921</td>
<td>Animal behaviour and behavioural ecology: field course (6)</td>
</tr>
<tr>
<td>BIOL4991</td>
<td>Ecology &amp; biodiversity project (12)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title | Major in Ecology & Biodiversity
---|---
Offered to students | 2014
admitted to Year 1 in |

**Objectives:**
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal biology and includes a compulsory week-long residential field trip. Advanced courses in the major teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial and freshwater environments) with an emphasis on field work, introduces the use of statistical and molecular techniques in ecology, and focuses on certain applied topics such as environmental impact assessment, ecotoxicology, fisheries and mariculture, and biodiversity conservation. Students have an opportunity to conduct independent research in ecology and biodiversity as a final year project or a dissertation under the close supervision of an individual staff member. Apart from the fundamental knowledge and skills in understanding and managing biodiversity offered in the core courses of this major, strong emphasis is placed upon experiential learning such as overseas field expedition and work placement in the environmental sector. Biodiversity conservation requires scientific input as well as passion. Through the range of formal field-based courses as well as extra-curricular activities offered, students taking this major will have opportunities to participate in research, field conservation and education projects both locally and internationally. Assistance will be provided so that students can develop expertise in one or a few groups of plants or animals, as familiarity with species identification is an essential prerequisite for biodiversity scientists or conservation biologists.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** understand and appreciate the major living and non-living components of the regional and global environment, and how they interact; identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 2:** understand and appreciate the variety of life in Hong Kong's and Southeast Asia's natural habitats, become equipped to understand, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 3:** have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
- **PLO 4:** use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)
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- **PLO 6:** have the skill and knowledge to pursue postgraduate ecological research or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)
- **PLO 7:** be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

**Impermissible Combinations:**
Major in Ecology & Biodiversity (Intensive)
Minor in Ecology & Biodiversity

### Required courses (96 credits)

1. **Introductory level courses (48 credits)**
   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)
   **Disciplinary Core Courses (36 credits)**
   - BIOL1110 From molecules to cells (6)
   - BIOL1309 Evolutionary diversity (6)
   - BIOL2102 Biostatistics (6)
   - BIOL2103 Biological sciences laboratory course (6)
   - BIOL2306 Ecology and evolution (6)
   - ENV42002 Environmental data analysis (6)
2. **Advanced level courses (42 credits)**
   **Disciplinary Core Courses (12 credits)**
   - BIOL3102 Systematics and phylogenetics (6)
   - BIOL3303 Conservation biology (6)
   **Disciplinary Electives (30 credits)**
   At least 30 credits selected from the following courses:
   - BIOL3101 Animal behaviour (6)
   - BIOL3109 Environmental microbiology (6)
   - BIOL3301 Marine biology (6)
   - BIOL3305 Tropical and temperate marine ecology field course (6)
   - BIOL3313 Freshwater ecology (6)
   - BIOL3317 Tropical and temperate marine ecology (6)
   - BIOL3318 Freshwater ecology (6)
   - BIOL4303 Conservation ecology (6)

Take either BIOL3101 or BIOL4303 to fulfill this 30 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.
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<td>BIOL3319</td>
<td>Tropical terrestrial ecology (6)</td>
<td>[previous title: Terrestrial ecology (6)]</td>
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<td>BIOL3505</td>
<td>Oyster aquaculture and restoration (6)</td>
<td>Take either BIOL3505 or BIOL4505 to fulfill this 30 credits requirement, but not both. BIOL3505 and BIOL4505 are mutually exclusive.</td>
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<tr>
<td>ENV3019</td>
<td>Urban ecology (6)</td>
<td></td>
</tr>
<tr>
<td>ENV3020</td>
<td>Global change ecology (6)</td>
<td></td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3951: Ecology & biodiversity field course (6)
- BIOL3991: Directed studies in ecology & biodiversity (6)
- BIOL4911: Conservation science in practice (6)
- BIOL4921: Animal behaviour and behavioural ecology: field course (6)
- BIOL4991: Ecology & biodiversity project (12)

Take either BIOL3951 (subclass B) or BIOL4921 to fulfill this 6 credits requirement, but not both. BIOL3951 (subclass B) and BIOL4921 are mutually exclusive.

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (disciplinary core) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Science Majors

Major Title
Major in Ecology & Biodiversity

Offered to students
2013

admitted to Year 1 in

Objectives:
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal ecology and biodiversity of different ecosystems (e.g. marine, terrestrial and freshwater environments) with an emphasis on field work, introduces the use of statistical and molecular techniques in ecology, and focuses on certain applied topics such as environmental impact assessment, ecotoxicology, fisheries and mariculture, and biodiversity conservation. Students have an opportunity to conduct independent research in ecology and biodiversity as a final year project or a dissertation under the close supervision of an individual staff member. Apart from the fundamental knowledge and skills in understanding and managing biodiversity offered in the core courses of this major, strong emphasis is placed upon experiential learning such as overseas field expedition and work placement in the environmental sector. Biodiversity conservation requires scientific input as well as passion. Through the range of formal field-based courses as well as extra-curricular activities offered, students taking this major will have opportunities to participate in research, field conservation and education projects both locally and internationally. Assistance will be provided so that students can develop expertise in one or a few groups of plants or animals, as familiarity with species identification is an essential prerequisite for biodiversity scientists or conservation biologists.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and appreciate the major living and non-living components of the regional and global environment, and how they interact; identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 2: understand and appreciate the variety of life in Hong Kong’s and Southeast Asia’s natural habitats, become equipped to understand, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 3: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 4: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 5: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)

PLO 6: have the skill and knowledge to pursue postgraduate ecological research or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)

PLO 7: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity (Intensive)
Minor in Ecology & Biodiversity

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1309 Evolutionary diversity (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2306 Ecology and evolution (6)
   ENV2002 Environmental data analysis (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (12 credits)
   BIOL3021 Systematics and phylogenetics (6)
   BIOL3303 Conservation biology (6)

   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   BIOL3101 Animal behaviour (6)
   BIOL3109 Environmental microbiology (6)
   BIOL3301 Marine biology (6)
   BIOL3305 Tropical and temperate marine ecology field course (6)
   BIOL3313 Freshwater ecology (6)

   Take either BIOL3101 or BIOL3303 to fulfill this 30 credits requirement, but not both. BIOL3101 and BIOL3303 are mutually exclusive.
BIOL3314 Plant structure and evolution (6)
BIOL3318 Experimental intertidal ecology (6)
BIOL3319 Tropical terrestrial ecology (6)
BIOL3320 The biology of marine mammals (6)
BIOL3322 Marine invertebrate zoology (6)
BIOL3328 Nearshore marine and estuarine ecology (6)
BIOL3419 Insect ecology: the little things that run the world (6)
BIOL3505 Oyster aquaculture and restoration (6)

Take either BIOL3505 or BIOL4505 to fulfill this 30 credits requirement, but not both. BIOL3505 and BIOL4505 are mutually exclusive.

BIOL3401 Fish and fisheries (6)
BIOL4302 Environmental impact assessment (6)
BIOL4303 Animal behaviour (6)

Take either BIOL3101 or BIOL4303 to fulfill this 30 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.

BIOL4304 Ecosystem functioning and services (6)
BIOL4451 Cetacean behaviour, ecology and conservation: field research experience (6)
BIOL4505 Oyster aquaculture (6)

Take either BIOL3505 or BIOL4505 to fulfill this 30 credits requirement, but not both. BIOL3505 and BIOL4505 are mutually exclusive.

BIOL4861 Ecology & biodiversity internship (6)
ENVS3019 Urban ecology (6)
ENVS3020 Global change ecology (6)

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3951 Ecology & biodiversity field course (6)
- BIOL3991 Ecology & biodiversity project (12)
- BIOL4101 Directed studies in ecology & biodiversity (6)
- BIOL4111 Conservation science in practice (6)
- BIOL4921 Animal behaviour and behavioural ecology: field course (6)

Take either BIOL3951 (subclass B) or BIOL4921 to fulfill this 6 credits requirement, but not both. BIOL3951 (subclass B) and BIOL4921 are mutually exclusive.

Notes:
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2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Ecology & Biodiversity

Offered to students admitted to Year 1 in 2012

Objectives:
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal biology and includes a compulsory week-long residential field trip. Advanced courses in the major teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial and freshwater environments) with an emphasis on field work, introduces the use of statistical and molecular techniques in ecology, and focuses on certain applied topics such as environmental impact assessment, ecotoxicology, fisheries and mariculture, and biodiversity conservation. Students have an opportunity to conduct independent research in ecology and biodiversity as a final year project or a dissertation under the close supervision of an individual staff member. Apart from the fundamental knowledge and skills in understanding and managing biodiversity offered in the core courses of this major, strong emphasis is placed upon experiential learning such as overseas field expedition and work placement in the environmental sector. Biodiversity conservation requires scientific input as well as passion. Through the range of formal field-based courses as well as extra-curricular activities offered, students taking this major will have opportunities to participate in research, field conservation and education projects both locally and internationally. Assistance will be provided so that students can develop expertise in one or a few groups of plants or animals, as familiarity with species identification is an essential prerequisite for biodiversity scientists or conservation biologists.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and appreciate the major living and non-living components of the regional and global environment, and how they interact; identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 2: understand and appreciate the variety of life in Hong Kong’s and Southeast Asia’s natural habitats, become equipped to understand, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 3: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 4: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 5: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)

PLO 6: have the skill and knowledge to pursue postgraduate ecological research or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)

PLO 7: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity (Intensive)
Minor in Ecology & Biodiversity

Required courses (96 credits)
1. Introductory level courses (42 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111 Science method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (30 credits)
- BIOL1110 From molecules to cells (6)
- BIOL1309 Evolutionary diversity (6)
- BIOL2102 Biostatistics (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2306 Ecology and evolution (6)

2. Advanced level courses (48 credits)

Disciplinary Core Courses (12 credits)
- BIOL3302 Systematics and phylogenetics (6)
- BIOL3303 Conservation biology (6)

Disciplinary Electives (36 credits)
At least 36 credits selected from the following courses:
- BIOL3101 Animal behaviour (6)
  Take either BIOL3101 or BIOL4303 to fulfill this 36 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.
- BIOL3109 Environmental microbiology (6)
- BIOL3301 Marine biology (6)
- BIOL3305 Tropical and temperate marine ecology field course (6)
- BIOL3313 Freshwater ecology (6)
- BIOL3314 Plant structure and evolution (6)
BIOL3318  Experimental intertidal ecology (6)
BIOL3319  Tropical terrestrial ecology (6)
BIOL3320  The biology of marine mammals (6)
BIOL3322  Marine invertebrate zoology (6)
BIOL3328  Nearshore marine and estuarine ecology (6)
BIOL3419  Insect ecology: the little things that run the world (6)
BIOL3505  Oyster aquaculture and restoration (6)

BIOL3419  Insect ecology: the little things that run the world (6)
BIOL3505  Oyster aquaculture and restoration (6)

BIOL4301  Fish and fisheries (6)
BIOL4302  Environmental impact assessment (6)
BIOL4303  Animal behaviour (6)

BIOL4304  Ecosystem functioning and services (6)
BIOL4451  Cetacean behaviour, ecology and conservation: field research experience (6)
BIOL4505  Oyster aquaculture (6)

BIOL4861  Ecology & biodiversity internship (6)
ENVS3019  Urban ecology (6)
ENVS3020  Global change ecology (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:

BIOL3951  Ecology & biodiversity field course (6)
BIOL3991  Directed studies in ecology & biodiversity (6)
BIOL4921  Animal behaviour and behavioural ecology: field course (6)
BIOL4991  Ecology & biodiversity project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Science Majors

Major Title: Major in Ecology & Biodiversity (Intensive)
Offered to students admitted to Year 1 in 2019

Objectives:
This intensive major is directed at teaching students the ‘rules of existence’ for organisms in natural and human-modified environments, including major threats to biodiversity and the approaches adopted to conserve species and habitats. Special reference is made to the plants, animals and habitats of Hong Kong and Asia, the ways in which humans have altered the region’s ecosystems, and the management or mitigation of those impacts. The range and scope of courses offered will provide students with a firm foundation in ecology, biodiversity and related disciplines, and equip them with the skills required for postgraduate research or employment with government and non-government organizations concerned with biodiversity conservation, nature preservation or habitat assessment and management.

The intensive major is based around an introductory core that emphasizes biology, ecology and evolution of plants and animals; it includes a compulsory residential field trip (as part of the Ecology and Evolution course), as well as instruction in data analysis and biostatistics. Many of the advanced courses in the major have a strong emphasis on field-work and on small projects performed by students. They teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial, freshwater and urban) and taxa (e.g. flowering plants, insects, fishes, marine mammals). Other courses focus on more applied topics, such as environmental impact assessment, conservation, and provide an opportunity for students to become familiar with specialised topics ranging from systematics to animal behaviour.

During their final year, students have an opportunity to conduct independent research in the form of an ecology and biodiversity research project or a directed-studies dissertation under the close supervision of an individual staff member. Students are able to make use of the facilities of the Swire Institute of Marine Science for such work. Strong emphasis is also placed upon experiential learning during overseas field trips that can be taken as part of the capstone requirement of this intensive major.

Ecology and biodiversity research requires extensive scientific knowledge as well as passion, and students are encouraged to take more than the requisite 12-credit minimum of capstone courses. Through these courses, and the range of formal field-based options as well as various extra-curricular activities offered, students will be expected to develop expertise in one or a few groups of plants or animals; this is an important skill since an ability to identify species and major taxa is an essential prerequisite for biodiversity scientists or conservation biologists.

This intensive major has been accredited by the Royal Society of Biology (RSB), UK, for the purpose of meeting in part the academic and experience requirement for the Membership and Chartered Biologist (CBiol).

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and appreciate the major living and non-living components of the local, regional and global environment, and how they interact; evaluate their role in ecosystem functioning and identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 2: assess, understand and appreciate the variety of life in Hong Kong's and Southeast Asia's natural habitats, become equipped to assess, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 3: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 4: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 5: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)

PLO 6: have the skill and knowledge to pursue postgraduate ecological research in top-level Universities around the world or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)

PLO 7: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems in a changing world. (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

Impermissible Combinations:
Major in Biological Sciences
Major in Ecology & Biodiversity
Minor in Ecology & Biodiversity

Required courses (144 credits)
1. Introductory level courses (60 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6) (Note 1)
SCNC1112 Fundamentals of modern science (6) (Note 1)

Disciplinary Core Courses (42 credits)
BIOL1110 From molecules to cells (6) (Note 1)
BIOL1309 Evolutionary diversity (6) (Note 1)
BIOL2102 Biostatistics (6) (Note 1)
BIOL2103 Biological sciences laboratory course (6) (Note 1)
BIOL2306 Ecology and evolution (6) (Note 1)
### Disciplinary Electives (6 credits)

**Plus at least 6 credits selected from the following courses:**

- CHEM1041: Foundations of chemistry (6)
- CHEM1042: General chemistry I (6)

*Note 1:*

*Take either CHEM1041 or CHEM1042 to fulfill this 6 credits requirement, but not both.*

### Advanced level courses (66 to 72 credits) (Note 2)

#### Disciplinary Core Courses (30 credits)

- BIOL3101: Animal behaviour (6)
- BIOL3301: Marine biology (6)
- BIOL3302: Systematics and phylogenetics (6)
- BIOL3303: Conservation biology (6)
- BIOL3319: Tropical terrestrial ecology (6)

*Note 1:*

### Disciplinary Electives (36 to 42 credits) (Note 2)

**Plus at least 36 or 42 credits selected from the following courses:**

- BIOL3305: Tropical and temperate marine ecology field course (6)
- BIOL3313: Freshwater ecology (6)
- BIOL3314: Plant structure and evolution (6)
- BIOL3318: Experimental intertidal ecology (6)
- BIOL3322: Marine invertebrate zoology (6)
- BIOL3328: Nearshore marine and estuarine ecology (6)
- BIOL3419: Insect ecology: the little things that run the world (6)
- BIOL3506: Evolutionary biology (6)
- BIOL4301: Fish and fisheries (6)
- BIOL4302: Environmental impact assessment (6)
- BIOL4304: Ecosystem functioning and services (6)
- BIOL4505: Oyster aquaculture (6)
- ENV53019: Urban ecology (6)
- ENV53020: Global change ecology (6)

### Capstone requirement (12 to 18 credits) (Note 2)

#### Disciplinary Core Courses (12 credits)

- BIOL4991: Ecology & biodiversity project (12)

#### Disciplinary Electives (6 credits)

- BIOL3991: Directed studies in ecology & biodiversity (6)
- BIOL4911: Conservation science in practice (6)

### Notes:

1. These are core courses in the regular Ecology & Biodiversity Major (96 credits) curriculum.

2. Within the E&B accredited curriculum, students have to pass a total of 60 credits within the Introductory Level Courses spread across two Science Foundation Courses (Level 1: 12 credits), seven Disciplinary Core Courses (Levels 1 & 2: 42 credits) and one chemistry (Level 1: 6 credits). For the chemistry course, students will have the choice between CHEM1041 and CHEM1042 in function of their prior chemistry background acquired during their upper secondary education. Students with no chemistry background should follow CHEM1041, while students with previous chemistry background should take CHEM1042.

Advanced Level Courses cover a total of 66 to 72 credits. Those are divided between five Disciplinary Core Courses (Level 3: 30 credits) and 6 to 7 Disciplinary Elective Courses (Level 3 & 4: 36 to 42 credits) among a choice of fourteen different courses. As eight of the Disciplinary Elective courses are being taught every other year, students must pay attention to the year during which these courses are taught and ensure that they have fulfilled the necessary requirements. There is a student mentorship programme in place that can assist them in this.

During their final year, students should complete a minimum of 12 credits as Capstone Courses (maximum of 18). The Ecology & Biodiversity Project (12 credits) is mandatory and students can choose to complete one of the other two Elective Capstone Courses (6 credits). If students choose to complete 18 credits of Capstone Courses, then they are required to complete only 36 credits of Disciplinary Elective Courses within the Advanced Level Courses (instead of 42 credits).

Finally, students who participate in student exchange programme are expected to enquire, prior to their departure from HKU, about potential equivalences with the courses taken during exchange programmes to ensure that they match requirements for obtaining the RSB accredited programme.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
During their final year, students have an opportunity to conduct independent research in the form of an ecology and biodiversity special topics ranging from systematics to animal behaviour. They teach students about the ecology and biodiversity of different ecosystems (e.g., marine, terrestrial, freshwater, and urban) and taxa (e.g., flowering plants, insects, fishes, marine mammals). Other courses focus on more applied topics, such as environmental impact assessment, conservation, and provide an opportunity for students to become familiar with specialised topics ranging from systematics to animal behaviour.

Ecology and biodiversity research requires extensive scientific knowledge as well as passion, and students are encouraged to take more than the requisite 12-credit minimum of capstone courses. Through these courses, and the range of formal field-based options as well as various extra-curricular activities offered, students will be expected to develop expertise in one or a few groups of plants or animals; this is an important skill since an ability to identify species and major taxa is an essential prerequisite for biodiversity scientists or conservation biologists.

This intensive major has been accredited by the Royal Society of Biology (RSB), UK, for the purpose of meeting in part the academic and experience requirement for the Membership and Chartered Biologist (CBiol).

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and appreciate the major living and non-living components of the local, regional and global environment, and how they interact; evaluate their role in ecosystem functioning and identify threats to them, and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 2: assess, understand and appreciate the variety of life in Hong Kong's and Southeast Asia's natural habitats, become equipped to assess, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 3: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 4: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 5: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)

PLO 6: have the skill and knowledge to pursue postgraduate ecological research in top-level Universities around the world or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)

PLO 7: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems in a changing world. (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

Impermissible Combinations:
Major in Biological Sciences
Major in Ecology & Biodiversity
Minor in Ecology & Biodiversity

Required courses (144 credits)
1. Introductory level courses (60 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (42 credits)
   B IOL1110 From molecules to cells (6)
   B IOL1309 Evolutionary diversity (6)
   B IOL2102 Biostatistics (6)
   B IOL2103 Biological sciences laboratory course (6)
   B IOL2306 Ecology and evolution (6)

   (Note 1)
### Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC1401</td>
<td>Blue Planet</td>
<td>(6)</td>
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<tr>
<td>ENV52002</td>
<td>Environmental data analysis</td>
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#### Disciplinary Electives (6 credits)

**Plus at least 6 credits selected from the following courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM1041</td>
<td>Foundations of chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>(6)</td>
</tr>
</tbody>
</table>

**Take either CHEM1041 or CHEM1042 to fulfill this 6 credits requirement, but not both.**

#### 2. Advanced level courses (66 to 72 credits) (Note 2)

### Disciplinary Core Courses (30 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL3101</td>
<td>Animal behaviour</td>
<td>(6)</td>
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<tr>
<td>BIOL3301</td>
<td>Marine biology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3302</td>
<td>Systematics and phylogenetics</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3303</td>
<td>Conservation biology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3319</td>
<td>Tropical terrestrial ecology</td>
<td>(6)</td>
</tr>
</tbody>
</table>

**Take either CHEM1041 or CHEM1042 to fulfill this 6 credits requirement, but not both.**

### Disciplinary Electives (36 to 42 credits) (Note 2)

**Plus at least 36 or 42 credits selected from the following courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3305</td>
<td>Tropical and temperate marine ecology field course</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3313</td>
<td>Freshwater ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3318</td>
<td>Experimental intertidal ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3322</td>
<td>Marine invertebrate zoology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3328</td>
<td>Nearshore marine and estuarine ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3419</td>
<td>Insect ecology: the little things that run the world</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3506</td>
<td>Evolutionary biology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL4301</td>
<td>Fish and fisheries</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment</td>
<td>(6)</td>
</tr>
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<td>BIOL4304</td>
<td>Ecosystem functioning and services</td>
<td>(6)</td>
</tr>
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<td>BIOL4505</td>
<td>Oyster aquaculture</td>
<td>(6)</td>
</tr>
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<td>ENV53019</td>
<td>Urban ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>ENV53020</td>
<td>Global change ecology</td>
<td>(6)</td>
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</table>

### 3. Capstone requirement (12 to 18 credits) (Note 2)

**Disciplinary Core Courses (12 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>BIOL4991</td>
<td>Ecology &amp; biodiversity project</td>
<td>(12)</td>
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</tbody>
</table>

**Disciplinary Electives (6 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3991</td>
<td>Directed studies in ecology &amp; biodiversity</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL4911</td>
<td>Conservation science in practice</td>
<td>(6)</td>
</tr>
</tbody>
</table>

### Notes:

1. These are core courses in the regular Ecology & Biodiversity Major (96 credits) curriculum.

2. Within the E&B accredited curriculum, students have to pass a total of 60 credits within the Introductory Level Courses spread across two Science Foundation Courses (Level 1; 12 credits), seven Disciplinary Core Courses (Levels 1 & 2; 42 credits) and one chemistry (Level 1; 6 credits). For the chemistry course, students will have the choice between CHEM1041 and CHEM1042 in function of their prior chemistry background acquired during their upper secondary education. Students with no chemistry background should follow CHEM1041, while students with previous chemistry background should take CHEM1042.

Advanced Level Courses cover a total of 66 to 72 credits. Those are divided between five Disciplinary Core Courses (Level 3; 30 credits) and 6 to 7 Disciplinary Elective Courses (Level 3 & 4; 36 to 42 credits) among a choice of fourteen different courses. As eight of the Disciplinary Elective courses are being taught every other year, students must pay attention to the year during which these courses are taught and ensure that they have fulfilled the necessary requirements. There is a student mentorship programme in place that can assist them in this.

During their final year, students should complete a minimum of 12 credits as Capstone Courses (maximum of 18). The Ecology & Biodiversity Project (12 credits) is mandatory and students can choose to complete one of the other two Elective Capstone Courses (6 credits). If students choose to complete 18 credits of Capstone Courses, then they are required to complete only 36 credits of Disciplinary Elective Courses within the Advanced Level Courses (instead of 42 credits).

Finally, students who participate in student exchange programme are expected to enquire, prior to their departure from HKU, about potential equivalences with the courses taken during exchange programmes to ensure that they match requirements for obtaining the RSB accredited programme.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
During their final year, students have an opportunity to conduct independent research in the form of an ecology and biodiversity specialisation, ranging from systematics to animal behaviour, performed by students. They teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial, freshwater and urban) and taxa (e.g. flowering plants, insects, fishes, marine mammals). Other courses focus on more applied topics, such as environmental impact assessment, conservation, and provide an opportunity for students to become familiar with specialised topics ranging from systematics to animal behaviour.

Ecology and biodiversity research requires extensive scientific knowledge as well as passion, and students are encouraged to take more than the requisite 12-credit minimum of capstone courses. Through these courses, and the range of formal field-based options as well as various extra-curricular activities offered, students will be expected to develop expertise in one or a few groups of plants or animals; this is an important skill since an ability to identify species and major taxa is an essential prerequisite for biodiversity scientists or conservation biologists.

This intensive major has been accredited by the Royal Society of Biology (RSB), UK, for the purpose of meeting in part the academic and experience requirement for the Membership and Chartered Biologist (CBiol).

**Learning Outcomes:**

By the end of this programme, students should be able to:

- **PLO 1:** understand and appreciate the major living and non-living components of the local, regional and global environment, and how they interact; evaluate their role in ecosystem functioning and identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 2:** assess, understand and appreciate the variety of life in Hong Kong’s and Southeast Asia’s natural habitats, become equipped to assess, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 3:** have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 4:** use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

- **PLO 5:** demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)

- **PLO 6:** have the skill and knowledge to pursue postgraduate ecological research in top-level Universities around the world or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)

- **PLO 7:** be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems in a changing world. (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

**Impermissible Combinations:**

- Major in Biological Sciences
- Major in Ecology & Biodiversity
- Minor in Ecology & Biodiversity

**Required courses (144 credits)**

1. **Introductory level courses (60 credits)**

   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
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<td></td>
</tr>
<tr>
<td>SCNC1112</td>
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<td></td>
</tr>
</tbody>
</table>

   **Disciplinary Core Courses (42 credits)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells (6)</td>
<td></td>
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<td>BIOL2102</td>
<td>Biostatistics (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL2103</td>
<td>Biological sciences laboratory course (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution (6)</td>
<td></td>
</tr>
</tbody>
</table>

(Note 1)
### Disciplinary Electives (6 credits)

**Plus at least 6 credits selected from the following courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1041</td>
<td>Foundations of chemistry (6)</td>
</tr>
<tr>
<td>CHEM1042</td>
<td>General chemistry I (6)</td>
</tr>
</tbody>
</table>

Take either CHEM1041 or CHEM1042 to fulfill this 6 credits requirement, but not both.

### 2. Advanced level courses (66 to 72 credits) (Note 2)

#### Disciplinary Core Courses (30 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3101</td>
<td>Animal behaviour (6)</td>
</tr>
<tr>
<td>BIOL3301</td>
<td>Marine biology (6)</td>
</tr>
<tr>
<td>BIOL3302</td>
<td>Systematics and phylogenetics (6)</td>
</tr>
<tr>
<td>BIOL3303</td>
<td>Conservation biology (6)</td>
</tr>
<tr>
<td>BIOL3319</td>
<td>Tropical terrestrial ecology (6)</td>
</tr>
</tbody>
</table>

### Disciplinary Electives (36 to 42 credits) (Note 2)

**Plus at least 36 or 42 credits selected from the following courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
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</tr>
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<tbody>
<tr>
<td>BIOL3305</td>
<td>Tropical and temperate marine ecology field course (6)</td>
</tr>
<tr>
<td>BIOL3313</td>
<td>Freshwater ecology (6)</td>
</tr>
<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution (6)</td>
</tr>
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<td>BIOL3318</td>
<td>Experimental intertidal ecology (6)</td>
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<td>BIOL3322</td>
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<td>Insect ecology: the little things that run the world (6)</td>
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<td>BIOL3506</td>
<td>Evolutionary biology (6)</td>
</tr>
<tr>
<td>BIOL4301</td>
<td>Fish and fisheries (6)</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment (6)</td>
</tr>
<tr>
<td>BIOL4304</td>
<td>Ecosystem functioning and services (6)</td>
</tr>
<tr>
<td>BIOL4505</td>
<td>Oyster aquaculture (6)</td>
</tr>
<tr>
<td>ENV53019</td>
<td>Urban ecology (6)</td>
</tr>
<tr>
<td>ENV53020</td>
<td>Global change ecology (6)</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (12 to 18 credits) (Note 2)

#### Disciplinary Core Courses (12 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4991</td>
<td>Ecology &amp; biodiversity project (12)</td>
</tr>
</tbody>
</table>

#### Disciplinary Electives (6 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3991</td>
<td>Directed studies in ecology &amp; biodiversity (6)</td>
</tr>
<tr>
<td>BIOL4911</td>
<td>Conservation science in practice (6)</td>
</tr>
</tbody>
</table>

---

**Notes:**

1. These are core courses in the regular Ecology & Biodiversity Major (96 credits) curriculum.

2. Within the E&B accredited curriculum, students have to pass a total of 60 credits within the Introductory Level Courses spread across two Science Foundation Courses (Level 1: 12 credits), seven Disciplinary Core Courses (Levels 1 & 2; 42 credits) and one chemistry (Level 1; 6 credits). For the chemistry course, students will have the choice between CHEM1041 and CHEM1042 in function of their prior chemistry background acquired during their upper secondary education. Students with no chemistry background should follow CHEM1041, while students with previous chemistry background should take CHEM1042.

Advanced Level Courses cover a total of 66 to 72 credits. Those are divided between five Disciplinary Core Courses (Level 3; 30 credits) and 6 to 7 Disciplinary Elective Courses (Level 3 & 4; 36 to 42 credits) among a choice of fourteen different courses. As eight of the Disciplinary Elective courses are being taught every other year, students must pay attention to the year during which these courses are taught and ensure that they have fulfilled the necessary requirements. There is a student mentorship programme in place that can assist them in this.

During their final year, students should complete a minimum of 12 credits as Capstone Courses (maximum of 18). The Ecology & Biodiversity Project (12 credits) is mandatory and students can choose to complete one of the other two Elective Capstone Courses (6 credits). If students choose to complete 18 credits of Capstone Courses, then they are required to complete only 36 credits of Disciplinary Elective Courses within the Advanced Level Courses (instead of 42 credits).

Finally, students who participate in student exchange programme are expected to enquire, prior to their departure from HKU, about potential equivalences with the courses taken during exchange programmes to ensure that they match requirements for obtaining the RSB accredited programme.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Science Majors

Major Title: Major in Ecology & Biodiversity (Intensive)
Offered to students admitted to Year 1 in 2016

Objectives:
This intensive major is directed at teaching students the ‘rules of existence’ for organisms in natural and human-modified environments, including major threats to biodiversity and the approaches adopted to conserve species and habitats. Special reference is made to the plants, animals and habitats of Hong Kong and Asia, the ways in which humans have altered the region’s ecosystems, and the management or mitigation of those impacts. The range and scope of courses offered will provide students with a firm foundation in ecology, biodiversity and related disciplines, and equip them with the skills required for postgraduate research or employment with government and non-government organizations concerned with biodiversity conservation, nature preservation or habitat assessment and management.

The intensive major is based around an introductory core that emphasizes biology, ecology and evolution of plants and animals; it includes a compulsory residential field trip (as part of the Ecology and Evolution course), as well as instruction in data analysis and biostatistics. Many of the advanced courses in the major have a strong emphasis on field-work and on small projects performed by students. They teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial, freshwater and urban) and taxa (e.g. flowering plants, insects, fishes, marine mammals). Other courses focus on more applied topics, such as environmental impact assessment, conservation, and provide an opportunity for students to become familiar with specialised topics ranging from systematics to animal behaviour.

During their final year, students have an opportunity to conduct independent research in the form of an ecology and biodiversity research project or a directed-studies dissertation under the close supervision of an individual staff member. Students are able to make use of the facilities of the Swire Institute of Marine Science for such work. Strong emphasis is also placed upon experiential learning during overseas field trips that can be taken as part of the capstone requirement of this intensive major.

Ecology and biodiversity research requires extensive scientific knowledge as well as passion, and students are encouraged to take more than the requisite 12-credit minimum of capstone courses. Through these courses, and the range of formal field-based options as well as various extra-curricular activities offered, students will be expected to develop expertise in one or a few groups of plants or animals; this is an important skill since an ability to identify species and major taxa is an essential prerequisite for biodiversity scientists or conservation biologists.

This intensive major has been accredited by the Royal Society of Biology (RSB), UK, for the purpose of meeting in part the academic and experience requirement for the Membership and Chartered Biologist (CBiol).

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and appreciate the major living and non-living components of the local, regional and global environment, and how they interact; evaluate their role in ecosystem functioning and identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 2: assess, understand and appreciate the variety of life in Hong Kong’s and Southeast Asia’s natural habitats, become equipped to assess, study, manage and protect that diversity, and appraise the related moral and ethical issues (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 3: have sufficient experience of the basic techniques of modern ecological science and prepare to learn new ones for specific tasks (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 4: use IT tools appropriately, and access and evaluate materials from libraries, archives and the Internet (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 5: demonstrate original, independent and critical thinking, with mastery of a range of communication skills (by means of coursework, project-based and presentation opportunities in the curriculum)

PLO 6: have the skill and knowledge to pursue postgraduate ecological research in top-level Universities around the world or to develop a career in nature conservation and environmental education, especially in Hong Kong and southern China (by means of coursework, tutorial classes, project-based and research-based learning in the curriculum)

PLO 7: be motivated and sufficiently equipped to apply the knowledge solve local, regional and global environmental problems in a changing world. (by means of coursework, laboratory-based, tutorial classes, capstone learning and/or project-based learning in the curriculum)

Impermissible Combinations:
Major in Biological Sciences
Major in Ecology & Biodiversity
Minor in Ecology & Biodiversity

Required courses (144 credits)

1. Introductory level courses (60 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)

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<tr>
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Disciplinary Core Courses (42 credits)

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</table>
Disciplinary Electives (6 credits)

Plus at least 6 credits selected from the following courses:

- CHEM1041 Foundations of chemistry (6)
- CHEM1042 General chemistry I (6)

2. Advanced level courses (66 to 72 credits) (Note 2)

Disciplinary Core Courses (30 credits)

- BIOL3101 Animal behaviour (6)
- BIOL3301 Marine biology (6)
- BIOL3302 Systematics and phylogenetics (6)
- BIOL3303 Conservation biology (6)
- BIOL3319 Tropical terrestrial ecology (6)

Disciplinary Electives (36 to 42 credits) (Note 2)

Plus at least 36 or 42 credits selected from the following courses:

- BIOL3305 Tropical and temperate marine ecology field course (6)
- BIOL3313 Freshwater ecology (6)
- BIOL3314 Plant structure and evolution (6)
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- BIOL3506 Evolutionary biology (6)
- BIOL4301 Fish and fisheries (6)
- BIOL4302 Environmental impact assessment (6)
- BIOL4304 Ecosystem functioning and services (6)
- BIOL4505 Oyster aquaculture (6)
- ENV53019 Urban ecology (6)
- ENV53020 Global change ecology (6)

3. Capstone requirement (12 to 18 credits) (Note 2)

Disciplinary Core Courses (12 credits)

- BIOL4991 Ecology & biodiversity project (12)

Disciplinary Electives (6 credits)

- BIOL3991 Directed studies in ecology & biodiversity (6)
- BIOL4911 Conservation science in practice (6)

Notes:

1. These are core courses in the regular Ecology & Biodiversity Major (96 credits) curriculum.

2. Within the E&B accredited curriculum, students have to pass a total of 60 credits within the Introductory Level Courses spread across two Science Foundation Courses (Level 1; 12 credits), seven Disciplinary Core Courses (Levels 1 & 2; 42 credits) and one chemistry (Level 1; 6 credits). For the chemistry course, students will have the choice between CHEM1041 and CHEM1042 in function of their prior chemistry background acquired during their upper secondary education. Students with no chemistry background should follow CHEM1041, while students with previous chemistry background should take CHEM1042.

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Finally, students who participate in student exchange programme are expected to enquire, prior to their departure from HKU, about potential equivalences with the courses taken during exchange programmes to ensure that they match requirements for obtaining the RSB accredited programme.

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Science Majors

**Major Title** Major in Ecology & Biodiversity (Intensive)

**Offered to students admitted to Year 1 in** 2015

**Objectives:**
This intensive major is directed at teaching students the ‘rules of existence’ for organisms in natural and human-modified environments, including major threats to biodiversity and the approaches adopted to conserve species and habitats. Special reference is made to the plants, animals and habitats of Hong Kong and Asia, the ways in which humans have altered the region’s ecosystems, and the management or mitigation of those impacts. The range and scope of courses offered will provide students with a firm foundation in ecology, biodiversity and related disciplines, and equip them with the skills required for postgraduate research or employment with government and non-government organizations concerned with biodiversity conservation, nature preservation or habitat assessment and management.

The intensive major is based around an introductory core that emphasizes biology, ecology and evolution of plants and animals; it includes a compulsory residential field trip (as part of the Ecology and Evolution course), as well as instruction in data analysis and biostatistics. Many of the advanced courses in the major have a strong emphasis on field-work and on small projects performed by students. They teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial, freshwater and urban) and taxa (e.g. flowering plants, insects, fishes, marine mammals). Other courses focus on more applied topics, such as environmental impact assessment, conservation, and provide an opportunity for students to become familiar with specialised topics ranging from systematics to animal behaviour.

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**Impermissible Combinations:**
- Major in Biological Sciences
- Major in Ecology & Biodiversity
- Minor in Ecology & Biodiversity

**Required courses (144 credits)**

1. **Introductory level courses (60 credits)**

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<td>Course Code</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>EASC1401</td>
</tr>
<tr>
<td>ENV2002</td>
</tr>
</tbody>
</table>

**Disciplinary Electives (6 credits)**

**Plus at least 6 credits selected from the following courses:**

- CHEM1041 Foundations of chemistry (6)
- CHEM1042 General chemistry I (6)

**Disciplinary Core Courses (30 credits)**

1. **BIOL3101** Animal behaviour (6)
2. **BIOL3301** Marine biology (6)
3. **BIOL3302** Systematics and phylogenetics (6)
4. **BIOL3303** Conservation biology (6)
5. **BIOL3319** Tropical terrestrial ecology (6)

**Disciplinary Electives (36 to 42 credits) (Note 2)**

**Plus at least 36 or 42 credits selected from the following courses:**

- **BIOL3305** Tropical and temperate marine ecology field course (6)
- **BIOL3313** Freshwater ecology (6)
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- **BIOL3328** Nearshore marine and estuarine ecology (6)
- **BIOL3419** Insect ecology: the little things that run the world (6)
- **BIOL3506** Evolutionary biology (6)
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- **ENV3019** Urban ecology (6)
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**3. Capstone requirement (12 to 18 credits) (Note 2)**

**Disciplinary Core Courses (12 credits)**

- **BIOL4991** Ecology & biodiversity project (12)

**Disciplinary Electives (6 credits)**

- **BIOL3991** Directed studies in ecology & biodiversity (6)
- **BIOL4911** Conservation science in practice (6)

**Notes:**

1. These are core courses in the regular Ecology & Biodiversity Major (96 credits) curriculum.

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Advanced Level Courses cover a total of 66 to 72 credits. Those are divided between five Disciplinary Core Courses (Level 3; 30 credits) and 6 to 7 Disciplinary Elective Courses (Level 3 & 4; 36 to 42 credits) among a choice of fourteen different courses. As eight of the Disciplinary Elective courses are being taught every other year, students must pay attention to the year during which these courses are taught and ensure that they have fulfilled the necessary requirements. There is a student mentorship programme in place that can assist them in this.

During their final year, students should complete a minimum of 12 credits as Capstone Courses (maximum of 18). The Ecology & Biodiversity Project (12 credits) is mandatory and students can choose to complete one of the other two Elective Capstone Courses (6 credits). If students choose to complete 18 credits of Capstone Courses, then they are required to complete only 36 credits of Disciplinary Elective Courses within the Advanced Level Courses (instead of 42 credits)

Finally, students who participate in student exchange programme are expected to enquire, prior to their departure from HKU, about potential equivalences with the courses taken during exchange programmes to ensure that they match requirements for obtaining the RSB accredited programme.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
# Major Title

**Major in Environmental Science**

**Offered to students admitted to Year 1 in**

2019

## Objectives:

The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

## Learning Outcomes:

By the end of this programme, students should be able to:

- **PLO 1**: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

- **PLO 2**: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

- **PLO 3**: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

- **PLO 4**: gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

## Impermissible Combinations:

Minor in Environmental Science

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### Required courses (96 credits)

#### 1. Introductory level courses (48 credits)

**Disciplinary Core Courses: Science Foundation Courses (12 credits)**

<table>
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<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6</td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6</td>
</tr>
</tbody>
</table>

**Disciplinary Core Courses (24 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>ENVS1401</td>
<td>Introduction to environmental science</td>
<td>6</td>
</tr>
<tr>
<td>ENVS2001</td>
<td>Methods in environmental science</td>
<td>6</td>
</tr>
<tr>
<td>ENVS2002</td>
<td>Environmental data analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses (Level 1 & 2):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC1020</td>
<td>Introduction to climate science</td>
<td>6</td>
</tr>
<tr>
<td>EASC1401</td>
<td>Blue Planet</td>
<td>6</td>
</tr>
<tr>
<td>ENV1301</td>
<td>Environmental life science</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2102</td>
<td>Biostatistics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2241</td>
<td>Analytical chemistry I</td>
<td>6</td>
</tr>
</tbody>
</table>

---

#### 2. Advanced level courses (42 credits)

**Disciplinary Core Courses (6 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVS3004</td>
<td>Environment, society and economics</td>
<td>6</td>
</tr>
</tbody>
</table>

**Disciplinary Electives (36 credits)**

At least 36 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3110</td>
<td>Environmental toxicology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3217</td>
<td>Food, environment and health</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3303</td>
<td>Conservation biology</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3141</td>
<td>Environmental chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3241</td>
<td>Analytical chemistry II: chemical instrumentation</td>
<td>6</td>
</tr>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
<td>6</td>
</tr>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing</td>
<td>6</td>
</tr>
<tr>
<td>ENV3307</td>
<td>Natural hazards and mitigation</td>
<td>6</td>
</tr>
<tr>
<td>ENV3310</td>
<td>Sustainable energy and environment</td>
<td>6</td>
</tr>
<tr>
<td>ENV3319</td>
<td>Urban ecology</td>
<td>6</td>
</tr>
<tr>
<td>ENV3320</td>
<td>Global change ecology</td>
<td>6</td>
</tr>
<tr>
<td>ENV3322</td>
<td>Environmental science field course</td>
<td>6</td>
</tr>
<tr>
<td>ENV3328</td>
<td>Coastal Sustainability</td>
<td>6</td>
</tr>
<tr>
<td>ENV3342</td>
<td>Pollution</td>
<td>6</td>
</tr>
<tr>
<td>ENV3313</td>
<td>Environmental oceanography</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment</td>
<td>6</td>
</tr>
</tbody>
</table>
ENVS4110 Environmental remediation (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
ENVS3999 Directed studies in environmental science (6)
ENVS4966 Environmental science internship (6)
ENVS4999 Environmental science project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Environmental Science
Offered to students admitted to Year 1 in 2018

Objectives:
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 4: gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Minor in Environmental Science

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (24 credits)
   CHEM1042 General chemistry I (6)
   ENVS1401 Introduction to environmental science (6)
   ENVS2001 Methods in environmental science (6)
   ENVS2002 Environmental data analysis (6)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses (Level 1 & 2):
   EASC1020 Introduction to climate science (6)
   EASC1401 Blue Planet (6)
   ENVS1301 Environmental life science (6)
   BIOL2102 Biostatistics (6)
   BIOL2306 Ecology and evolution (6)
   CHEM2241 Analytical chemistry I (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (6 credits)
   ENVS3004 Environment, society and economics (6)

Disciplinary Electives (36 credits)
At least 36 credits selected from the following courses:
   BIOL3110 Environmental toxicology (6)
   BIOL3217 Food, environment and health (6)
   BIOL3303 Conservation biology (6)
   CHEM3141 Environmental chemistry (6)
   CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   EASC3020 Global change: anthropogenic impacts (6)
   EASC3405 Environmental remote sensing (6)
   ENVS3007 Natural hazards and mitigation (6)
   ENVS3010 Sustainable energy and environment (6)
   ENVS3019 Urban ecology (6)
   ENVS3020 Global change ecology (6)
   ENVS3022 Environmental science field course (6)
   ENVS3028 Coastal Sustainability (6)
   ENVS3042 Pollution (6)
   ENVS3313 Environmental oceanography (6)
   BIOL4302 Environmental impact assessment (6)
### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:
- ENVS3999 Directed studies in environmental science (6)
- ENVS4966 Environmental science internship (6)
- ENVS4999 Environmental science project (12)

#### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (“disciplinary core”) in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

#### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Environmental Science
Offered to students admitted to Year 1 in 2017

**Objectives:**
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 2:** observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 3:** appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 4:** gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

**Impermissible Combinations:**
Minor in Environmental Science

**Required courses (96 credits)**

<table>
<thead>
<tr>
<th>1. Introductory level courses (48 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disciplinary Core Courses:</strong> Science Foundation Courses (12 credits)</td>
</tr>
<tr>
<td>SCNC1111 Scientific method and reasoning (6)</td>
</tr>
<tr>
<td>SCNC1112 Fundamentals of modern science (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (18 credits)</strong></td>
</tr>
<tr>
<td>ENVS1401 Introduction to environmental science (6)</td>
</tr>
<tr>
<td>ENVS2001 Methods in environmental science (6)</td>
</tr>
<tr>
<td>ENVS2002 Environmental data analysis (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (18 credits)</strong></td>
</tr>
<tr>
<td><em>At least 18 credits selected from the following courses (Level 1 &amp; 2):</em></td>
</tr>
<tr>
<td>CHEM1042 General chemistry I (6)</td>
</tr>
<tr>
<td>EASC1020 Introduction to climate science (6)</td>
</tr>
<tr>
<td>EASC1401 Blue Planet (6)</td>
</tr>
<tr>
<td>ENVS1301 Environmental life science (6)</td>
</tr>
<tr>
<td>STAT1601 Elementary statistical methods (6)</td>
</tr>
<tr>
<td>STAT1603 Introductory statistics (6)</td>
</tr>
<tr>
<td>BIOL2102 Biostatistics (6)</td>
</tr>
<tr>
<td>BIOL2306 Ecology and evolution (6)</td>
</tr>
<tr>
<td>CHEM2041 Principles of chemistry (6)</td>
</tr>
<tr>
<td>CHEM2241 Analytical chemistry I (6)</td>
</tr>
<tr>
<td>CHEM2442 Fundamentals of organic chemistry (6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Advanced level courses (42 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disciplinary Core Courses (6 credits)</strong></td>
</tr>
<tr>
<td>ENVS3004 Environment, society and economics (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (36 credits)</strong></td>
</tr>
<tr>
<td><em>At least 36 credits selected from the following courses:</em></td>
</tr>
<tr>
<td>BIOL3110 Environmental toxicology (6)</td>
</tr>
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<td>BIOL3217 Food, environment and health (6)</td>
</tr>
<tr>
<td>BIOL3303 Conservation biology (6)</td>
</tr>
<tr>
<td>CHEM3141 Environmental chemistry (6)</td>
</tr>
<tr>
<td>CHEM3241 Analytical chemistry II: chemical instrumentation (6)</td>
</tr>
<tr>
<td>CHEM3242 Food and water analysis (6)</td>
</tr>
<tr>
<td>EASC3020 Global change: anthropogenic impacts (6)</td>
</tr>
<tr>
<td>EASC3405 Environmental remote sensing (6)</td>
</tr>
<tr>
<td>ENVS3007 Natural hazards and mitigation (6)</td>
</tr>
<tr>
<td>ENVS3010 Sustainable energy and environment (6)</td>
</tr>
<tr>
<td>ENVS3019 Urban ecology (6)</td>
</tr>
<tr>
<td>ENVS3020 Global change ecology (6)</td>
</tr>
<tr>
<td>Course Code</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>ENVS3022</td>
</tr>
<tr>
<td>ENVS3028</td>
</tr>
<tr>
<td>ENVS3042</td>
</tr>
<tr>
<td>ENVS3313</td>
</tr>
<tr>
<td>MATH3408</td>
</tr>
<tr>
<td>STAT3611</td>
</tr>
<tr>
<td>BIOL4302</td>
</tr>
<tr>
<td>ENVS4110</td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:
- ENVS3999 Directed studies in environmental science (6)
- ENVS4966 Environmental science internship (6)
- ENVS4999 Environmental science project (12)

**Notes:**
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Environmental Science
Offered to students admitted to Year 1 in 2016

Objectives:
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/lab-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/lab-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/lab-based learning in the curriculum)

PLO 4: gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/lab-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Minor in Environmental Science

Required courses (96 credits)
1. Introductory level courses (48 credits)
   - Disciplinary Core Courses: Science Foundation Courses (12 credits)
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - Disciplinary Core Courses (18 credits)
     - ENVS1401 Introduction to environmental science (6)
     - ENVS2001 Methods in environmental science (6)
     - ENVS2002 Environmental data analysis (6)
   - Disciplinary Electives (18 credits)
     - At least 18 credits selected from the following courses (Level 1 & 2):
       - CHEM1042 General chemistry I (6)
       - EASC1020 Introduction to climate science (6)
       - EASC1401 Blue Planet (6)
       - ENVS1301 Environmental life science (6)
       - STAT1601 Elementary statistical methods (6)
       - STAT1603 Introductory statistics (6)
       - BIOL2102 Biostatistics (6)
       - BIOL2306 Ecology and evolution (6)
       - CHEM2041 Principles of chemistry (6)
       - CHEM2241 Analytical chemistry I (6)
       - CHEM2442 Fundamentals of organic chemistry (6)

2. Advanced level courses (42 credits)
   - Disciplinary Core Courses (6 credits)
     - ENVS3004 Environment, society and economics (6)
   - Disciplinary Electives (36 credits)
     - At least 36 credits selected from the following courses:
       - BIOL3110 Environmental toxicology (6)
       - BIOL3217 Food, environment and health (6)
       - BIOL3303 Conservation biology (6)
       - CHEM3141 Environmental chemistry (6)
       - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
       - CHEM3242 Food and water analysis (6)
       - EASC3020 Global change: anthropogenic impacts (6)
       - EASC3405 Environmental remote sensing (6)
       - ENVS3007 Natural hazards and mitigation (6)
       - ENVS3010 Sustainable energy and environment (6)
       - ENVS3019 Urban ecology (6)
       - ENVS3020 Global change ecology (6)

   May take either STAT1601 or STAT1603 to fulfill this 18 credits requirement, but not both.
ENVS3022 Environmental science field course (6)
ENVS3028 Coastal Sustainability (6)
ENVS3042 Pollution (6)
ENVS3313 Environmental oceanography (6)
MATH3408 Computational methods and differential equations with applications (6)
STAT3611 Computer-aided data analysis (6)
BIOL4302 Environmental impact assessment (6)
ENVS4110 Environmental remediation (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   ENVS3999 Directed studies in environmental science (6)
   ENVS4966 Environmental science internship (6)
   ENVS4999 Environmental science project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Environmental Science  
Offered to students admitted to Year 1 in 2015

**Objectives:**
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 2:** observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 3:** appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 4:** gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

**Impermissible Combinations:**
Minor in Environmental Science

**Required courses (96 credits)**

1. **Introductory level courses (48 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - **Disciplinary Core Courses (18 credits)**
     - ENVS1401 Introduction to environmental science (6)
     - ENVS2001 Methods in environmental science (6)
     - ENVS2002 Environmental data analysis (6)
   - **Disciplinary Electives (18 credits)**
     - At least 18 credits selected from the following courses (Level 1 & 2):
       - CHEM1042 General chemistry I (6)
       - EASC1020 Introduction to climate science (6)
       - EASC1401 Blue Planet (6)
       - ENVS1301 Environmental life science (6)
       - STAT1601 Elementary statistical methods (6)
     - STAT1603 Introductory statistics (6)
     - BIOL2102 Biostatistics (6)
     - BIOL2306 Ecology and evolution (6)
     - CHEM2041 Principles of chemistry I (6)
     - CHEM2241 Analytical chemistry I (6)
     - CHEM2442 Fundamentals of organic chemistry (6)

2. **Advanced level courses (42 credits)**
   - **Disciplinary Core Courses (6 credits)**
     - ENV5004 Environment, society and economics (6)
   - **Disciplinary Electives (36 credits)**
     - At least 36 credits selected from the following courses:
       - BIOL3110 Environmental toxicology (6)
       - BIOL3217 Food, environment and health (6)
       - BIOL3303 Conservation biology (6)
       - CHEM3141 Environmental chemistry (6)
       - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
       - CHEM3242 Food and water analysis (6)
       - EASC3020 Global change: anthropogenic impacts (6)
       - EASC3405 Environmental remote sensing (6)
       - ENV5007 Natural hazards and mitigation (6)
       - ENV5010 Sustainable energy and environment (6)
       - ENV5019 Urban ecology (6)
       - ENV5020 Global change ecology (6)

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</tr>
<tr>
<td>ENVS4110</td>
<td>Environmental remediation</td>
<td>(6)</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- ENVS3999  | Directed studies in environmental science            | (6)     |
- ENVS4966  | Environmental science internship                      | (6)     |
- ENVS4999  | Environmental science project                        | (12)    |

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 4: gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/laboratory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:

Minor in Environmental Science

Required courses (96 credits)

1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6)
SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (18 credits)
ENVS1401 Introduction to environmental science (6)
ENVS2001 Methods in environmental science (6)
ENVS2002 Environmental data analysis (6)

Disciplinary Electives (18 credits)

At least 18 credits selected from the following courses (Level 1 & 2):
CHEM1042 General chemistry I (6)
EASC1020 Introduction to climate science (6)
EASC1401 Blue Planet (6)
ENVS1301 Environmental life science (6)
STAT1601 Elementary statistical methods (6)
STAT1603 Introductory statistics (6)
BIOL2102 Biostatistics (6)
BIOL2306 Ecology and evolution (6)
CHEM2041 Principles of chemistry (6)
CHEM2241 Analytical chemistry I (6)
CHEM2442 Fundamentals of organic chemistry (6)

2. Advanced level courses (42 credits)

Disciplinary Core Courses (6 credits)
ENVS3004 Environment, society and economics (6)

Disciplinary Electives (36 credits)

At least 36 credits selected from the following courses:
BIOL3110 Environmental toxicology (6)
BIOL3303 Conservation biology (6)
CHEM3141 Environmental chemistry (6)
CHEM3241 Analytical chemistry II: chemical instrumentation (6)
CHEM3242 Food and water analysis (6)
EASC3020 Global change: anthropogenic impacts (6)
EASC3405 Environmental remote sensing (6)
ENVS3006 Environmental radiation (6)
ENVS3007 Natural hazards and mitigation (6)
ENVS3010 Sustainable energy and environment (6)
ENVS3019 Urban ecology (6)
ENVS3020 Global change ecology (6)
### Science Majors

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<td>Computational methods and differential equations</td>
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<td>Environmental impact assessment</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS4110</td>
<td>Environmental remediation</td>
<td>(6)</td>
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</tbody>
</table>

#### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- ENVS3999  Directed studies in environmental science (6)
- ENVS4955  Environmental science in practice (6)
- ENVS4966  Environmental science internship (6)
- ENVS4999  Environmental science project (12)

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabus.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Major Title
Major in Environmental Science

## Offered to students
Admitted to Year 1 in 2013

## Objectives:
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

## Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: Identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/labatory/team-based learning in the curriculum)
- **PLO 2**: Observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/labatory/team-based learning in the curriculum)
- **PLO 3**: Appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/labatory/team-based learning in the curriculum)
- **PLO 4**: Gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/labatory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

### Impermissible Combinations:
Minor in Environmental Science

## Required courses (96 credits)

1. **Introductory level courses (48 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111: Scientific method and reasoning (6)
     - SCNC1112: Fundamentals of modern science (6)
   - **Disciplinary Core Courses (18 credits)**
     - ENVS1401: Introduction to environmental science (6)
     - ENVS2001: Methods in environmental science (6)
     - ENVS2002: Environmental data analysis (6)
   - **Disciplin ary Electives (18 credits)**
     - At least 18 credits selected from the following courses (Level 1 & 2):
       - CHEM1042: General chemistry I (6)
       - EASC1020: Introduction to climate science (6)
       - EASC1401: Blue Planet (6)
       - ENVS1301: Environmental life science (6)
       - STAT1601: Elementary statistical methods (6)
       - **STAT1603**: Introductory statistics (6)
       - BIOL102: Biostatistics (6)
       - BIOL2306: Ecology and evolution (6)
       - CHEM2041: Principles of chemistry (6)
       - CHEM2241: Analytical chemistry I (6)
       - CHEM2442: Fundamentals of organic chemistry (6)
       - May take either STAT1601 or STAT1603 to fulfill this 18 credits requirement, but not both.

2. **Advanced level courses (42 credits)**
   - **Disciplinary Core Courses (6 credits)**
     - ENVS3004: Environment, society and economics (6)
   - **Disciplinary Electives (36 credits)**
     - At least 36 credits selected from the following courses:
       - BIOL2110: Environmental toxicology (6)
       - BIOL3303: Conservation biology (6)
       - CHEM3141: Environmental chemistry (6)
       - CHEM3241: Analytical chemistry II: chemical instrumentation (6)
       - CHEM3242: Food and water analysis (6)
       - EASC3020: Global change: anthropogenic impacts (6)
       - EASC3405: Environmental remote sensing (6)
       - ENVS3006: Environmental radiation (6)
       - ENVS3007: Natural hazards and mitigation (6)
       - ENVS3010: Sustainable energy and environment (6)
       - ENVS3019: Urban ecology (6)
       - **ENVS3020**: Global change ecology (6)
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<td>ENVS4110</td>
<td>Environmental remediation</td>
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<td></td>
<td><strong>3. Capstone requirement (6 credits)</strong></td>
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<td></td>
<td>At least 6 credits selected from the following courses:</td>
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<tr>
<td>ENVS3999</td>
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<td>ENVS4955</td>
<td>Environmental science in practice</td>
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<td>Environmental science internship</td>
<td>6</td>
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<tr>
<td>ENVS4999</td>
<td>Environmental science project</td>
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**Notes:**
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 4: gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Minor in Environmental Science

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (12 credits)
   ENVS1401 Introduction to environmental science (6)
   STAT1601 Elementary statistical methods (6)
   STAT1603 Introductory statistics (6)

   May take either STAT1601 or STAT1603 to fulfill this 12 credits requirement, but not both.

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (6 credits)
   ENVS3004 Environment, society and economics (6)

   May take either STAT1601 or STAT1603 to fulfill this 12 credits requirement, but not both.

   Disciplinary Electives (24 credits)
   At least 12 credits selected from the following courses (Level 2) in List B:
   List B
   BIOL2306 Ecology and evolution (6)
   CHEM2041 Principles of chemistry (6)
   CHEM2241 Analytical chemistry I (6)
   CHEM2442 Fundamentals of organic chemistry (6)
   EASC2404 Introduction to atmosphere and hydrosphere (6)
   ENV52001 Methods in environmental science (6)
   ENV52002 Environmental data analysis (6)

   At least 12 credits selected from the following courses (Level 1) in List A:
   List A
   CHEM104 General chemistry I (6)
   EASC1020 Introduction to climate science (6)
   EASC1401 Blue Planet (6)
   ENV51301 Environmental life science (6)

   May take either STAT1601 or STAT1603 to fulfill this 12 credits requirement, but not both.

Disciplinary Electives (36 credits)
At least 36 credits selected from the following courses:
   BIOL3110 Environmental toxicology (6)
   BIOL3303 Conservation biology (6)
   CHEM3141 Environmental chemistry (6)
   CHEM3242 Analytical chemistry II: chemical instrumentation (6)
   CHEM3242 Food and water analysis (6)
   EASC3020 Global change: anthropogenic impacts (6)
   EASC3405 Environmental remote sensing (6)
   ENV53006 Environmental radiation (6)
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<td>ENVS4110</td>
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### 3. Capstone requirement (6 credits)

**At least 6 credits selected from the following courses:**

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<th>Credits</th>
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<td>ENVS3999</td>
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<td>ENVS4966</td>
<td>Environmental science internship</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS4999</td>
<td>Environmental science project</td>
<td>(12)</td>
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</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Food & Nutritional Science

Offered to students: 2019

Admitted to Year 1 in

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:
(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology, and nutrition and their relationship to human health; (b) critical knowledge and understanding on the relationship between food and a wide range of social, legal, technological and environmental factors; (c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma related to health sciences. The curriculum is designed for students to select studies in Nutrition and Public Health in preparation for postgraduate diploma in dietetics or human nutrition. Study in Food Security is an innovative programme that entails scientific and social approach in food, nutrition and environment, allowing students to relate global challenges in industry, society and government levels.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students’ critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical and health sectors, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food sustainability (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: apply and disseminate scientific knowledge obtained from food, nutrition and related biosciences for the understanding of the influences in nutrition, health and disease of a community using a range of formats and approaches (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food- and/or nutrition-related hypothesis (by means of coursework, tutorial classes, laboratory-based and project-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)

1. Introductory level courses (60 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (36 credits)
- BIOL1110 From molecules to cells (6)
- BIOL1201 Introduction to food and nutrition (6)
- BIOL2101 Principles of food chemistry (6)
- BIOL2102 Biostatistics (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2220 Principles of biochemistry (6)
- BIOL2220 Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

- BIOC2600 Basic biochemistry (6)
- BIOC2600 Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

Disciplinary Electives (12 credits)

At least 12 credits of introductory level course from the list below, of which at least 6 credits of CHEMXXXX from the list below:
- CHEM1042 General chemistry I (6)
- CHEM2440 Fundamentals of organic chemistry (6)
- GEOG2013 Sustainable development (6)
- GEOG2030 Global development (6)

2. Advanced level courses (30 credits)

Disciplinary Core Courses (12 credits)
- BIOL3202 Nutritional biochemistry (6)
Science Majors

<table>
<thead>
<tr>
<th>Disciplinary Electives (18 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least 12 credits of advanced level BIOL3XXX and/or BIOL4XXX course from the list below:</td>
</tr>
<tr>
<td>BIOL3203 Food microbiology (6)</td>
</tr>
<tr>
<td>BIOL3204 Nutrition and the life cycle (6)</td>
</tr>
<tr>
<td>BIOL3205 Human physiology (6)</td>
</tr>
<tr>
<td>BIOL3207 Principles of toxicology (6)</td>
</tr>
<tr>
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<tr>
<td>BIOL3211 Nutrigenomics (6)</td>
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</tr>
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<td>BIOL3217 Food, environment and health (6)</td>
</tr>
<tr>
<td>BIOL3218 Food hygiene and quality control (6)</td>
</tr>
<tr>
<td>BIOL3503 Endocrinology: human physiology II (6)</td>
</tr>
<tr>
<td>BIOL3606 Diet and disease (6)</td>
</tr>
<tr>
<td>BIOL3608 Food commodities (6)</td>
</tr>
<tr>
<td>BIOL4201 Public health nutrition (6)</td>
</tr>
<tr>
<td>BIOL4202 Nutrition and sports performance (6)</td>
</tr>
<tr>
<td>BIOL4205 Food technology (6)</td>
</tr>
<tr>
<td>BIOL4209 Functional foods (6)</td>
</tr>
<tr>
<td>BIOL4411 Plant and food biotechnology (6)</td>
</tr>
<tr>
<td>BIOL3606 Molecular medicine (6)</td>
</tr>
<tr>
<td>STAT3617 Sample survey methods (6)</td>
</tr>
<tr>
<td>GEOG3202 GIS in environmental studies (6)</td>
</tr>
<tr>
<td>POLI3121 Environmental policy (6)</td>
</tr>
<tr>
<td>BBMS4004 Public health genetics (6)</td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3992 Directed studies in food & nutritional science (6)
- BIOL4922 Food product development and evaluation (6)
- BIOL4962 Food & nutritional science internship (6)
- BIOL4992 Food & nutritional science project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Those who want to specialize in the Nutrition and Public Health Studies should pass the following course:

- Introduction level courses - 2 Disciplinary Core Courses: Science Foundation: SCNC1111 and SCNC1112; 6 Disciplinary Core Courses: BIOL1110, BIOL1201, BIOL2101; BIOL2102, BIOL2203, BIOL2202 or BIOL2600; 2 Disciplinary Electives: CHEM1042 and CHEM2442.

Advanced level courses - 2 Disciplinary Core Courses: BIOL3202 and BIOL3203; any 3 Disciplinary Electives with at least 2 must be at BIOL3XXX and/or BIOL4XXX in the list: BIOL3204, BIOL3205, BIOL3207, BIOL3209, BIOL3211, BIOL3217, BIOL3503, BIOL3606, BIOL4202, BIOL4205, BIOL4209, BIOL4210, BIOL3608, STAT3617, and BBMS4004.

Capstone requirement: any 1 Capstone Course: BIOL3992, BIOL4922, BIOL4962, and BIOL4992.

6. Those who want to specialize in the Food Security Studies should pass the following course:

- Introduction level courses - 2 Disciplinary Core Courses: Science Foundation: SCNC1111 and SCNC1112; 6 Disciplinary Core Courses: BIOL1110, BIOL1201, BIOL2101; BIOL2102, BIOL2203, BIOL2202 or BIOL2600; 2 Disciplinary Electives: GEOG2013 and GEOG2030.

Advanced level courses - 2 Disciplinary Core Courses: BIOL3202 and BIOL3203; any 3 Disciplinary Electives with at least 2 must be at BIOL3XXX and/or BIOL4XXX in the list: BIOL3207, BIOL3215, BIOL3216, BIOL3218, BIOL3506, BIOL3608, BIOL4206, BIOL4209, BIOL4210, BIOL4411, ENV5309, GEOG3202, POLI3121, STAT3617, and BBMS4004.

Capstone requirement: any 1 Capstone Course: BIOL3992, BIOL4922, BIOL4962, and BIOL4992.

7. Students who may wish to pursue postgraduate study in dietetics are strongly advised to consult their academic and course selection advisor. Students are recommended to take BIOL1110, BBMS1001, CHEM1042 and CHEM2442 in Year 1 of the study. Students should also take BIOL3204 and Level 3/4 courses related to molecular biology.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Food & Nutritional Science
Offered to students admitted to Year 1 in 2018

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:
(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology, and nutrition and their relationship to human health; (b) critical knowledge and understanding on the relationship between food and a wide range of social, legal, technological and environmental factors; (c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students’ critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical centers, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: apply and disseminate scientific knowledge obtained from food, nutrition and related biosciences for the understanding of the influences of nutrition in health and disease, using a range of formats and approaches (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food- and/or nutrition-related hypothesis (by means of coursework, tutorial classes, laboratory-based and project-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1201 Introduction to food and nutrition (6)
   BIOL2101 Principles of food chemistry (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2220 Principles of biochemistry (6)
   BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.
   BIOL2220 and BIOC2600 are mutually exclusive.
   BIOL2601 Principles of toxicology (6)

   BIOL2601 Principles of toxicology (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   BIOL3202 Nutritional biochemistry (6)
   BIOL3203 Food microbiology (6)
   BIOL3209 Food and nutrient analysis (6)
   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   BIOL3204 Nutrition and the life cycle (6)
   BIOL3205 Human physiology (6)
   BIOL3206 Clinical nutrition (6)
   BIOL3206 Principles of toxicology (6)
   BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.
<table>
<thead>
<tr>
<th>Course Code</th>
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</tr>
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<tr>
<td>BIOL3207</td>
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<td>BIOL3211</td>
<td>Principles of dietary assessment (6)</td>
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<td>BIOL3215</td>
<td>Food waste management (6)</td>
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<td>BIOL3216</td>
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<td>Food hygiene and quality control (6)</td>
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<td>Diet and disease (6)</td>
</tr>
<tr>
<td>BIOL3606</td>
<td>Food commodities (6)</td>
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<td>BIOL3608</td>
<td>Public health nutrition (6)</td>
</tr>
<tr>
<td>BIOL4201</td>
<td>Nutrition and sports performance (6)</td>
</tr>
<tr>
<td>BIOL4202</td>
<td>Food technology (6)</td>
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<tr>
<td>BIOL4205</td>
<td>Meat, dairy and grain sciences (6)</td>
</tr>
<tr>
<td>BIOL4208</td>
<td>Functional foods (6)</td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology (6)</td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3992 Directed studies in food & nutritional science (6)
- BIOL4913 Advanced practicum on food and nutrient analysis (6)
- BIOL4922 Food product development and evaluation (6)
- BIOL4962 Food & nutritional science internship (6)
- BIOL4992 Food & nutritional science project (12)

Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students who wish to specialize in a certain area may choose to emphasize selection of courses from the following lists:
   (a) Food Science and Technology: BIOL3608; BIOL3207; BIOL3209; BIOL3216; BIOL3218; BIOL4205; BIOL4208; BIOL4209; BIOL4411; BIOL4915; BIOL4922.
   (b) Nutrition and Health Science: BIOL3204; BIOL3205; BIOL3206; BIOL3207; BIOL3211; BIOL3215; BIOL3217; BIOL3218; BIOL3606; BIOL4201; BIOL4202.

6. Students who may wish to pursue postgraduate study in dietetics are strongly advised to consult their academic and course selection advisors regarding additional courses in Physiology and Biochemistry.

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Food & Nutritional Science
Offered to students admitted to Year 1 in 2017

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:
(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology, and nutrition and their relationship to human health; (b) critical knowledge and understanding on the relationship between food and a wide range of social, legal, technological and environmental factors; (c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students’ critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical centers, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

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PLO 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food- and/or nutrition-related hypothesis (by means of coursework, tutorial classes, laboratory-based and project-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)

1. Introductory level courses (48 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (36 credits)
- BIOL1110 From molecules to cells (6)
- BIOL1201 Introduction to food and nutrition (6)
- BIOL2101 Principles of food chemistry (6)
- BIOL2102 Biostatistics (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2220 Principles of biochemistry (6)

- BIOL2220 Basic biochemistry (6)

- BIOL2600 Basic biochemistry (6)

2. Advanced level courses (42 credits)
Disciplinary Core Courses (18 credits)
- BIOL3202 Nutritional biochemistry (6)
- BIOL3203 Food microbiology (6)
- BIOL3209 Food and nutrient analysis (6)

Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
- BIOL3204 Nutrition and the life cycle (6)
- BIOL3205 Human physiology (6)
- BIOL3206 Clinical nutrition (6)

Take either BIOL3202 or BIOL3606 to fulfill this 36 credits requirement, but not both. BIOL3202 and BIOL3606 are mutually exclusive.

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BIOL3207  Nutrigenomics (6)
BIOL3211  Principles of dietary assessment (6)
BIOL3215  Food waste management (6)
BIOL3216  Food, environment and health (6)
BIOL3218  Food hygiene and quality control (6)
BIOL3606  Diet and disease (6)

Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.

BIOL3608  Food commodities (6)

Take either BIOL3608 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3608 and BIOL4208 are mutually exclusive.

BIOL4201  Public health nutrition (6)
BIOL4202  Nutrition and sports performance (6)
BIOL4205  Food technology (6)
BIOL4208  Meat, dairy and grain sciences (6)

Take either BIOL3608 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3608 and BIOL4208 are mutually exclusive.

BIOL4209  Functional foods (6)
BIOL4411  Plant and food biotechnology (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - BIOL3992  Directed studies in food & nutritional science (6)
   - BIOL4913  Advanced practicum on food and nutrient analysis (6)
   - BIOL4922  Food product development and evaluation (6)
   - BIOL4962  Food & nutritional science internship (6)
   - BIOL4992  Food & nutritional science project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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Major Title: Major in Food & Nutritional Science  
Offered to students admitted to Year 1 in 2016

Objectives:
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Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

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Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)

1. Introductory level courses (48 credits)
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   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1201 Introduction to food and nutrition (6)
   BIOL1309 Evolutionary diversity (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2220 Principles of biochemistry (6)

   BIOL2600 Basic biochemistry (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   BIOL2101 Food chemistry (6)
   BIOL2102 Nutritional biochemistry (6)
   BIOL2103 Food microbiology (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   BIOL2104 Nutrition and the life cycle (6)
   BIOL3605 Human physiology (6)
   BIOL2206 Clinical nutrition (6)
   Principles of toxicology (6)

Take either BIOL2220 or BIOL2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOL2600 are mutually exclusive.

Take either BIOL2220 or BIOL2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOL2600 are mutually exclusive.
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<th>Course Title</th>
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<tr>
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<td>Take either BIOL3208 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3208 and BIOL3218 are mutually exclusive.</td>
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<td>BIOL3208</td>
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<tr>
<td>BIOL3209</td>
<td>Food and nutrient analysis (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3210</td>
<td>Grain production and utilization (6)</td>
<td>Take either BIOL3210 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3210 and BIOL4208 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL3211</td>
<td>Nutrigenomics (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3215</td>
<td>Principles of dietary assessment (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3216</td>
<td>Food waste management (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3217</td>
<td>Food, environment and health (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3218</td>
<td>Food hygiene and quality control (6)</td>
<td>Take either BIOL3208 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3208 and BIOL3218 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL3606</td>
<td>Diet and disease (6)</td>
<td>Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL3608</td>
<td>Food commodities (6)</td>
<td>Take either BIOL3208 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3208 and BIOL3218 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL4201</td>
<td>Public health nutrition (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4202</td>
<td>Nutrition and sports performance (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4204</td>
<td>Diet, brain function and behavior (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4205</td>
<td>Food technology (6)</td>
<td>Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL4207</td>
<td>Meat and dairy sciences (6)</td>
<td>Take either BIOL4207 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL4207 and BIOL4208 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL4208</td>
<td>Meat, dairy and grain sciences (6)</td>
<td>Take either BIOL3210 or BIOL4208; BIOL4207 or BIOL4208; BIOL3608 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3210 and BIOL4208; BIOL4207 and BIOL4208; BIOL3608 and BIOL4208 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL4209</td>
<td>Functional foods (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology (6)</td>
<td></td>
</tr>
</tbody>
</table>

3. **Capstone requirement (6 credits)**
   
   At least 6 credits selected from the following courses:
   
<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BIOL3992</td>
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</tr>
<tr>
<td>BIOL4912</td>
<td>Sensory evaluation of food (6)</td>
</tr>
<tr>
<td>BIOL4913</td>
<td>Advanced practicum on food and nutrient analysis (6)</td>
</tr>
<tr>
<td>BIOL4922</td>
<td>Food product development and evaluation (6)</td>
</tr>
<tr>
<td>BIOL4962</td>
<td>Food &amp; nutritional science internship (6)</td>
</tr>
<tr>
<td>BIOL4992</td>
<td>Food &amp; nutritional science project (12)</td>
</tr>
</tbody>
</table>

Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (“disciplinary core”) in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students who wish to specialize in a certain area may choose to emphasize selection of courses from the following lists:
   
   (a) **Food Science and Technology**: BIOL3608; BIOL3207; BIOL3208 or BIOL3218; BIOL3209; BIOL3210 or BIOL4208; BIOL3216; BIOL4205; BIOL4207 or BIOL4208; BIOL4209; BIOL4411; BIOL4913; BIOL4922.
   
   (b) **Nutrition and Health Science**: BIOL3204; BIOL3205; BIOL3206; BIOL3207; BIOL3208 or BIOL3218; BIOL3211; BIOL3215; BIOL3217; BIOL3606; BIOL4201; BIOL4202.

6. Students who may wish to pursue postgraduate study in dietetics are strongly advised to consult their academic and course selection advisors regarding additional courses in Physiology and Biochemistry.
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Food & Nutritional Science

Offered to students admitted to Year 1 in 2015

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:

(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology, and nutrition and their relationship to human health;
(b) critical knowledge and understanding on the relationship between food and a wide range of social, legal, technological and environmental factors;
(c) a curriculum meeting the requirements for higher degree in MPhil and PhD or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students’ critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical centers, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: apply and disseminate scientific knowledge obtained from food, nutrition and related biosciences for the understanding of the influences of nutrition in health and disease, using a range of formats and approaches (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food- and/or nutrition-related hypothesis (by means of coursework, tutorial classes, laboratory-based and project-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6</td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6</td>
</tr>
</tbody>
</table>

   Disciplinary Core Courses (36 credits)
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1201</td>
<td>Introduction to food and nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2102</td>
<td>Biostatistics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2103</td>
<td>Biological sciences laboratory course</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

   BIOL2600 Basic biochemistry (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3201</td>
<td>Food chemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3202</td>
<td>Nutritional biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3203</td>
<td>Food microbiology</td>
<td>6</td>
</tr>
</tbody>
</table>

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3204</td>
<td>Nutrition and the life cycle</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3206</td>
<td>Clinical nutrition</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Principles of toxicology</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL3202 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3202 and BIOL3606 are mutually exclusive.
| BIOL3207 | [previous title: Food and nutritional toxicology (6)] |
| BIOL3208 | Food safety and quality management (6) |
| BIOL3209 | Food and nutrient analysis (6) |
| BIOL3210 | Grain production and utilization (6) |
| BIOL3211 | Nutrigenomics (6) |
| BIOL3215 | Principles of dietary assessment (6) |
| BIOL3216 | Food waste management (6) |
| BIOL3217 | Food, environment and health (6) |
| BIOL3218 | Food hygiene and quality control (6) |
| BIOL3606 | Diet and disease (6) |
| BIOL3608 | Food commodities (6) |
| BIOL4201 | Public health nutrition (6) |
| BIOL4202 | Nutrition and sports performance (6) |
| BIOL4204 | Diet, brain function and behavior (6) |
| BIOL4205 | Food technology (6) |
| BIOL4207 | Meat and dairy sciences (6) |
| BIOL4208 | Meat, dairy and grain sciences (6) |
| BIOL4209 | Functional foods (6) |
| BIOL4210 | Food product development (6) |
| BIOL4411 | Plant and food biotechnology (6) |

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

| BIOL3992 | Directed studies in food & nutritional science (6) |
| BIOL4912 | Sensory evaluation of food (6) |
| BIOL4913 | Advanced practicum on food and nutrient analysis (6) |
| BIOL4922 | Food product development and evaluation (6) |
| BIOL4962 | Food & nutritional science internship (6) |
| BIOL4992 | Food & nutritional science project (12) |

### Notes:

1. BIOL4210 and BIOL4922 are mutually exclusive.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students who wish to specialize in a certain area may choose to emphasize selection of courses from the following lists:
   - (a) Food Science and Technology: BIOL3608; BIOL3207; BIOL3208 or BIOL3218; BIOL3209; BIOL3210 or BIOL4208; BIOL3216; BIOL4205; BIOL4207 or BIOL4208; BIOL4209; BIOL4210 or BIOL4922; BIOL4411; BIOL4913.
   - (b) Nutrition and Health Science: BIOL3204; BIOL3205; BIOL3206; BIOL3207; BIOL3208 or BIOL3218; BIOL3211; BIOL3215; BIOL3217; BIOL3606; BIOL4201; BIOL4202.
7. Students who may wish to pursue postgraduate study in dietetics are strongly advised to consult their academic and course selection advisors regarding additional courses in Physiology and Biochemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Food & Nutritional Science

Offered to students admitted to Year 1 in 2014

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:
(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology, and nutrition and their relationship to human health;
(b) critical knowledge and understanding on the relationship between food and a wide range of social, legal, technological and environmental factors;
(c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students’ critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical centers, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: apply and disseminate scientific knowledge obtained from food, nutrition and related biosciences for the understanding of the influences of nutrition in health and disease, using a range of formats and approaches (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food-and/or nutrition-related hypothesis (by means of coursework, tutorial classes, laboratory-based and project-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1201 Introduction to food and nutrition (6)
   BIOL1309 Evolutionary diversity (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2220 Principles of biochemistry (6)
   BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

   BIOL2600 Basic biochemistry (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   BIOL3201 Food chemistry (6)
   BIOL3202 Nutritional biochemistry (6)
   BIOL3203 Food microbiology (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   BIOL3204 Nutrition and the life cycle (6)
   BIOL3205 Human physiology (6)
   BIOL3206 Clinical nutrition (6)
   BIOL3206 and BIOL3606 are mutually exclusive.

   Principles of toxicology (6)

   Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.
BIOL3207 Food safety and quality management (6)

BIOL3208 Food and nutritional toxicology (6)

BIOL3209 Food and nutrient analysis (6)

BIOL3210 Grain production and utilization (6)

BIOL3211 Nutrigenomics (6)

BIOL3215 Principles of dietary assessment (6)

BIOL3216 Food waste management (6)

BIOL3217 Food, environment and health (6)

BIOL3218 Food hygiene and quality control (6)

BIOL3606 Diet and disease (6)

BIOL3608 Food commodities (6)

BIOL4201 Public health nutrition (6)

BIOL4202 Nutrition and sports performance (6)

BIOL4204 Diet, brain function and behavior (6)

BIOL4205 Food technology (6)

BIOL4207 Meat and dairy sciences (6)

BIOL4208 Meat, dairy and grain sciences (6)

BIOL4209 Functional foods (6)

BIOL4210 Food product development (6)

BIOL4411 Plant and food biotechnology (6)

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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<td>BIOL4992</td>
<td>Food &amp; nutritional science project (12)</td>
</tr>
</tbody>
</table>

Notes:

1. BIOL4210 and BIOL4922 are mutually exclusive.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students who wish to specialize in a certain area may choose to emphasize selection of courses from the following lists:

   - Food Science and Technology: BIOL3608; BIOL3207; BIOL3208 or BIOL3218; BIOL3209; BIOL3210 or BIOL4208; BIOL3216; BIOL4205; BIOL4207 or BIOL4208; BIOL4209; BIOL4210 or BIOL4922; BIOL4411; BIOL4913.
   - Nutrition and Health Science: BIOL3204; BIOL3205; BIOL3206; BIOL3207; BIOL3208 or BIOL3218; BIOL3211; BIOL3215; BIOL3217; BIOL3606; BIOL4201; BIOL4202.

7. Students who may wish to pursue postgraduate study in dietetics are strongly advised to consult their academic and course selection
advisors regarding additional courses in Physiology and Biochemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Food & Nutritional Science

Offered to students admitted to Year 1 in 2013

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:
(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology, and nutrition and their relationship to human health; (b) critical knowledge and understanding on the relationship between food and a wide range of social, legal, technological and environmental factors; (c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

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Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

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PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1201 Introduction to food and nutrition (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2220 Principles of biochemistry (6)
   BIOL2600 Basic biochemistry (6)

   Take either BIOL2220 or BIOC2600 to fulfill this 30 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

   Disciplinary Electives (6 credits)
   BIOL1309 Evolutionary diversity (6)
   BIOL2306 Ecology and evolution (6)

   Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   BIOL3201 Food chemistry (6)
   BIOL3202 Nutritional biochemistry (6)
   BIOL3203 Food microbiology (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   BIOL3204 Nutrition and the life cycle (6)
   BIOL3205 Human physiology (6)
   Clinical nutrition (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3206</td>
<td>Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.</td>
<td></td>
</tr>
<tr>
<td>BIOL3207</td>
<td>Principles of toxicology (6)</td>
<td>Previous title: Food and nutritional toxicology (6)</td>
</tr>
<tr>
<td>BIOL3208</td>
<td>Food safety and quality management (6)</td>
<td>Take either BIOL3208 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3208 and BIOL3218 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL3209</td>
<td>Food and nutrient analysis (6)</td>
<td>Take either BIOL3210 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3210 and BIOL4208 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL3210</td>
<td>Grain production and utilization (6)</td>
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</tr>
<tr>
<td>BIOL3211</td>
<td>Nutrigenomics (6)</td>
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<td>BIOL3215</td>
<td>Principles of dietary assessment (6)</td>
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<td>Food, environment and health (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3218</td>
<td>Food hygiene and quality control (6)</td>
<td>Take either BIOL3208 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3208 and BIOL3218 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL3606</td>
<td>Diet and disease (6)</td>
<td>Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL3608</td>
<td>Food commodities (6)</td>
<td>Take either BIOL3608 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3608 and BIOL4208 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL4201</td>
<td>Public health nutrition (6)</td>
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<td>BIOL4202</td>
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<tr>
<td>BIOL4204</td>
<td>Diet, brain function and behavior (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4205</td>
<td>Food technology (6)</td>
<td>[Previous title: Food processing and engineering (6)]</td>
</tr>
<tr>
<td>BIOL4207</td>
<td>Meat and dairy sciences (6)</td>
<td>Take either BIOL4207 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL4207 and BIOL4208 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL4208</td>
<td>Meat, dairy and grain sciences (6)</td>
<td>Take either BIOL3210 or BIOL4208; BIOL4207 or BIOL4208; BIOL3608 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3210 and BIOL4208; BIOL4207 and BIOL4208; BIOL3608 and BIOL4208 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL4209</td>
<td>Functional foods (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4210</td>
<td>Food product development (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology (6)</td>
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</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:

- BIOL3992 Directed studies in food & nutritional science (6)
- BIOL4912 Sensory evaluation of food (6)
- BIOL4913 Advanced practicum on food and nutrient analysis (6)
- BIOL4922 Food product development and evaluation (6)
- BIOL4962 Food & nutritional science internship (6)
- BIOL4992 Food & nutritional science project (12)

### Notes:
1. BIOL4210 and BIOL4922 are mutually exclusive.
2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.
3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.
4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.
5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.
6. Students who wish to specialize in a certain area may choose to emphasize selection of courses from the following lists:
   (a) Food Science and Technology: BIOL3608; BIOL3207; BIOL3208 or BIOL3218; BIOL3209; BIOL3210 or BIOL4208; BIOL3216; BIOL4205.
BIOL4207 or BIOL4208; BIOL4209; BIOL4210 or BIOL4922; BIOL4411; BIOL4913.

(b) Nutrition and Health Science: BIOL3204; BIOL3205; BIOL3206; BIOL3207; BIOL3208 or BIOL3218; BIOL3211; BIOL3215; BIOL3217; BIOL3606; BIOL4201; BIOL4202.

7. Students who may wish to pursue postgraduate study in dietetics are strongly advised to consult their academic and course selection advisors regarding additional courses in Physiology and Biochemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Food & Nutritional Science

Offered to students admitted to Year 1 in 2012

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:
(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology, and nutrition and their relationship to human health; (b) critical knowledge and understanding on the relationship between food and a wide range of social, legal, technological and environmental factors; (c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students’ critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical centers, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: apply and disseminate scientific knowledge obtained from food, nutrition and related biosciences for the understanding of the influences of nutrition in health and disease, using a range of formats and approaches (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food- and/or nutrition-related hypothesis (by means of coursework, tutorial classes, laboratory-based and project-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:

Minor in Food & Nutritional Science

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   BIOL1110 From molecules to cells (6)
   BIOL1201 Introduction to food and nutrition (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2220 Principles of biochemistry (6)
   BIOL2306 Ecology and evolution (6)
   BIOL2600 Basic biochemistry (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   BIOL3201 Food chemistry (6)
   BIOL3202 Nutritional biochemistry (6)
   BIOL3203 Food microbiology (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   BIOL3204 Nutrition and the life cycle (6)
   BIOL3205 Human physiology (6)
   BIOL3206 Clinical nutrition (6)
   BIOL3207 Principles of toxicology (6)
   Food safety and quality management (6)

   Take either BIOL2220 or BIOL2600 to fulfill this 36 credits, but not both. BIOL2220 and BIOL2600 are mutually exclusive.

   Take either BIOL2220 or BIOL2600 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.

   Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.

   [previous title: Food and nutritional toxicology (6)]
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<tr>
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<td>BIOL3208</td>
<td>Take either BIOL3208 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3208 and BIOL3218 are mutually exclusive.</td>
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<tr>
<td>BIOL3209</td>
<td>Food and nutrient analysis (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3210</td>
<td>Grain production and utilization (6)</td>
<td>Take either BIOL3210 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3210 and BIOL4208 are mutually exclusive.</td>
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<td>BIOL3211</td>
<td>Nutrigenomics (6)</td>
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<td>BIOL3606</td>
<td>Diet and disease (6)</td>
<td>Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.</td>
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<tr>
<td>BIOL3608</td>
<td>Food commodities (6)</td>
<td>Take either BIOL3608 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3608 and BIOL4208 are mutually exclusive.</td>
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</tr>
<tr>
<td>BIOL4208</td>
<td>Meat, dairy and grain sciences (6)</td>
<td>Take either BIOL3210 or BIOL4208; BIOL4207 or BIOL4208; BIOL3608 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL4207 and BIOL4208 are mutually exclusive.</td>
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<td>BIOL4411</td>
<td>Plant and food biotechnology (6)</td>
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</tr>
</tbody>
</table>

3. **Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

- BIOL3992 Directed studies in food & nutritional science (6)
- BIOL4912 Sensory evaluation of food (6)
- BIOL4913 Advanced practicum on food and nutrient analysis (6)
- BIOL4922 Food product development and evaluation (6)
- BIOL4962 Food & nutritional science internship (6)
- BIOL4992 Food & nutritional science project (12)

**Notes:**

1. BIOL4210 and BIOL4922 are mutually exclusive.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ('disciplinary core') in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students who wish to specialize in a certain area may choose to emphasize selection of courses from the following lists:
   - (a) Food Science and Technology: BIOL3608; BIOL3207; BIOL3208 or BIOL3218; BIOL3209; BIOL3210 or BIOL4208; BIOL3216; BIOL4205; BIOL4207 or BIOL4208; BIOL4209; BIOL4210 or BIOL4922; BIOL4411; BIOL4913.
   - (b) Nutrition and Health Science: BIOL3204; BIOL3205; BIOL3206; BIOL3207; BIOL3208 or BIOL3218; BIOL3211; BIOL3215; BIOL3217; BIOL3606; BIOL4201; BIOL4202.

7. Students who may wish to pursue postgraduate study in dietetics are strongly advised to consult their academic and course selection advisors regarding additional courses in Physiology and Biochemistry.
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology
Offered to students admitted to Year 1 in 2019

Objectives:
Geology concerns with the scientific study of the Earth's structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology (Intensive)
Minor in Earth Sciences

Required courses (96 credits)

<table>
<thead>
<tr>
<th>1. Introductory level courses (42 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111 Scientific method and reasoning (6)</td>
</tr>
<tr>
<td>SCNC1112 Fundamentals of modern science (6)</td>
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</tr>
<tr>
<td>2. Advanced level courses (48 credits)</td>
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<tr>
<td>EASC1402 Principles of geology (6)</td>
</tr>
<tr>
<td>EASC2401 Fluid/solid interactions in earth processes (6)</td>
</tr>
<tr>
<td>EASC2402 Field and laboratory methods (6)</td>
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<tr>
<td>EASC2406 Geochemistry (6)</td>
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<tr>
<td>EASC2407 Mineralogy (6)</td>
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</tr>
<tr>
<td>3. Capstone requirement (6 credits)</td>
</tr>
<tr>
<td>------------------------------------</td>
</tr>
<tr>
<td>EASC4955 Integrated field studies (6)</td>
</tr>
</tbody>
</table>

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology

Offered to students admitted to Year 1 in 2018

Objectives:
Geology concerns with the scientific study of the Earth’s structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology (Intensive)
Minor in Earth Sciences

Required courses (96 credits)

1. Introductory level courses (42 credits)

   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)
   EASC2402 Field and laboratory methods (6)
   EASC2406 Geochemistry (6)
   EASC2407 Mineralogy (6)

2. Advanced level courses (48 credits)

   Disciplinary Core Courses (36 credits)
   EASC3402 Petrology (6)
   EASC3403 Sedimentary environments (6)
   EASC3404 Structural geology (6)
   EASC3408 Geophysics (6)
   EASC3409 Igneous and metamorphic petrogenesis (6)
   EASC4406 Earth dynamics & global tectonics (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   EASC3406 Reconstruction of past climate (6)
   EASC3410 Hydrogeology (6)
   EASC3412 Earth resources (6)
   EASC3413 Engineering geology (6)
   EASC3414 Soil and rock mechanics (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENVS3007 Natural hazards and mitigation (6)
   EASC4403 Biogeochemical cycles (6)
   EASC4407 Regional geology (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4955 Integrated field studies (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
major in science. The double-counted courses must include SCNC111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (‘disciplinary core’) in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology
Offered to students admitted to Year 1 in 2017

Objectives:
Geology concerns with the scientific study of the Earth's structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology (Intensive)
Minor in Earth Sciences

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)
   EASC2402 Field and laboratory methods (6)
   EASC2406 Geochemistry (6)
   EASC2407 Mineralogy (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (36 credits)
   EASC3402 Petrology (6)
   EASC3403 Sedimentary environments (6)
   EASC3404 Structural geology (6)
   EASC3408 Geophysics (6)
   EASC3409 Igneous and metamorphic petrogenesis (6)
   EASC4406 Earth dynamics & global tectonics (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   EASC3406 Reconstruction of past climate (6)
   EASC3410 Hydrogeology (6)
   EASC3412 Earth resources (6)
   EASC3413 Engineering geology (6)
   EASC3414 Soil and rock mechanics (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENV3307 Natural hazards and mitigation (6)
   EASC4403 Biogeochemical cycles (6)
   EASC4407 Regional geology (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4955 Integrated field studies (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (“disciplinary core”) in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology
Offered to students admitted to Year 1 in 2016

Objectives:
Geology concerns the scientific study of the Earth's structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology (Intensive)
Minor in Earth Sciences

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)
   EASC2402 Field and laboratory methods (6)
   EASC2406 Geochemistry (6)
   EASC2407 Mineralogy (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (36 credits)
   EASC3402 Petrology (6)
   EASC3403 Sedimentary environments (6)
   EASC3404 Structural geology (6)
   EASC3408 Geophysics (6)
   EASC3409 Igneous and metamorphic petrogenesis (6)
   EASC4406 Earth dynamics & global tectonics (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   EASC3406 Reconstruction of past climate (6)
   EASC3410 Hydrogeology (6)
   EASC3412 Earth resources (6)
   EASC3413 Engineering geology (6)
   EASC3414 Soil and rock mechanics (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENV3307 Natural hazards and mitigation (6)
   EASC4403 Biogeochemical cycles (6)
   EASC4407 Regional geology (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4955 Integrated field studies (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
Geology concerns with the scientific study of the Earth’s structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology (Intensive)
Minor in Earth Sciences

Required courses (96 credits)
1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)
   EASC2402 Field and laboratory methods (6)
   EASC2406 Geochemistry (6)
   EASC2407 Mineralogy (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (36 credits)
   EASC3402 Petrology (6)
   EASC3403 Sedimentary environments (6)
   EASC3404 Structural geology (6)
   EASC3408 Geophysics (6)
   EASC3409 Igneous and metamorphic petrogenesis (6)
   EASC4406 Earth dynamics & global tectonics (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   EASC3406 Reconstruction of past climate (6)
   EASC3410 Hydrogeology (6)
   EASC3412 Earth resources (6)
   EASC3413 Engineering geology (6)
   EASC3414 Soil and rock mechanics (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENVS3007 Natural hazards and mitigation (6)
   EASC4403 Biogeochemical cycles (6)
   EASC4407 Regional geology (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4955 Integrated field studies (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second...
major in science. The double-counted courses must include SCNC111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (\"disciplinary core\") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (\"disciplinary core\") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to \"Students taking double Majors, Major-Minor or double Minors with overlapping course requirements\" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology
Offered to students: admitted to Year 1 in 2014

Objectives:
Geology concerns with the scientific study of the Earth's structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology (Intensive)
Minor in Earth Sciences

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   - EASC1402 Principles of geology (6)
   - EASC2401 Fluid/solid interactions in earth processes (6)
   - EASC2402 Field and laboratory methods (6)
   - EASC2406 Geochemistry (6)
   - EASC2407 Mineralogy (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (36 credits)
   - EASC3402 Petrology (6)
   - EASC3403 Sedimentary environments (6)
   - EASC3404 Structural geology (6)
   - EASC3408 Geophysics (6)
   - EASC3409 Igneous and metamorphic petrogenesis (6)
   - EASC4406 Earth dynamics & global tectonics (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - EASC3406 Reconstruction of past climate (6)
   - EASC3410 Hydrogeology (6)
   - EASC3412 Earth resources (6)
   - EASC3413 Engineering geology (6)
   - EASC3414 Soil and rock mechanics (6)
   - EASC3416 Advanced geochemistry and geochronology (6)
   - EASC3417 Earth through time (6)
   - EASC3999 Directed studies in earth sciences (6)
   - ENVS3007 Natural hazards and mitigation (6)
   - EASC4403 Biogeochemical cycles (6)
   - EASC4407 Regional geology (6)
   - EASC4408 Special topics in earth sciences (6)
   - EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   - EASC4955 Integrated field studies (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology
Offered to students admitted to Year 1 in 2013

Objectives:
Geology concerns with the scientific study of the Earth's structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology (Intensive)
Minor in Earth Sciences

Required courses (96 credits)
1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111  Scientific method and reasoning (6)
   SCNC1112  Fundamentals of modern science (6)
   Disciplinary Core Courses (30 credits)
   EASC1402  Principles of geology (6)
   EASC2401  Fluid/solid interactions in earth processes (6)
   EASC2402  Field and laboratory methods (6)
   EASC2406  Geochemistry (6)
   EASC2407  Mineralogy (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (36 credits)
   EASC3402  Petrology (6)
   EASC3403  Sedimentary environments (6)
   EASC3404  Structural geology (6)
   EASC3408  Geophysics (6)
   EASC3409  Igneous and metamorphic petrogenesis (6)
   EASC4406  Earth dynamics & global tectonics (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   EASC3406  Reconstruction of past climate (6)
   EASC3410  Hydrogeology (6)
   EASC3412  Earth resources (6)
   EASC3413  Engineering geology (6)
   EASC3414  Soil and rock mechanics (6)
   EASC3416  Advanced geochemistry and geochronology (6)
   EASC3417  Earth through time (6)
   EASC3999  Directed studies in earth sciences (6)
   ENVS3007  Natural hazards and mitigation (6)
   EASC4403  Biogeochemical cycles (6)
   EASC4407  Regional geology (6)
   EASC4408  Special topics in earth sciences (6)
   EASC4999  Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4955  Integrated field studies (6)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title:** Major in Geology  
**Offered to students admitted to Year 1 in:** 2012

**Objectives:**  
Geology concerns with the scientific study of the Earth's structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

**Learning Outcomes:**  
By the end of this programme, students should be able to:  

**PLO 1:** describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

**PLO 2:** have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

**PLO 3:** communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

**PLO 4:** have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

**PLO 5:** work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

**Impermissible Combinations:**  
Major in Geology (Intensive)  
Minor in Earth Sciences

**Required courses (96 credits)**  

<table>
<thead>
<tr>
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<tbody>
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<tr>
<td>EASC2407</td>
<td>Mineralogy (6)</td>
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<table>
<thead>
<tr>
<th>2. Advanced level courses (48 credits)</th>
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<tbody>
<tr>
<td><strong>Disciplinary Core Courses (36 credits)</strong></td>
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<tr>
<td>EASC3402</td>
<td>Petrology (6)</td>
</tr>
<tr>
<td>EASC3403</td>
<td>Sedimentary environments (6)</td>
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<tr>
<td>EASC3404</td>
<td>Structural geology (6)</td>
</tr>
<tr>
<td>EASC3408</td>
<td>Geophysics (6)</td>
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<tr>
<td>EASC3409</td>
<td>Igneous and metamorphic petrogenesis (6)</td>
</tr>
<tr>
<td>EASC4406</td>
<td>Earth dynamics &amp; global tectonics (6)</td>
</tr>
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<table>
<thead>
<tr>
<th><strong>Disciplinary Electives (12 credits)</strong></th>
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<tbody>
<tr>
<td>At least 12 credits selected from the following courses:</td>
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<tr>
<td>EASC3406</td>
<td>Reconstruction of past climate (6)</td>
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<tr>
<td>EASC3410</td>
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<td>EASC3412</td>
<td>Earth resources (6)</td>
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<tr>
<td>EASC3413</td>
<td>Engineering geology (6)</td>
</tr>
<tr>
<td>EASC3414</td>
<td>Soil and rock mechanics (6)</td>
</tr>
<tr>
<td>EASC3416</td>
<td>Advanced geochemistry and geochronology (6)</td>
</tr>
<tr>
<td>EASC3417</td>
<td>Earth through time (6)</td>
</tr>
<tr>
<td>EASC3999</td>
<td>Directed studies in earth sciences (6)</td>
</tr>
<tr>
<td>ENV5301</td>
<td>Natural hazards and mitigation (6)</td>
</tr>
<tr>
<td>EASC4403</td>
<td>Biogeochemical cycles (6)</td>
</tr>
<tr>
<td>EASC4407</td>
<td>Regional geology (6)</td>
</tr>
<tr>
<td>EASC4408</td>
<td>Special topics in earth sciences (6)</td>
</tr>
<tr>
<td>EASC4999</td>
<td>Earth sciences project (12)</td>
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</table>

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<th>3. Capstone requirement (6 credits)</th>
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</thead>
<tbody>
<tr>
<td>EASC4955</td>
<td>Integrated field studies (6)</td>
</tr>
</tbody>
</table>

**Notes:**  
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second
major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology (Intensive)
Offered to students admitted to Year 1 in 2019

Objectives:
To provide an education in Geology which meets the current minimum requirements of the Geological Society of London for accreditation.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology
Minor in Earth Sciences

Required courses (150 credits)
1. Introductory level courses (54 to 66 credits) (Note 1)

**Disciplinary Core Courses: Science Foundation Courses (12 credits)**
- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

**Disciplinary Core Courses (42 credits)**
- EASC1401 Blue Planet (6)
- EASC1402 Principles of geology (6)
- EASC2401 Fluid/solid interactions in earth processes (6)
- EASC2402 Field and laboratory methods (6)
- EASC2406 Geochemistry (6)
- EASC2407 Mineralogy (6)
- EASC2409 Regional field studies (6)

2. Advanced level courses (78 to 90 credits) (Note 1)

**Disciplinary Core Courses (60 credits)**
- EASC3402 Petrology (6)
- EASC3403 Sedimentary environments (6)
- EASC3404 Structural geology (6)
- EASC3408 Geophysics (6)
- EASC3409 Igneous and metamorphic petrogenesis (6)
- EASC3417 Earth through time (6)
- EASC4406 Earth dynamics & global tectonics (6)
- EASC4407 Regional geology (6)
- EASC4999 Earth sciences project (12)

**Disciplinary Electives (30 credits)**
At least 30 credits selected from the following introductory and advanced level courses in List A and List B, among which at least 6 credits from List A:

**List A**
- EASC3405 Environmental remote sensing (6)
- EASC3413 Engineering geology (6)

**List B**
- EASC2404 Introduction to atmosphere and hydrosphere (6)
- EASC2408 Planetary geology (6)
- EASC3020 Global change: anthropogenic impacts (6)
- EASC3406 Reconstruction of past climate (6)
- EASC3410 Hydrogeology (6)
- EASC3412 Earth resources (6)
- EASC3414 Soil and rock mechanics (6)
- EASC3416 Advanced geochemistry and geochronology (6)
- EASC3999 Directed studies in earth sciences (6)
- ENV3007 Natural hazards and mitigation (6)
- ENV3313 Environmental oceanography (6)
- EASC4403 Biogeochemical cycles (6)
- EASC4408 Special topics in earth sciences (6)
- EASC4911 Earth system: contemporary issues (6)
### Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC4966</td>
<td>Earth sciences internship</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC4955</td>
<td>Integrated field studies</td>
<td>(6)</td>
</tr>
</tbody>
</table>

#### Notes:

1. In the list of disciplinary elective courses, two of them are introductory level courses while the others are advanced level courses. If students take all advanced level courses in the list, the total number of introductory level courses is 54 credits while that of advanced level courses is 90 credits. If students take 2 introductory level courses in the list and 3 advanced level courses, the total number of introductory level courses is 66 credits and that of advanced level courses is 78 credits.

2. These are core courses in the regular Geology Major (96 credits) curriculum.

3. Requires approval to qualify for accredited pathway. EASC4999 Earth sciences project must have a significant 3D geological evolutionary component to meet Accredited Pathway requirements, as specified during our 2016 re-accreditation. Therefore, each EASC4999 project intended to qualify for the Accredited Pathway must be approved by the Geology major coordinator as satisfying this requirement. This policy is effective for all projects starting in 2017 and after.

#### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology (Intensive)
Offered to students admitted to Year 1 in 2018

Objectives:
To provide an education in Geology which meets the current minimum requirements of the Geological Society of London for accreditation.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology
Minor in Earth Sciences

Required courses (150 credits)
1. Introductory level courses (54 to 66 credits) (Note 1)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6) (Note 2)
SCNC1112 Fundamentals of modern science (6) (Note 2)

Disciplinary Core Courses (42 credits)
EASC1401 Blue Planet (6)
EASC1402 Principles of geology (6) (Note 2)
EASC2401 Fluid/solid interactions in earth processes (6) (Note 2)
EASC2402 Field and laboratory methods (6) (Note 2)
EASC2406 Geochemistry (6) (Note 2)
EASC2407 Mineralogy (6) (Note 2)
EASC2409 Regional field studies (6)

2. Advanced level courses (78 to 90 credits) (Note 1)

Disciplinary Core Courses (60 credits)
EASC3402 Petrology (6) (Note 2)
EASC3403 Sedimentary environments (6) (Note 2)
EASC3404 Structural geology (6) (Note 2)
EASC3408 Geophysics (6) (Note 2)
EASC3409 Igneous and metamorphic petrogenesis (6) (Note 2)
EASC3417 Earth through time (6)
EASC4406 Earth dynamics & global tectonics (6) (Note 2)
EASC4407 Regional geology (6)
EASC4999 Earth sciences project (12) (Note 3)

Disciplinary Electives (30 credits)
At least 30 credits selected from the following introductory and advanced level courses in List A and List B, among which at least 6 credits from List A:

List A
EASC3405 Environmental remote sensing (6)
EASC3413 Engineering geology (6)

List B
EASC2404 Introduction to atmosphere and hydrosphere (6)
EASC2408 Planetary geology (6)
EASC3020 Global change: anthropogenic impacts (6)
EASC3406 Reconstruction of past climate (6)
EASC3410 Hydrogeology (6)
EASC3412 Earth resources (6)
EASC3414 Soil and rock mechanics (6)
EASC3416 Advanced geochemistry and geochronology (6)
EASC3999 Directed studies in earth sciences (6)
ENVS3007 Natural hazards and mitigation (6)
ENVS3313 Environmental oceanography (6)
EASC4403 Biogeochemical cycles (6)
EASC4408 Special topics in earth sciences (6)
EASC4911 Earth system: contemporary issues (6)
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**Notes:**

1. In the list of disciplinary elective courses, two of them are introductory level courses while the others are advanced level courses. If students take all advanced level courses in the list, the total number of introductory level courses is 54 credits while that of advanced level courses is 90 credits. If students take 2 introductory level courses in the list and 3 advanced level courses, the total number of introductory level courses is 66 credits and that of advanced level courses is 78 credits.

2. These are core courses in the regular Geology Major (96 credits) curriculum.

3. Requires approval to qualify for accredited pathway. EASC4999 Earth sciences project must have a significant 3D geological evolutionary component to meet Accredited Pathway requirements, as specified during our 2016 re-accreditation. Therefore, each EASC4999 project intended to qualify for the Accredited Pathway must be approved by the Geology major coordinator as satisfying this requirement. This policy is effective for all projects starting in 2017 and after.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology (Intensive)
Offered to students admitted to Year 1 in 2017

Objectives:
To provide an education in Geology which meets the current minimum requirements of the Geological Society of London for accreditation.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology
Minor in Earth Sciences

Required courses (150 credits)
1. Introductory level courses (54 to 66 credits) (Note 1)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6) (Note 2)
SCNC1112 Fundamentals of modern science (6) (Note 2)

Disciplinary Core Courses (42 credits)
EASC1401 Blue Planet (6)
EASC1402 Principles of geology (6) (Note 2)
EASC2401 Fluid/solid interactions in earth processes (6) (Note 2)
EASC2402 Field and laboratory methods (6) (Note 2)
EASC2406 Geochemistry (6) (Note 2)
EASC2407 Mineralogy (6) (Note 2)
EASC2409 Regional field studies (6)

2. Advanced level courses (78 to 90 credits) (Note 1)

Disciplinary Core Courses (60 credits)
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EASC3403 Sedimentary environments (6) (Note 2)
EASC3404 Structural geology (6) (Note 2)
EASC3408 Geophysics (6) (Note 2)
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EASC4407 Regional geology (6)
EASC4999 Earth sciences project (12) (Note 3)

Disciplinary Electives (30 credits)
At least 30 credits selected from the following introductory and advanced level courses in List A and List B, among which at least 6 credits from List A:

List A
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EASC3413 Engineering geology (6)

List B
EASC2404 Introduction to atmosphere and hydrosphere (6)
EASC2408 Planetary geology (6)
EASC3402 Global change: anthropogenic impacts (6)
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EASC3410 Hydrogeology (6)
EASC3412 Earth resources (6)
EASC3414 Soil and rock mechanics (6)
EASC3416 Advanced geochemistry and geochronology (6)
EASC3999 Directed studies in earth sciences (6)
ENVS3007 Natural hazards and mitigation (6)
ENVS3313 Environmental oceanography (6)
EASC4403 Biogeochemical cycles (6)
EASC4408 Special topics in earth sciences (6)
EASC4911 Earth system: contemporary issues (6)
3. Capstone requirement (6 credits)

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Notes:
1. In the list of disciplinary elective courses, two of them are introductory level courses while the others are advanced level courses. If students take all advanced level courses in the list, the total number of introductory level courses is 54 credits while that of advanced level courses is 90 credits. If students take 2 introductory level courses in the list and 3 advanced level courses, the total number of introductory level courses is 66 credits and that of advanced level courses is 78 credits.

2. These are core courses in the regular Geology Major (96 credits) curriculum.

3. Requires approval to qualify for accredited pathway. EASC4999 Earth sciences project must have a significant 3D geological evolutionary component to meet Accredited Pathway requirements, as specified during our 2016 re-accreditation. Therefore, each EASC4999 project intended to qualify for the Accredited Pathway must be approved by the Geology major coordinator as satisfying this requirement. This policy is effective for all projects starting in 2017 and after.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Geology (Intensive)
Offered to students admitted to Year 1 in 2016

Objectives:
To provide an education in Geology which meets the current minimum requirements of the Geological Society of London for accreditation.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

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PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
Major in Geology
Minor in Earth Sciences

Required courses (150 credits)
1. Introductory level courses (54 to 66 credits) (Note 1)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6) (Note 2)
   SCNC1112 Fundamentals of modern science (6) (Note 2)
   Disciplinary Core Courses (42 credits)
   EASC1401 Blue Planet (6)
   EASC1402 Principles of geology (6) (Note 2)
   EASC2401 Fluid/solid interactions in earth processes (6) (Note 2)
   EASC2402 Field and laboratory methods (6) (Note 2)
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   EASC2407 Mineralogy (6) (Note 2)
   EASC2409 Regional field studies (6)

2. Advanced level courses (78 to 90 credits) (Note 1)
   Disciplinary Core Courses (60 credits)
   EASC3402 Petrology (6) (Note 2)
   EASC3403 Sedimentary environments (6) (Note 2)
   EASC3404 Structural geology (6) (Note 2)
   EASC3408 Geophysics (6) (Note 2)
   EASC3409 Igneous and metamorphic petrogenesis (6) (Note 2)
   EASC3417 Earth through time (6)
   EASC4406 Earth dynamics & global tectonics (6) (Note 2)
   EASC4407 Regional geology (6)
   EASC4999 Earth sciences project (12) (Note 3)

Disciplinary Electives (30 credits)
At least 30 credits selected from the following introductory and advanced level courses in List A and List B, among which at least 6 credits from List A:

List A
   EASC3405 Environmental remote sensing (6)
   EASC3413 Engineering geology (6)

List B
   EASC2404 Introduction to atmosphere and hydrosphere (6)
   EASC2408 Planetary geology (6)
   EASC3020 Global change: anthropogenic impacts (6)
   EASC3406 Reconstruction of past climate (6)
   EASC3410 Hydrogeology (6)
   EASC3412 Earth resources (6)
   EASC3414 Soil and rock mechanics (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3999 Directed studies in earth sciences (6)
   ENVS3007 Natural hazards and mitigation (6)
   ENVS3313 Environmental oceanography (6)
   EASC4403 Biogeochemical cycles (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4911 Earth system: contemporary issues (6)
3. Capstone requirement (6 credits)
   EASC4966 Earth sciences internship (6)
   EASC4955 Integrated field studies (6)

Notes:
1. In the list of disciplinary elective courses, two of them are introductory level courses while the others are advanced level courses. If students take all advanced level courses in the list, the total number of introductory level courses is 54 credits while that of advanced level courses is 90 credits. If students take 2 introductory level courses in the list and 3 advanced level courses, the total number of introductory level courses is 66 credits and that of advanced level courses is 78 credits.

2. These are core courses in the regular Geology Major (96 credits) curriculum.

3. Requires approval to qualify for accredited pathway. EASC4999 Earth sciences project must have a significant 3D geological evolutionary component to meet Accredited Pathway requirements, as specified during our 2016 re-accreditation. Therefore, each EASC4999 project intended to qualify for the Accredited Pathway must be approved by the Geology major coordinator as satisfying this requirement. This policy is effective for all projects starting in 2017 and after.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title**  
Major in Geology (Intensive)

**Offered to students**  
admitted to Year 1 in 2015

**Objectives:**
To provide an education in Geology which meets the current minimum requirements of the Geological Society of London for accreditation.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

- **PLO 2**: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

- **PLO 3**: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

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- **PLO 5**: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

**Impermissible Combinations:**
Major in Geology  
Minor in Earth Sciences

**Required courses (150 credits)**

1. **Introductory level courses (54 to 66 credits) (Note 1)**

   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   - SCNC1111 Scientific method and reasoning (6)  
   - SCNC1112 Fundamentals of modern science (6)  

   **Disciplinary Core Courses (42 credits)**
   - SCNC1111 Scientific method and reasoning (6)  
   - SCNC1112 Fundamentals of modern science (6)

2. **Advanced level courses (78 to 90 credits) (Note 1)**

   **Disciplinary Core Courses (60 credits)**
   - EASC1401 Blue Planet (6)  
   - EASC1402 Principles of geology (6)  
   - EASC2401 Fluid/solid interactions in earth processes (6)  
   - EASC2402 Field and laboratory methods (6)  
   - EASC2406 Geochemistry (6)  
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   - EASC2409 Regional field studies (6)  
   - EASC3402 Petrology (6)  
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   - EASC3404 Structural geology (6)  
   - EASC3408 Geophysics (6)  
   - EASC3409 Igneous and metamorphic petrogenesis (6)  
   - EASC3417 Earth through time (6)  
   - EASC4406 Earth dynamics & global tectonics (6)  
   - EASC4407 Regional geology (6)  
   - EASC4999 Earth sciences project (12)  

   **Disciplinary Electives (30 credits)**
   At least 30 credits selected from the following introductory and advanced level courses in List A and List B, among which at least 6 credits from List A:

   **List A**
   - EASC3405 Environmental remote sensing (6)  
   - EASC3413 Engineering geology (6)  

   **List B**
   - EASC2404 Introduction to atmosphere and hydrosphere (6)  
   - EASC2408 Planetary geology (6)  
   - EASC3020 Global change: anthropogenic impacts (6)  
   - EASC3406 Reconstruction of past climate (6)  
   - EASC3410 Hydrogeology (6)  
   - EASC3412 Earth resources (6)  
   - EASC3414 Soil and rock mechanics (6)  
   - EASC3416 Advanced geochemistry and geochronology (6)  
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   - ENVS3007 Natural hazards and mitigation (6)  
   - ENVS3313 Environmental oceanography (6)  
   - EASC4403 Biogeochemical cycles (6)  
   - EASC4408 Special topics in earth sciences (6)  
   - EASC4911 Earth system: contemporary issues (6)
EASC4966 Earth sciences internship (6)

3. Capstone requirement (6 credits)

EASC4955 Integrated field studies (6) (Note 2)

Notes:
1. In the list of disciplinary elective courses, two of them are introductory level courses while the others are advanced level courses. If students take all advanced level courses in the list, the total number of introductory level courses is 54 credits while that of advanced level courses is 90 credits. If students take 2 introductory level courses in the list and 3 advanced level courses, the total number of introductory level courses is 66 credits and that of advanced level courses is 78 credits.

2. These are core courses in the regular Geology Major (96 credits) curriculum.

3. Requires approval to qualify for accredited pathway. EASC4999 Earth sciences project must have a significant 3D geological evolutionary component to meet Accredited Pathway requirements, as specified during our 2016 re-accreditation. Therefore, each EASC4999 project intended to qualify for the Accredited Pathway must be approved by the Geology major coordinator as satisfying this requirement. This policy is effective for all projects starting in 2017 and after.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Major Title
Major in Mathematics

## Offered to students
admitted to Year 1 in 2019

### Objectives:
The Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize fundamental knowledge and concepts in Mathematics and elective courses provide training in both pure and applied aspects of Mathematics. Throughout the curriculum there is also emphasis on experiential learning through guided studies, projects, seminars and summer internships. With the diversity of courses offered in the major, various specializations are available. These will lead to careers in a wide range of sectors including education, economics and finance, analytics and data science, logistics, management, research and further studies.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1:** describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)
- **PLO 2:** apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)
- **PLO 3:** communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)
- **PLO 4:** collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
- **PLO 5:** appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

### Impermissible Combinations:
- Minor in Computational & Financial Mathematics
- Minor in Mathematics
- Minor in Operations Research & Mathematical Programming

### Required courses (96 credits)

#### 1. Introductory level courses (48 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning (6)</td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science (6)</td>
</tr>
</tbody>
</table>

#### Disciplinary Core Courses (36 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
</tr>
<tr>
<td>MATH2012</td>
<td>Fundamental concepts of mathematics (6)</td>
</tr>
<tr>
<td>MATH2101</td>
<td>Linear algebra I (6)</td>
</tr>
<tr>
<td>MATH2102</td>
<td>Linear algebra II (6)</td>
</tr>
<tr>
<td>MATH2211</td>
<td>Multivariable calculus (6)</td>
</tr>
<tr>
<td>MATH2241</td>
<td>Introduction to mathematical analysis (6)</td>
</tr>
</tbody>
</table>

#### Disciplinary Electives (36 credits)

At least 36 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits are selected from List A and at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A, List B and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.

**List A**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3301</td>
<td>Algebra I (6)</td>
</tr>
<tr>
<td>MATH3303</td>
<td>Functions of a complex variable (6)</td>
</tr>
<tr>
<td>MATH3601</td>
<td>Numerical analysis (6)</td>
</tr>
<tr>
<td>MATH3603</td>
<td>Probability theory (6)</td>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization (6)</td>
</tr>
</tbody>
</table>

**List B**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3001</td>
<td>Development of mathematical ideas (6)</td>
</tr>
<tr>
<td>MATH3002</td>
<td>Mathematics seminar (6)</td>
</tr>
<tr>
<td>MATH3303</td>
<td>Matrix theory and its applications (6)</td>
</tr>
<tr>
<td>MATH3304</td>
<td>Introduction to number theory (6)</td>
</tr>
<tr>
<td>MATH3405</td>
<td>Differential equations (6)</td>
</tr>
<tr>
<td>MATH3408</td>
<td>Computational methods and differential equations with applications (6)</td>
</tr>
<tr>
<td>MATH3541</td>
<td>Introduction to topology (6)</td>
</tr>
<tr>
<td>MATH3600</td>
<td>Discrete mathematics (6)</td>
</tr>
<tr>
<td>MATH3901</td>
<td>Operations research I (6)</td>
</tr>
<tr>
<td>MATH3905</td>
<td>Queueing theory and simulation (6)</td>
</tr>
<tr>
<td>MATH3906</td>
<td>Financial calculus (6)</td>
</tr>
<tr>
<td>MATH3911</td>
<td>Game theory and strategy (6)</td>
</tr>
<tr>
<td>MATH3943</td>
<td>Network models in operations research (6)</td>
</tr>
<tr>
<td>MATH4302</td>
<td>Algebra II (6)</td>
</tr>
<tr>
<td>MATH4402</td>
<td>Analysis II (6)</td>
</tr>
<tr>
<td>MATH4404</td>
<td>Functional analysis (6)</td>
</tr>
<tr>
<td>MATH4406</td>
<td>Introduction to partial differential equations (6)</td>
</tr>
</tbody>
</table>
MATH4501 Geometry (6)
MATH4511 Introduction to differentiable manifolds (6)
MATH4602 Scientific computing (6)
MATH4902 Operations research II (6)
MATH4907 Numerical methods for financial calculus (6)
MATH7101 Intermediate complex analysis (6)
MATH7201 Topics in geometry (6)
MATH7202 Complex manifolds (6)
MATH7217 Topics in financial mathematics (6)
MATH7219 Topics in applied functional analysis (6)
MATH7224 Topics in advanced probability theory (6)
MATH7501 Topics in algebra (6)
MATH7502 Topics in applied discrete mathematics (6)
MATH7503 Topics in mathematical programming and optimization (6)
MATH7504 Geometric topology (6)
MATH7505 Real analysis (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:

Math3999 Directed studies in mathematics (6)
MATH4910 Senior mathematics seminar (6)
MATH4911 Mathematics capstone project (6)
MATH4966 Mathematics internship (6)
MATH4999 Mathematics project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics  
Offered to students admitted to Year 1 in 2018

Objectives:
The Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize fundamental knowledge and concepts in Mathematics and elective courses provide training in both pure and applied aspects of Mathematics. Throughout the curriculum there is also emphasis on experiential learning through guided studies, projects, seminars and summer internships. With the diversity of courses offered in the major, various specializations are available. These will lead to careers in a wide range of sectors including education, economics and finance, analytics and data science, logistics, management, research and further studies.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)

PLO 2: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)

PLO 3: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)

PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)

PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
Minor in Computational & Financial Mathematics  
Minor in Mathematics  
Minor in Operations Research & Mathematical Programming

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (36 credits)
   MATH1013 University mathematics II (6)
   MATH2012 Fundamental concepts of mathematics (6)
   MATH2101 Linear algebra I (6)
   MATH2102 Linear algebra II (6)
   MATH2211 Multivariable calculus (6)
   MATH2241 Introduction to mathematical analysis (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Course (6 credits)
   MATH3401 Analysis I (6)
   Disciplinary Electives (36 credits)
   At least 36 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits are selected from List A and at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A, List B and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.
   List A
   MATH3301 Algebra I (6)
   MATH3303 Functions of a complex variable (6)
   MATH3601 Numerical analysis (6)
   MATH3603 Probability theory (6)
   MATH3904 Introduction to optimization (6)
   List B
   MATH3302 Development of mathematical ideas (6)
   MATH3302 Mathematics seminar (6)
   MATH3303 Matrix theory and its applications (6)
   MATH3304 Introduction to number theory (6)
   MATH3405 Differential equations (6)
   MATH3408 Computational methods and differential equations with applications (6)
   MATH3541 Introduction to topology (6)
   MATH3600 Discrete mathematics (6)
   MATH3601 Operations research I (6)
   MATH3905 Queueing theory and simulation (6)
   MATH3906 Financial calculus (6)
   MATH3911 Game theory and strategy (6)
   MATH3943 Network models in operations research (6)
   MATH4302 Algebra II (6)
   MATH4402 Analysis II (6)
   MATH4404 Functional analysis (6)
   MATH4406 Introduction to partial differential equations (6)
MATH4501 Geometry (6)
MATH4511 Introduction to differentiable manifolds (6)
MATH4602 Scientific computing (6)
MATH4902 Operations research II (6)
MATH4907 Numerical methods for financial calculus (6)
MATH7101 Intermediate complex analysis (6)
MATH7201 Topics in geometry (6)
MATH7202 Complex manifolds (6)
MATH7217 Topics in financial mathematics (6)
MATH7219 Topics in applied functional analysis (6)
MATH7224 Topics in advanced probability theory (6)
MATH7501 Topics in algebra (6)
MATH7502 Topics in applied discrete mathematics (6)
MATH7503 Topics in mathematical programming and optimization (6)
MATH7504 Geometric topology (6)
MATH7505 Real analysis (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   MATH3999 Directed studies in mathematics (6)
   MATH4910 Senior mathematics seminar (6)
   MATH4911 Mathematics capstone project (6)
   MATH4966 Mathematics internship (6)
   MATH4999 Mathematics project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics  
Offered to students admitted to Year 1 in 2017

Objectives:
The Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize fundamental knowledge and concepts in Mathematics and elective courses provide training in both pure and applied aspects of Mathematics. Throughout the curriculum there is also emphasis on experiential learning through guided studies, projects, seminars and summer internships. With the diversity of courses offered in the major, various specializations are available. These will lead to careers in a wide range of sectors including education, economics and finance, analytics and data science, logistics, management, research and further studies.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)
PLO 2: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)
PLO 3: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)
PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
Major in Mathematics/Physics
Minor in Computational & Financial Mathematics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming

Required courses (96 credits)
1. Introductory level courses (48 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6)
SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (36 credits)
MATH1101 University mathematics II (6)
MATH2101 Linear algebra I (6)
MATH2102 Linear algebra II (6)
MATH2111 Multivariable calculus (6)
MATH2241 Introduction to mathematical analysis (6)

2. Advanced level courses (42 credits)
Disciplinary Core Course (6 credits)
MATH3401 Analysis I (6)
Disciplinary Electives (36 credits)
At least 36 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits are selected from List A and at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A, List B and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.

List A
MATH3301 Algebra I (6)
MATH3403 Functions of a complex variable (6)
MATH3601 Numerical analysis (6)
MATH3603 Probability theory (6)
MATH3904 Introduction to optimization (6)

List B
MATH3302 Mathematics seminar (6)
MATH3303 Matrix theory and its applications (6)
MATH3304 Introduction to number theory (6)
MATH3405 Differential equations (6)
MATH3408 Computational methods and differential equations with applications (6)
MATH3541 Introduction to topology (6)
MATH3600 Discrete mathematics (6)
MATH3901 Operations research I (6)
MATH3905 Queueing theory and simulation (6)
MATH3906 Financial calculus (6)
MATH3911 Game theory and strategy (6)
MATH3943 Network models in operations research (6)
MATH4301 Algebra II (6)
MATH4402 Analysis II (6)
MATH4404 Functional analysis (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH4406</td>
<td>Introduction to partial differential equations</td>
<td>6</td>
</tr>
<tr>
<td>MATH4501</td>
<td>Geometry</td>
<td>6</td>
</tr>
<tr>
<td>MATH4511</td>
<td>Introduction to differentiable manifolds</td>
<td>6</td>
</tr>
<tr>
<td>MATH4602</td>
<td>Scientific computing</td>
<td>6</td>
</tr>
<tr>
<td>MATH4902</td>
<td>Operations research II</td>
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</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus</td>
<td>6</td>
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<tr>
<td>MATH7101</td>
<td>Intermediate complex analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH7201</td>
<td>Topics in geometry</td>
<td>6</td>
</tr>
<tr>
<td>MATH7202</td>
<td>Complex manifolds</td>
<td>6</td>
</tr>
<tr>
<td>MATH7217</td>
<td>Topics in financial mathematics</td>
<td>6</td>
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<td>MATH7219</td>
<td>Topics in applied functional analysis</td>
<td>6</td>
</tr>
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<td>MATH7224</td>
<td>Topics in advanced probability theory</td>
<td>6</td>
</tr>
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<td>MATH7501</td>
<td>Topics in algebra</td>
<td>6</td>
</tr>
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<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
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<td>MATH7503</td>
<td>Topics in mathematical programming and optimization</td>
<td>6</td>
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<tr>
<td>MATH7504</td>
<td>Geometric topology</td>
<td>6</td>
</tr>
<tr>
<td>MATH7505</td>
<td>Real analysis</td>
<td>6</td>
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</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3999</td>
<td>Directed studies in mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH4910</td>
<td>Senior mathematics seminar</td>
<td>6</td>
</tr>
<tr>
<td>MATH4911</td>
<td>Mathematics capstone project</td>
<td>6</td>
</tr>
<tr>
<td>MATH4966</td>
<td>Mathematics internship</td>
<td>6</td>
</tr>
<tr>
<td>MATH4999</td>
<td>Mathematica project</td>
<td>12</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at [https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements](https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements).

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics
Offered to students admitted to Year 1 in 2016

Objectives:
The Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize fundamental knowledge and concepts in Mathematics and elective courses provide training in both pure and applied aspects of Mathematics. Throughout the curriculum there is also emphasis on experiential learning through guided studies, projects, seminars and summer internships. With the diversity of courses offered in the major, various specializations are available. These will lead to careers in a wide range of sectors including education, economics and finance, analytics and data science, logistics, management, research and further studies.

Learning Outcomes:
By the end of this programme, students should be able to:

- PLO 1: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)
- PLO 2: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)
- PLO 3: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)
- PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
- PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
- Major in Mathematics/Physics
- Minor in Computational & Financial Mathematics
- Minor in Mathematics
- Minor in Operations Research & Mathematical Programming

Required courses (96 credits)

1. Introductory level courses (48 credits)

   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   - MATH1013 University mathematics II (6)
   - MATH2012 Fundamental concepts of mathematics (6)
   - MATH2101 Linear algebra I (6)
   - MATH2102 Linear algebra II (6)
   - MATH2211 Multivariable calculus (6)
   - MATH2241 Introduction to mathematical analysis (6)

2. Advanced level courses (42 credits)

   Disciplinary Core Course (6 credits)
   - MATH3401 Analysis I (6)

   Disciplinary Electives (36 credits)
   - At least 36 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits are selected from List A and at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A, List B and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.

   List A
   - MATH3301 Algebra I (6)
   - MATH3403 Functions of a complex variable (6)
   - MATH3601 Numerical analysis (6)
   - MATH3603 Probability theory (6)
   - MATH3904 Introduction to optimization (6)

   List B
   - MATH3001 Development of mathematical ideas (6)
   - MATH3002 Mathematics seminar (6)
   - MATH3303 Matrix theory and its applications (6)
   - MATH3304 Introduction to number theory (6)
   - MATH3405 Differential equations (6)
   - MATH3408 Computational methods and differential equations with applications (6)
   - MATH3541 Introduction to topology (6)
   - MATH3600 Discrete mathematics (6)
   - MATH3901 Operations research I (6)
   - MATH3905 Queueing theory and simulation (6)
   - MATH3906 Financial calculus (6)
   - MATH3911 Game theory and strategy (6)
   - MATH3943 Network models in operations research (6)
   - MATH4302 Algebra II (6)
   - MATH4402 Analysis II (6)
   - MATH4404 Functional analysis (6)
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<th>Course Code</th>
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<td>MATH4406</td>
<td>Introduction to partial differential equations</td>
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<tr>
<td>MATH4501</td>
<td>Geometry</td>
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<tr>
<td>MATH4511</td>
<td>Introduction to differentiable manifolds</td>
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<td>MATH4602</td>
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<td>MATH4907</td>
<td>Numerical methods for financial calculus</td>
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<td>Intermediate complex analysis</td>
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<tr>
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<td>Topics in geometry</td>
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<td>Complex manifolds</td>
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<td>6</td>
</tr>
<tr>
<td>MATH7505</td>
<td>Real analysis</td>
<td>6</td>
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</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- MATH3999 Directed studies in mathematics | 6
- MATH4910 Senior mathematics seminar | 6
- MATH4911 Mathematics capstone project | 6
- MATH4966 Mathematics internship | 6
- MATH4999 Mathematics project | 12

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
### Major Title
Major in Mathematics

### Offered to students
admitted to Year 1 in 2015

### Objectives:
The Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize fundamental knowledge and concepts in Mathematics and elective courses provide training in both pure and applied aspects of Mathematics. Throughout the curriculum there is also emphasis on experiential learning through guided studies, projects, seminars and summer internships. With the diversity of courses offered in the major, various specializations are available. These will lead to careers in a wide range of sectors including education, economics and finance, analytics and data science, logistics, management, research and further studies.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)
- **PLO 2**: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)
- **PLO 3**: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)
- **PLO 4**: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
- **PLO 5**: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

### Impermissible Combinations:
- Major in Mathematics/Physics
- Minor in Computational & Financial Mathematics
- Minor in Mathematics
- Minor in Operations Research & Mathematical Programming

### Required courses (96 credits)

#### 1. Introductory level courses (48 credits)

**Disciplinary Core Courses: Science Foundation Courses (12 credits)**
- SCNC1111: Scientific method and reasoning (6)
- SCNC1112: Fundamentals of modern science (6)

**Disciplinary Core Courses (36 credits)**
- MATH1013: University mathematics II (6)
- MATH2012: Fundamental concepts of mathematics (6)
- MATH2101: Linear algebra I (6)
- MATH2102: Linear algebra II (6)
- MATH2211: Multivariable calculus (6)
- MATH2241: Introduction to mathematical analysis (6)

#### 2. Advanced level courses (42 credits)

**Disciplinary Core Course (6 credits)**
- MATH3401: Analysis I (6)

**Disciplinary Electives (36 credits)**
- At least 36 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits are selected from List A and at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A, List B and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.

**List A**
- MATH3301: Algebra I (6)
- MATH3403: Functions of a complex variable (6)
- MATH3601: Numerical analysis (6)
- MATH3603: Probability theory (6)
- MATH3904: Introduction to optimization (6)

**List B**
- MATH3001: Development of mathematical ideas (6)
- MATH3002: Mathematics seminar (6)
- MATH3303: Matrix theory and its applications (6)
- MATH3304: Introduction to number theory (6)
- MATH3405: Differential equations (6)
- MATH3408: Computational methods and differential equations with applications (6)
- MATH3541: Introduction to topology (6)
- MATH3600: Discrete mathematics (6)
- MATH3901: Operations research I (6)
- MATH3905: Queueing theory and simulation (6)
- MATH3906: Financial calculus (6)
- MATH3911: Game theory and strategy (6)
- MATH3943: Network models in operations research (6)
- MATH4302: Algebra II (6)
- MATH4402: Analysis II (6)
- MATH4404: Functional analysis (6)
3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
- MATH3999 Directed studies in mathematics (6)
- MATH4910 Senior mathematics seminar (6)
- MATH4911 Mathematics capstone project (6)
- MATH4966 Mathematics internship (6)
- MATH4999 Mathematics project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics  
Offered to students admitted to Year 1 in 2014

Objectives:
The Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize fundamental knowledge and concepts in Mathematics and elective courses provide training in both pure and applied aspects of Mathematics. Throughout the curriculum there is also emphasis on experiential learning through guided studies, projects, seminars and summer internships. With the diversity of courses offered in the major, various specializations are available. These will lead to careers in a wide range of sectors including education, economics and finance, analytics and data science, logistics, management, research and further studies.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)
PLO 2: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)
PLO 3: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)
PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
Major in Mathematics/Physics  
Minor in Computational & Financial Mathematics  
Minor in Mathematics  
Minor in Operations Research & Mathematical Programming

### Required courses (96 credits)

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<th>1. Introductory level courses (48 credits)</th>
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<td>Disciplinary Core Courses: Science Foundation Courses (12 credits)</td>
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<td>MATH2211 Multivariable calculus (6)</td>
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<td>MATH2241 Introduction to mathematical analysis (6)</td>
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<td>MATH3301 Algebra I (6)</td>
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<td>MATH3302 Analysis I (6)</td>
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<td>MATH3303 Functions of a complex variable (6)</td>
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<table>
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<tr>
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<td>MATH3001 Development of mathematical ideas (6)</td>
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<td>MATH3003 Matrix theory and its applications (6)</td>
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<td>MATH4004 Functional analysis (6)</td>
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<td>MATH4005 Introduction to partial differential equations (6)</td>
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MATH4501 Geometry (6)
MATH4511 Introduction to differentiable manifolds (6)
MATH4602 Scientific computing (6)
MATH4902 Operations research II (6)
MATH4907 Numerical methods for financial calculus (6)
MATH7101 Intermediate complex analysis (6)
MATH7201 Topics in geometry (6)
MATH7202 Complex manifolds (6)
MATH7217 Topics in financial mathematics (6)
MATH7219 Topics in applied functional analysis (6)
MATH7224 Topics in advanced probability theory (6)
MATH7501 Topics in algebra (6)
MATH7502 Topics in applied discrete mathematics (6)
MATH7503 Topics in mathematical programming and optimization (6)
MATH7504 Geometric topology (6)
MATH7505 Real analysis (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
- MATH3999 Directed studies in mathematics (6)
- MATH4910 Senior mathematics seminar (6)
- MATH4911 Mathematics capstone project (6)
- MATH4966 Mathematics internship (6)
- MATH4999 Mathematics project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
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Objectives:
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Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)

PLO 2: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)

PLO 3: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)

PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)

PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
Major in Mathematics/Physics
Minor in Computational & Financial Mathematics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming
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<td>MATH7505</td>
<td>Real analysis (6)</td>
</tr>
</tbody>
</table>

3. **Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

- MATH3999  Directed studies in mathematics (6)
- MATH4910  Senior mathematics seminar (6)
- MATH4911  Mathematics capstone project (6)
- MATH4966  Mathematics internship (6)
- MATH4999  Mathematics project (12)

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics
Offered to students admitted to Year 1 in 2012

Objectives:
The Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize fundamental knowledge and concepts in Mathematics and elective courses provide training in both pure and applied aspects of Mathematics. Throughout the curriculum there is also emphasis on experiential learning through guided studies, projects, seminars and summer internships. With the diversity of courses offered in the major, various specializations are available. These will lead to careers in a wide range of sectors including education, economics and finance, analytics and data science, logistics, management, research and further studies.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)

PLO 2: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)

PLO 3: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)

PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)

PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
Major in Mathematics/Physics
Minor in Computational & Financial Mathematics
Minor in Mathematics

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (36 credits)
   MATH1013 University mathematics II (6)
   MATH2012 Fundamental concepts of mathematics (6)
   MATH2101 Linear algebra I (6)
   MATH2102 Linear algebra II (6)
   MATH2211 Multivariable calculus (6)
   MATH2241 Introduction to mathematical analysis (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   MATH3301 Algebra I (6)
   MATH3401 Analysis I (6)
   MATH3403 Functions of a complex variable (6)

   Disciplinary Electives (24 credits)
   At least 24 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.

   List A
   MATH3001 Development of mathematical ideas (6)
   MATH3002 Mathematics seminar (6)
   MATH3003 Matrix theory and its applications (6)
   MATH3004 Introduction to number theory (6)
   MATH3405 Differential equations (6)
   MATH3408 Computational methods and differential equations with applications (6)
   MATH3541 Introduction to topology (6)
   MATH3600 Discrete mathematics (6)
   MATH3601 Numerical analysis (6)
   MATH3603 Probability theory (6)
   MATH3901 Operations research I (6)
   MATH3904 Introduction to optimization (6)
   MATH3905 Queueing theory and simulation (6)
   MATH3906 Financial calculus (6)
   MATH3911 Game theory and strategy (6)
   MATH3943 Network models in operations research (6)
   MATH3946 Algebra II (6)
   MATH4402 Analysis II (6)
   MATH4404 Functional analysis (6)
   MATH4406 Introduction to partial differential equations (6)
   MATH4501 Geometry (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH4511</td>
<td>Introduction to differentiable manifolds</td>
<td>6</td>
</tr>
<tr>
<td>MATH4602</td>
<td>Scientific computing</td>
<td>6</td>
</tr>
<tr>
<td>MATH4902</td>
<td>Operations research II</td>
<td>6</td>
</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus</td>
<td>6</td>
</tr>
<tr>
<td>MATH7101</td>
<td>Intermediate complex analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH7201</td>
<td>Topics in geometry</td>
<td>6</td>
</tr>
<tr>
<td>MATH7202</td>
<td>Complex manifolds</td>
<td>6</td>
</tr>
<tr>
<td>MATH7217</td>
<td>Topics in financial mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH7219</td>
<td>Topics in applied functional analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory</td>
<td>6</td>
</tr>
<tr>
<td>MATH7501</td>
<td>Topics in algebra</td>
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</tr>
<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
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</tr>
<tr>
<td>MATH7503</td>
<td>Topics in mathematical programming and optimization</td>
<td>6</td>
</tr>
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<td>MATH7504</td>
<td>Geometric topology</td>
<td>6</td>
</tr>
<tr>
<td>MATH7505</td>
<td>Real analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- MATH3999 Directed studies in mathematics (6)
- MATH4910 Senior mathematics seminar (6)
- MATH4911 Mathematics capstone project (6)
- MATH4966 Mathematics internship (6)
- MATH4999 Mathematics project (12)

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at [https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements](https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements).

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title**  
Major in Mathematics (Intensive)

**Offered to students admitted to Year 1 in**  
2019

**Objectives:**
The Intensive Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize a firm foundation in Mathematics. The strong emphasis on experiential learning in guided studies, projects, seminars or summer internships provides more opportunities for students to carry out research based studies and to develop their expertise. Graduates are expected to have strong academic ability to pursue graduate studies or professional careers that require in-depth mathematical training.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: describe and present a variety of concepts and theories in mathematics (by means of coursework and learning activities in the curriculum)
- **PLO 2**: apply mathematical theory and techniques to handle research-style questions, scrutinize problems, and appraise the related ethical issues (by means of coursework and learning activities in the curriculum)
- **PLO 3**: communicate in mathematical language, and present mathematical ideas and scientific arguments (by means of coursework, seminars, guided studies and projects)
- **PLO 4**: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
- **PLO 5**: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

**Impermissible Combinations:**
- Major in Mathematics
- Major in Mathematics/Physics
- Minor in Computational & Financial Mathematics
- Minor in Mathematics
- Minor in Operations Research & Mathematical Programming

**Required courses (144 credits)**

1. Introductory level courses (48 credits)

   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
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</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6</td>
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</table>

   **Disciplinary Core Courses (36 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
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<tr>
<td>MATH2012</td>
<td>Fundamental concepts of mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH2101</td>
<td>Linear algebra I</td>
<td>6</td>
</tr>
<tr>
<td>MATH2102</td>
<td>Linear algebra II</td>
<td>6</td>
</tr>
<tr>
<td>MATH2211</td>
<td>Multivariable calculus</td>
<td>6</td>
</tr>
<tr>
<td>MATH2241</td>
<td>Introduction to mathematical analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

2. Advanced level courses (84 credits)

   **Disciplinary Core Course (60 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH3002</td>
<td>Mathematics seminar</td>
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<tr>
<td>MATH3301</td>
<td>Algebra I</td>
<td>6</td>
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<tr>
<td>MATH3401</td>
<td>Analysis I</td>
<td>6</td>
</tr>
<tr>
<td>MATH3403</td>
<td>Functions of a complex variable</td>
<td>6</td>
</tr>
<tr>
<td>MATH3405</td>
<td>Differential equations</td>
<td>6</td>
</tr>
<tr>
<td>MATH3600</td>
<td>Discrete mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH3603</td>
<td>Probability theory</td>
<td>6</td>
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<tr>
<td>MATH3904</td>
<td>Introduction to optimization</td>
<td>6</td>
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<tr>
<td>MATH4404</td>
<td>Functional analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH4406</td>
<td>Introduction to partial differential equations</td>
<td>6</td>
</tr>
</tbody>
</table>

   **Disciplinary Electives (24 credits)**

   **Select Stream (A) or Stream (B):**

   **(A) Pure Mathematics (at least 24 credits with 12 credits from MATH7XXX level, subject to pre-requisite requirement)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH3541</td>
<td>Introduction to topology</td>
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<tr>
<td>MATH4302</td>
<td>Algebra II</td>
<td>6</td>
</tr>
<tr>
<td>MATH4402</td>
<td>Analysis II</td>
<td>6</td>
</tr>
<tr>
<td>MATH4501</td>
<td>Geometry</td>
<td>6</td>
</tr>
<tr>
<td>MATH4511</td>
<td>Introduction to differentiable manifolds</td>
<td>6</td>
</tr>
<tr>
<td>MATH7101</td>
<td>Intermediate complex analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH7201</td>
<td>Topics in geometry</td>
<td>6</td>
</tr>
<tr>
<td>MATH7202</td>
<td>Complex manifolds</td>
<td>6</td>
</tr>
<tr>
<td>MATH7501</td>
<td>Topics in algebra</td>
<td>6</td>
</tr>
<tr>
<td>MATH7505</td>
<td>Real analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

   **(B) Applied Mathematics (at least 24 credits with 12 credits from MATH4XXX or MATH7XXX level, subject to pre-requisite requirement)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</tr>
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<tr>
<td>MATH3901</td>
<td>Operations research I</td>
<td>6</td>
</tr>
<tr>
<td>MATH3906</td>
<td>Financial calculus</td>
<td>6</td>
</tr>
<tr>
<td>MATH3911</td>
<td>Game theory and strategy</td>
<td>6</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>------------</td>
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<td>---------</td>
</tr>
<tr>
<td>MATH3943</td>
<td>Network models in operations research</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH4602</td>
<td>Scientific computing</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH4902</td>
<td>Operations research II</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7217</td>
<td>Topics in financial mathematics</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7503</td>
<td>Topics in mathematical programming and optimization</td>
<td>(6)</td>
</tr>
</tbody>
</table>

3. Capstone requirement (12 credits)

At least 12 credits selected from the following courses:

- MATH3999 Directed studies in mathematics (6)
- MATH4910 Senior mathematics seminar (6)
- MATH4911 Mathematics capstone project (6)
- MATH4966 Mathematics internship (6)
- MATH4999 Mathematics project (12)

**Notes:**
1. These are core courses in the regular Mathematics Major (96 credits) curriculum.
2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.
3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics (Intensive)  
Offered to students admitted to Year 1 in 2018

Objectives:
The Intensive Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize a firm foundation in Mathematics. The strong emphasis on experiential learning in guided studies, projects, seminars or summer internships provides more opportunities for students to carry out research based studies and to develop their expertise. Graduates are expected to have strong academic ability to pursue graduate studies or professional careers that require in-depth mathematical training.

Learning Outcomes:
By the end of this programme, students should be able to:
- PLO 1: describe and present a variety of concepts and theories in mathematics (by means of coursework and learning activities in the curriculum)
- PLO 2: apply mathematical theory and techniques to handle research-style questions, scrutinize problems, and appraise the related ethical issues (by means of coursework and learning activities in the curriculum)
- PLO 3: communicate in mathematical language, and present mathematical ideas and scientific arguments (by means of coursework, seminars, guided studies and projects)
- PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
- PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
Major in Mathematics  
Major in Mathematics/Physics  
Minor in Computational & Financial Mathematics  
Minor in Mathematics  
Minor in Operations Research & Mathematical Programming

Required courses (144 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)  
   SCNC1112 Fundamentals of modern science (6)  
   (Note 1)

   Disciplinary Core Courses (36 credits)
   MATH1013 University mathematics II (6)  
   MATH2012 Fundamental concepts of mathematics (6)  
   MATH2101 Linear algebra I (6)  
   MATH2102 Linear algebra II (6)  
   MATH2211 Multivariable calculus (6)  
   MATH2241 Introduction to mathematical analysis (6)  
   (Note 1)

2. Advanced level courses (84 credits)
   Disciplinary Core Course (60 credits)
   MATH3002 Mathematics seminar (6)  
   MATH3301 Algebra I (6)  
   MATH3401 Analysis I (6)  
   MATH3403 Functions of a complex variable (6)  
   MATH3405 Differential equations (6)  
   MATH3600 Discrete mathematics (6)  
   MATH3603 Probability theory (6)  
   MATH3904 Introduction to optimization (6)  
   MATH4404 Functional analysis (6)  
   MATH4406 Introduction to partial differential equations (6)

   Disciplinary Electives (24 credits)
   Select Stream (A) or Stream (B):
   (A) Pure Mathematics (at least 24 credits with 12 credits from MATH7XXX level, subject to pre-requisite requirement)
   MATH3541 Introduction to topology (6)  
   MATH4302 Algebra II (6)  
   MATH4402 Analysis II (6)  
   MATH4501 Geometry (6)  
   MATH4511 Introduction to differentiable manifolds (6)  
   MATH7101 Intermediate complex analysis (6)  
   MATH7201 Topics in geometry (6)  
   MATH7202 Complex manifolds (6)  
   MATH7401 Topics in algebra (6)  
   MATH7405 Real analysis (6)
   (B) Applied Mathematics (at least 24 credits with 12 credits from MATH4XXX or MATH7XXX level, subject to pre-requisite requirement)
   MATH3601 Numerical analysis (6)  
   MATH3901 Operations research I (6)  
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3. Capstone requirement (12 credits)
   At least 12 credits selected from the following courses:

   - MATH3999 Directed studies in mathematics (6)
   - MATH4910 Senior mathematics seminar (6)
   - MATH4911 Mathematics capstone project (6)
   - MATH4966 Mathematics internship (6)
   - MATH4999 Mathematics project (12)

**Notes:**
1. These are core courses in the regular Mathematics Major (96 credits) curriculum.
2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.
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**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics (Intensive)

Offered to students: 2017

admitted to Year 1 in

Objectives:
The Intensive Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize a firm foundation in Mathematics. The strong emphasis on experiential learning in guided studies, projects, seminars or summer internships provides more opportunities for students to carry out research based studies and to develop their expertise. Graduates are expected to have strong academic ability to pursue graduate studies or professional careers that require in-depth mathematical training.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and present a variety of concepts and theories in mathematics (by means of coursework and learning activities in the curriculum)

PLO 2: apply mathematical theory and techniques to handle research-style questions, scrutinize problems, and appraise the related ethical issues (by means of coursework and learning activities in the curriculum)

PLO 3: communicate in mathematical language, and present mathematical ideas and scientific arguments (by means of coursework, seminars, guided studies and projects)

PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)

PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics/Physics
Minor in Computational & Financial Mathematics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming

Required courses (144 credits)

1. Introductory level courses (48 credits)

   Disciplinary Core Courses: Science Foundation Courses (12 credits)

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<tr>
<th>Course Code</th>
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<tr>
<td>SCNC1112</td>
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   Disciplinary Core Courses (36 credits)

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<td>MATH2102</td>
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<td>MATH2241</td>
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2. Advanced level courses (84 credits)

   Disciplinary Core Course (60 credits)

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<td>Mathematics seminar (6)</td>
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<td>MATH3301</td>
<td>Algebra I (6)</td>
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<td>MATH3401</td>
<td>Analysis I (6)</td>
<td>(Note 1)</td>
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<tr>
<td>MATH3403</td>
<td>Functions of a complex variable (6)</td>
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<td>MATH3405</td>
<td>Differential equations (6)</td>
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<td>Discrete mathematics (6)</td>
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<td>Probability theory (6)</td>
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<td>Introduction to optimization (6)</td>
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<td>MATH4404</td>
<td>Functional analysis (6)</td>
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<tr>
<td>MATH4406</td>
<td>Introduction to partial differential equations (6)</td>
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</table>

   Disciplinary Electives (24 credits)

   Select Stream (A) or Stream (B):

   (A) Pure Mathematics (at least 24 credits with 12 credits from MATH7XXX level, subject to pre-requisite requirement)

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<td>MATH4501</td>
<td>Geometry (6)</td>
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<td>MATH4511</td>
<td>Introduction to differentiable manifolds (6)</td>
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<td>MATH4702</td>
<td>Topics in geometry (6)</td>
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<td>MATH4703</td>
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<tr>
<td>MATH4705</td>
<td>Topics in algebra (6)</td>
<td></td>
</tr>
</tbody>
</table>

   (B) Applied Mathematics (at least 24 credits with 12 credits from MATH4XXX or MATH7XXX level, subject to pre-requisite requirement)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3901</td>
<td>Operations research I (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3906</td>
<td>Financial calculus (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3911</td>
<td>Game theory and strategy (6)</td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credit</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>MATH3943</td>
<td>Network models in operations research</td>
<td>6</td>
</tr>
<tr>
<td>MATH4602</td>
<td>Scientific computing</td>
<td>6</td>
</tr>
<tr>
<td>MATH4902</td>
<td>Operations research II</td>
<td>6</td>
</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus</td>
<td>6</td>
</tr>
<tr>
<td>MATH7217</td>
<td>Topics in financial mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory</td>
<td>6</td>
</tr>
<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH7503</td>
<td>Topics in mathematical programming and optimization</td>
<td>6</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (12 credits)

At least 12 credits selected from the following courses:

- MATH3999 Directed studies in mathematics (6)
- MATH4910 Senior mathematics seminar (6)
- MATH4911 Mathematics capstone project (6)
- MATH4966 Mathematics internship (6)
- MATH4999 Mathematics project (12)

**Notes:**

1. These are core courses in the regular Mathematics Major (96 credits) curriculum.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at [https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements](https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements).

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics (Intensive)
Offered to students admitted to Year 1 in 2016

Objectives:
The Intensive Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize a firm foundation in Mathematics. The strong emphasis on experiential learning in guided studies, projects, seminars or summer internships provides more opportunities for students to carry out research based studies and to develop their expertise. Graduates are expected to have strong academic ability to pursue graduate studies or professional careers that require in-depth mathematical training.

Learning Outcomes:
By the end of this programme, students should be able to:
PLO 1: describe and present a variety of concepts and theories in mathematics (by means of coursework and learning activities in the curriculum)
PLO 2: apply mathematical theory and techniques to handle research-style questions, scrutinize problems, and appraise the related ethical issues (by means of coursework and learning activities in the curriculum)
PLO 3: communicate in mathematical language, and present mathematical ideas and scientific arguments (by means of coursework, seminars, guided studies and projects)
PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics/Physics
Minor in Computational & Financial Mathematics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming

<table>
<thead>
<tr>
<th>Required courses (144 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (48 credits)</td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses: Science Foundation Courses (12 credits)</strong></td>
</tr>
<tr>
<td>SCNC1111 Scientific method and reasoning (6)</td>
</tr>
<tr>
<td>SCNC1112 Fundamentals of modern science (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (36 credits)</strong></td>
</tr>
<tr>
<td>MATH1013 University mathematics II (6)</td>
</tr>
<tr>
<td>MATH2012 Fundamental concepts of mathematics (6)</td>
</tr>
<tr>
<td>MATH2101 Linear algebra I (6)</td>
</tr>
<tr>
<td>MATH2102 Linear algebra II (6)</td>
</tr>
<tr>
<td>MATH2211 Multivariable calculus (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Core Course (60 credits)</strong></td>
</tr>
<tr>
<td>MATH3002 Mathematics seminar (6)</td>
</tr>
<tr>
<td>MATH3301 Algebra I (6)</td>
</tr>
<tr>
<td>MATH3401 Analysis I (6)</td>
</tr>
<tr>
<td>MATH3403 Functions of a complex variable (6)</td>
</tr>
<tr>
<td>MATH3405 Differential equations (6)</td>
</tr>
<tr>
<td>MATH3600 Discrete mathematics (6)</td>
</tr>
<tr>
<td>MATH3603 Probability theory (6)</td>
</tr>
<tr>
<td>MATH3904 Introduction to optimization (6)</td>
</tr>
<tr>
<td>MATH4404 Functional analysis (6)</td>
</tr>
<tr>
<td>MATH4406 Introduction to partial differential equations (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (24 credits)</strong></td>
</tr>
<tr>
<td><strong>Select Stream (A) or Stream (B):</strong></td>
</tr>
<tr>
<td><strong>(A) Pure Mathematics (at least 24 credits with 12 credits from MATH7XXX level, subject to pre-requisite requirement)</strong></td>
</tr>
<tr>
<td>MATH3541 Introduction to topology (6)</td>
</tr>
<tr>
<td>MATH4302 Algebra II (6)</td>
</tr>
<tr>
<td>MATH4402 Analysis II (6)</td>
</tr>
<tr>
<td>MATH4501 Geometry (6)</td>
</tr>
<tr>
<td>MATH4511 Introduction to differentiable manifolds (6)</td>
</tr>
<tr>
<td>MATH7101 Intermediate complex analysis (6)</td>
</tr>
<tr>
<td>MATH7201 Topics in geometry (6)</td>
</tr>
<tr>
<td>MATH7202 Complex manifolds (6)</td>
</tr>
<tr>
<td>MATH7501 Topics in algebra (6)</td>
</tr>
<tr>
<td>MATH7505 Real analysis (6)</td>
</tr>
<tr>
<td><strong>(B) Applied Mathematics (at least 24 credits with 12 credits from MATH4XXX or MATH7XXX level, subject to pre-requisite requirement)</strong></td>
</tr>
<tr>
<td>MATH3601 Numerical analysis (6)</td>
</tr>
<tr>
<td>MATH3901 Operations research I (6)</td>
</tr>
<tr>
<td>MATH3906 Financial calculus (6)</td>
</tr>
<tr>
<td>MATH3911 Game theory and strategy (6)</td>
</tr>
<tr>
<td>Course Code</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>MATH3943</td>
</tr>
<tr>
<td>MATH4602</td>
</tr>
<tr>
<td>MATH4902</td>
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<tr>
<td>MATH4907</td>
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<tr>
<td>MATH7217</td>
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<tr>
<td>MATH7224</td>
</tr>
<tr>
<td>MATH7502</td>
</tr>
<tr>
<td>MATH7503</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (12 credits)

At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3999</td>
<td>Directed studies in mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH4910</td>
<td>Senior mathematics seminar</td>
<td>6</td>
</tr>
<tr>
<td>MATH4911</td>
<td>Mathematics capstone project</td>
<td>6</td>
</tr>
<tr>
<td>MATH4999</td>
<td>Mathematics project</td>
<td>12</td>
</tr>
<tr>
<td>MATH4966</td>
<td>Mathematics internship</td>
<td>6</td>
</tr>
</tbody>
</table>

### Notes:

1. These are core courses in the regular Mathematics Major (96 credits) curriculum.
2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.
3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at [https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements](https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements).

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics/Physics

Offered to students admitted to Year 1 in 2017

Objectives:
The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with a rigorous representation using their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)

PLO 3: apply mathematical theory and techniques to analyze physical problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Major in Mathematics
Major in Physics
Minor in Computational & Financial Mathematics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming
Minor in Physics

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   MATH1013 University mathematics II (6)
   MATH2101 Linear algebra I (6)
   MATH2211 Multivariable calculus (6)
   PHYS1250 Fundamental physics (6)
   PHYS2265 Introductory quantum physics (6)

   Disciplinary Electives (6 credits)
   At least 6 credits selected from the following courses:
   PHYS1150 Problem solving in physics (6)
   PHYS2055 Introductory relativity (6)
   PHYS2150 Methods in physics I (6)
   PHYS2155 Methods in physics II (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2260 Heat and waves (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (36 credits)
   MATH3001 Development of mathematical ideas (6)
   MATH3301 Algebra I (6)
   MATH3401 Analysis I (6)
   MATH4501 Geometry (6)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS3351 Advanced quantum mechanics (6)

   Disciplinary Electives (6 credits)
   At least 6 credits of advanced level Mathematics or Physics courses (MATH3XXX or MATH4XXX or MATH7XXX or PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list of courses include courses in List A and those courses not selected to fulfill the capstone requirement, but excluding MATH4966 Mathematics Internship.

List A
   MATH3001 Development of mathematical ideas (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3002</td>
<td>Mathematics seminar (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3303</td>
<td>Matrix theory and its applications (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3304</td>
<td>Introduction to number theory (6)</td>
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</tr>
<tr>
<td>MATH3403</td>
<td>Functions of a complex variable (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3405</td>
<td>Differential equations (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3408</td>
<td>Computational methods and differential equations with applications (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3541</td>
<td>Introduction to topology (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3600</td>
<td>Discrete mathematics (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3601</td>
<td>Numerical analysis (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3603</td>
<td>Probability theory (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3901</td>
<td>Operations research I (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization (6)</td>
<td></td>
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<tr>
<td>MATH3905</td>
<td>Queueing theory and simulation (6)</td>
<td></td>
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<tr>
<td>MATH3906</td>
<td>Financial calculus (6)</td>
<td></td>
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<tr>
<td>MATH3911</td>
<td>Game theory and strategy (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3943</td>
<td>Network models in operations research (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4302</td>
<td>Computational methods and differential equations with applications (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4402</td>
<td>Analysis II (6)</td>
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<td>MATH4404</td>
<td>Functional analysis (6)</td>
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<td>MATH4406</td>
<td>Introduction to partial differential equations (6)</td>
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</tr>
<tr>
<td>MATH4511</td>
<td>Introduction to differentiable manifolds (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4602</td>
<td>Scientific computing (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4902</td>
<td>Operations research II (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus (6)</td>
<td></td>
</tr>
<tr>
<td>MATH47101</td>
<td>Intermediate complex analysis (6)</td>
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</tr>
<tr>
<td>MATH7201</td>
<td>Topics in geometry (6)</td>
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<tr>
<td>MATH7202</td>
<td>Complex manifolds (6)</td>
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<td>MATH7217</td>
<td>Topics in financial mathematics (6)</td>
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<td>MATH7219</td>
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<td>MATH7224</td>
<td>Topics in advanced probability theory (6)</td>
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<td>MATH7501</td>
<td>Topics in algebra (6)</td>
<td></td>
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<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics (6)</td>
<td></td>
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<tr>
<td>MATH7503</td>
<td>Topics in mathematical programming and optimization (6)</td>
<td></td>
</tr>
<tr>
<td>MATH7504</td>
<td>Geometric topology (6)</td>
<td></td>
</tr>
<tr>
<td>MATH7505</td>
<td>Real analysis (6)</td>
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<tr>
<td>PHYS3150</td>
<td>Theoretical physics (6)</td>
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<tr>
<td>PHYS3151</td>
<td>Machine learning in physics (6)</td>
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<tr>
<td>PHYS3450</td>
<td>Electromagnetism (6)</td>
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</tr>
<tr>
<td>PHYS3550</td>
<td>Statistical mechanics &amp; thermodynamics (6)</td>
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<tr>
<td>PHYS3551</td>
<td>Introductory solid state physics (6)</td>
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<tr>
<td>PHYS3650</td>
<td>Observational astronomy (6)</td>
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</tr>
<tr>
<td>PHYS3651</td>
<td>The physical universe (6)</td>
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</tr>
<tr>
<td>PHYS3652</td>
<td>Principles of astronomy (6)</td>
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<tr>
<td>PHYS3750</td>
<td>Laser and spectroscopy (6)</td>
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<tr>
<td>PHYS3751</td>
<td>Physics of nanomaterials (6)</td>
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<tr>
<td>PHYS3850</td>
<td>Waves and optics (6)</td>
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</tr>
<tr>
<td>PHYS3851</td>
<td>Atomic and nuclear physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4150</td>
<td>Computational physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4151</td>
<td>Data analysis and modeling in physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4350</td>
<td>Advanced classical mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4450</td>
<td>Advanced electromagnetism (6)</td>
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</tr>
<tr>
<td>PHYS4550</td>
<td>Advanced statistical mechanics (6)</td>
<td></td>
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<tr>
<td>PHYS4551</td>
<td>Solid state physics (6)</td>
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<tr>
<td>PHYS4650</td>
<td>Stellar physics (6)</td>
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<tr>
<td>PHYS4651</td>
<td>Selected topics in astrophysics (6)</td>
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<tr>
<td>PHYS4652</td>
<td>Planetary science (6)</td>
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<td>PHYS4653</td>
<td>Cosmology (6)</td>
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<td>PHYS4654</td>
<td>General relativity (6)</td>
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<td>PHYS4655</td>
<td>Interstellar medium (6)</td>
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<td>PHYS4750</td>
<td>Experimental physics (6)</td>
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<tr>
<td>PHYS4850</td>
<td>Particle physics (6)</td>
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<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics (6)</td>
<td></td>
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<tr>
<td>PHYS7351</td>
<td>Graduate quantum mechanics (6)</td>
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<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetism (6)</td>
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<tr>
<td>PHYS7550</td>
<td>Graduate statistical mechanics (6)</td>
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</tr>
<tr>
<td>PHYS7551</td>
<td>Graduate solid state physics (6)</td>
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<tr>
<td>PHYS7650</td>
<td>Stellar atmospheres (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS7750</td>
<td>Nanophysics (6)</td>
<td></td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - MATH3999: Directed studies in mathematics (6)
   - MATH4401: Senior mathematics seminar (6)
   - MATH4910: Mathematics capstone project (6)
   - MATH4966: Mathematics internship (6)
   - MATH4999: Mathematics project (12)
Notes:
1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and (b) Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

7. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics/Physics
Offered to students admitted to Year 1 in 2016

Objectives:
The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with a rigorous representation using their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)

PLO 3: apply mathematical theory and techniques to analyze physical problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Major in Mathematics
Major in Physics
Minor in Computational & Financial Mathematics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming
Minor in Physics

Required courses (96 credits)

1. Introductory level courses (48 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (30 credits)
   MATH1013 University mathematics II (6)
   MATH2101 Linear algebra I (6)
   MATH2211 Multivariable calculus (6)
   PHYS1250 Fundamental physics (6)
   PHYS2255 Introductory electricity and magnetism (6)

Disciplinary Electives (6 credits)
At least 6 credits selected from the following courses:
   PHYS1150 Problem solving in physics (6)
   PHYS2055 Introductory relativity (6)
   PHYS2150 Methods in physics I (6)
   PHYS2155 Methods in physics II (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2260 Heat and waves (6)

2. Advanced level courses (42 credits)
Disciplinary Core Courses (36 credits)
   MATH3301 Algebra I (6)
   MATH3401 Analysis I (6)
   MATH4501 Geometry (6)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS4351 Advanced quantum mechanics (6)

Disciplinary Electives (6 credits)
At least 6 credits of advanced level Mathematics or Physics courses (MATH3XXX or MATH4XXX or MATH7XXX or PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list of courses include courses in List A and those courses not selected to fulfill the capstone requirement, but excluding MATH4966 Mathematics Internship.

List A
   MATH3001 Development of mathematical ideas (6)
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<td>PHYS7750</td>
<td>Nanophysics (6)</td>
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</table>

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - MATH3999 Directed studies in mathematics (6)
   - MATH4910 Senior mathematics seminar (6)
   - MATH4911 Mathematics capstone project (6)
   - MATH4966 Mathematics internship (6)
   - MATH4999 Mathematics project (12)
Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and
(b) Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

7. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics/Physics
Offered to students admitted to Year 1 in 2015

Objectives:
The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g., quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

Learning Outcomes:
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PLO 2 : have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)

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Impermissible Combinations:
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Major in Physics
Minor in Mathematics
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Minor in Physics

Required courses (96 credits)
1. Introductory level courses (48 credits)
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   Disciplinary Core Courses (30 credits)
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   MATH2101 Linear algebra I (6)
   MATH2211 Multivariable calculus (6)
   PHYS1250 Fundamental physics (6)
   PHYS2265 Introductory quantum physics (6)

   Disciplinary Electives (6 credits)
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   PHYS2055 Introductory relativity (6)
   PHYS2150 Methods in physics I (6)
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   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2260 Heat and waves (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (36 credits)
   MATH3301 Algebra I (6)
   MATH3401 Analysis I (6)
   MATH4501 Geometry (6)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS4351 Advanced quantum mechanics (6)

   Disciplinary Electives (6 credits)
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   List A
   MATH4001 Development of mathematical ideas (6)
   MATH4002 Mathematics seminar (6)
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<td>(6)</td>
</tr>
<tr>
<td>PHYS4750</td>
<td>Experimental physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS4850</td>
<td>Particle physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7351</td>
<td>Graduate quantum mechanics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetism</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7550</td>
<td>Graduate statistical mechanics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7551</td>
<td>Graduate solid state physics</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7650</td>
<td>Stellar atmospheres</td>
<td>(6)</td>
</tr>
<tr>
<td>PHYS7750</td>
<td>Nanophysics</td>
<td>(6)</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- MATH3999: Directed studies in mathematics (6)
- MATH4910: Senior mathematics seminar (6)
- MATH4911: Mathematics capstone project (6)
- MATH4966: Mathematics internship (6)
- MATH4999: Mathematics project (12)
- PHYS3999: Directed studies in physics (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS4966</td>
<td>Physics internship</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4999</td>
<td>Physics project</td>
<td>12</td>
</tr>
</tbody>
</table>

**Notes:**

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and  
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**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1 : identify and describe physical systems with a rigorous representation using their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2 : have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)

PLO 3 : apply mathematical theory and techniques to analyze physical problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4 : communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5 : apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:

Major in Mathematics
Major in Physics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming
Minor in Physics
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3603</td>
<td>Probability theory (6)</td>
<td></td>
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<tr>
<td>MATH3901</td>
<td>Operations research I (6)</td>
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</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization</td>
<td></td>
</tr>
<tr>
<td>MATH3905</td>
<td>Queueing theory and simulation</td>
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<tr>
<td>MATH3906</td>
<td>Financial calculus (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3911</td>
<td>Game theory and strategy</td>
<td></td>
</tr>
<tr>
<td>MATH3943</td>
<td>Network models in operations research (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4302</td>
<td>Algebra II (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4402</td>
<td>Analysis II (6)</td>
<td></td>
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<tr>
<td>MATH4404</td>
<td>Functional analysis (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4406</td>
<td>Introduction to partial differential equations (6)</td>
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<tr>
<td>MATH4511</td>
<td>Introduction to differentiable manifolds (6)</td>
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<tr>
<td>MATH4602</td>
<td>Scientific computing (6)</td>
<td></td>
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<tr>
<td>MATH4902</td>
<td>Operations research II (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus (6)</td>
<td></td>
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<tr>
<td>MATH7101</td>
<td>Intermediate complex analysis</td>
<td></td>
</tr>
<tr>
<td>MATH7201</td>
<td>Topics in geometry (6)</td>
<td></td>
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<tr>
<td>MATH7202</td>
<td>Complex manifolds (6)</td>
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<tr>
<td>MATH7217</td>
<td>Topics in financial mathematics (6)</td>
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<td>MATH7219</td>
<td>Topics in applied functional analysis (6)</td>
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<td>MATH7224</td>
<td>Topics in advanced probability theory (6)</td>
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<td>MATH7501</td>
<td>Topics in algebra (6)</td>
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<td>MATH7502</td>
<td>Topics in applied discrete mathematics (6)</td>
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<td>MATH7503</td>
<td>Topics in mathematical programming and optimization (6)</td>
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<td>MATH7504</td>
<td>Geometric topology (6)</td>
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<td>MATH7505</td>
<td>Real analysis (6)</td>
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<tr>
<td>PHYS3150</td>
<td>Theoretical physics (6)</td>
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<tr>
<td>PHYS3450</td>
<td>Electromagnetism (6)</td>
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<tr>
<td>PHYS3550</td>
<td>Statistical mechanics &amp; thermodynamics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3551</td>
<td>Introductory solid state physics (6)</td>
<td></td>
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<tr>
<td>PHYS3650</td>
<td>Observational astronomy (6)</td>
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<tr>
<td>PHYS3651</td>
<td>The physical universe (6)</td>
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<tr>
<td>PHYS3652</td>
<td>Principles of astronomy (6)</td>
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</tr>
<tr>
<td>PHYS3750</td>
<td>Laser and spectroscopy (6)</td>
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<td>PHYS3751</td>
<td>Physics of nanomaterials (6)</td>
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<tr>
<td>PHYS3850</td>
<td>Waves and optics (6)</td>
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<td>PHYS3851</td>
<td>Atomic and nuclear physics (6)</td>
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<td>PHYS4150</td>
<td>Computational physics (6)</td>
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<tr>
<td>PHYS4151</td>
<td>Data analysis and modeling in physics (6)</td>
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<tr>
<td>PHYS4350</td>
<td>Advanced classical mechanics (6)</td>
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<td>PHYS4450</td>
<td>Advanced electromagnetism (6)</td>
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<td>PHYS4550</td>
<td>Advanced statistical mechanics (6)</td>
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<td>PHYS4551</td>
<td>Solid state physics (6)</td>
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<td>PHYS4650</td>
<td>Stellar physics (6)</td>
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<tr>
<td>PHYS4651</td>
<td>Selected topics in astrophysics (6)</td>
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<tr>
<td>PHYS4652</td>
<td>Planetary science (6)</td>
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<td>PHYS4653</td>
<td>Cosmology (6)</td>
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<td>PHYS4654</td>
<td>General relativity (6)</td>
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<tr>
<td>PHYS4655</td>
<td>Interstellar medium (6)</td>
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<td>PHYS4750</td>
<td>Experimental physics (6)</td>
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<tr>
<td>PHYS4850</td>
<td>Particle physics (6)</td>
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<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics (6)</td>
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<tr>
<td>PHYS7351</td>
<td>Graduate quantum mechanics (6)</td>
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<td>PHYS7450</td>
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<td>Graduate statistical mechanics (6)</td>
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<tr>
<td>PHYS7551</td>
<td>Graduate solid state physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS7650</td>
<td>Stellar atmospheres (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS7750</td>
<td>Nanophysics (6)</td>
<td></td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- MATH3999 Directed studies in mathematics (6)
- MATH4910 Senior mathematics seminar (6)
- MATH4911 Mathematics capstone project (6)
- MATH4966 Mathematics internship (6)
- MATH4999 Mathematics project (12)
- PHYS3999 Directed studies in physics (6)
- PHYS4966 Physics internship (6)
- PHYS4999 Physics project (12)

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.
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3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and
(b) Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Mathematics/Physics  
Offered to students admitted to Year 1 in 2013

Objectives:
The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

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By the end of this programme, students should be able to:

- **PLO 1**: identify and describe physical systems with a rigorous representation using their professional knowledge (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)
- **PLO 3**: apply mathematical theory and techniques to analyze physical problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)
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- **PLO 5**: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
- Major in Mathematics
- Major in Physics
- Minor in Mathematics
- Minor in Operations Research & Mathematical Programming
- Minor in Physics

Required courses (96 credits)

1. Introductory level courses (48 credits)
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111: Scientific method and reasoning (6)
     - SCNC1112: Fundamentals of modern science (6)
   - **Disciplinary Core Courses (36 credits)**
     - MATH1013: University mathematics II (6)
     - MATH2101: Linear algebra I (6)
     - MATH2211: Multivariable calculus (6)
     - PHYS1250: Fundamental physics (6)
     - PHYS2250: Introductory mechanics (6)
     - PHYS2265: Introductory quantum physics (6)

2. Advanced level courses (42 credits)
   - **Disciplinary Core Courses (36 credits)**
     - MATH3301: Algebra I (6)
     - MATH3401: Analysis I (6)
     - MATH4501: Geometry (6)
     - PHYS3350: Classical mechanics (6)
     - PHYS3351: Quantum mechanics (6)
     - PHYS4351: Advanced quantum mechanics (6)
   - **Disciplinary Electives (6 credits)**
     - At least 6 credits of advanced level Mathematics or Physics courses (MATH3XXX or MATH4XXX or MATH7XXX or PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list of courses include courses in List A and those courses not selected to fulfill the capstone requirement, but excluding MATH4966 Mathemtics Internship.

List A

- MATH3001: Development of mathematical ideas (6)
- MATH3002: Mathematics seminar (6)
- MATH3003: Matrix theory and its applications (6)
- MATH3304: Introduction to number theory (6)
- MATH3401: Functions of a complex variable (6)
- MATH3407: Differential equations (6)
- MATH3408: Computational methods and differential equations with applications (6)
- MATH3551: Introduction to topology (6)
- MATH3600: Discrete mathematics (6)
- MATH3601: Numerical analysis (6)
MATH3603 Probability theory (6)
MATH3901 Operations research I (6)
MATH3904 Introduction to optimization (6)
MATH3905 Queueing theory and simulation (6)
MATH3906 Financial calculus (6)
MATH3911 Game theory and strategy (6)
MATH3943 Network models in operations research (6)
MATH4302 Algebra II (6)
MATH4402 Analysis II (6)
MATH4404 Functional analysis (6)
MATH4406 Introduction to partial differential equations (6)
MATH4511 Introduction to differentiable manifolds (6)
MATH4602 Scientific computing (6)
MATH4902 Operations research II (6)
MATH4907 Numerical methods for financial calculus (6)
MATH7101 Intermediate complex analysis (6)
MATH7201 Topics in geometry (6)
MATH7202 Complex manifolds (6)
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MATH7501 Topics in algebra (6)
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MATH7504 Geometric topology (6)
MATH7505 Real analysis (6)
PHYS3150 Theoretical physics (6)
PHYS3450 Electromagnetism (6)
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PHYS3651 The physical universe (6)
PHYS3652 Principles of astronomy (6)
PHYS3750 Laser and spectroscopy (6)
PHYS3751 Physics of nanomaterials (6)
PHYS3850 Waves and optics (6)
PHYS3851 Atomic and nuclear physics (6)
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PHYS4151 Data analysis and modeling in physics (6)
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PHYS4450 Advanced electromagnetism (6)
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PHYS4650 Stellar physics (6)
PHYS4651 Selected topics in astrophysics (6)
PHYS4652 Planetary science (6)
PHYS4653 Cosmology (6)
PHYS4654 General relativity (6)
PHYS4655 Interstellar medium (6)
PHYS4750 Experimental physics (6)
PHYS4850 Particle physics (6)
PHYS4950 Graduate classical mechanics (6)
PHYS4951 Graduate quantum mechanics (6)
PHYS4953 Graduate electromagnetism (6)
PHYS5750 Graduate statistical mechanics (6)
PHYS5751 Graduate solid state physics (6)
PHYS5755 Nanophysics (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
MATH3999 Directed studies in mathematics (6)
MATH4910 Senior mathematics seminar (6)
MATH4911 Mathematics capstone project (6)
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Major Title: Major in Mathematics/Physics
Offered to students admitted to Year 1 in 2012

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Disciplinary Core Courses (36 credits)
- MATH3301 Algebra I (6)
- MATH3401 Analysis I (6)
- MATH4501 Geometry (6)
- PHYS3350 Classical mechanics (6)
- PHYS3351 Quantum mechanics (6)
- PHYS4351 Advanced quantum mechanics (6)
Disciplinary Electives (6 credits)
At least 6 credits of advanced level Mathematics or Physics courses (MATH3XXX or MATH4XXX or MATH7XXX or PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list of courses include courses in List A and those courses not selected to fulfill the capstone requirement, but excluding MATH4966 Mathematics Internship.

List A
- MATH3001 Development of mathematical ideas (6)
- MATH3002 Mathematics seminar (6)
- MATH3303 Matrix theory and its applications (6)
- MATH3304 Introduction to number theory (6)
- MATH3403 Functions of a complex variable (6)
- MATH3405 Differential equations (6)
- MATH4308 Computational methods and differential equations with applications (6)
- MATH4341 Introduction to topology (6)
- MATH3600 Discrete mathematics (6)
- MATH3601 Numerical analysis (6)
- MATH3603 Probability theory (6)
MATH3901 Operations research I (6)
MATH3904 Introduction to optimization (6)
MATH3905 Queueing theory and simulation (6)
MATH3906 Financial calculus (6)
MATH3911 Game theory and strategy (6)
MATH3943 Network models in operations research (6)
MATH4302 Algebra II (6)
MATH4402 Analysis II (6)
MATH4404 Functional analysis (6)
MATH4406 Introduction to partial differential equations (6)
MATH4511 Introduction to differentiable manifolds (6)
MATH4602 Scientific computing (6)
MATH4902 Operations research II (6)
MATH4907 Numerical methods for financial calculus (6)
MATH47101 Intermediate complex analysis (6)
MATH7201 Topics in geometry (6)
MATH7202 Complex manifolds (6)
MATH7217 Topics in financial mathematics (6)
MATH7219 Topics in applied functional analysis (6)
MATH7224 Topics in advanced probability theory (6)
MATH7501 Topics in algebra (6)
MATH7502 Topics in applied discrete mathematics (6)
MATH7503 Topics in mathematical programming and optimization (6)
MATH7504 Geometric topology (6)
MATH7505 Real analysis (6)
PHYS3150 Theoretical physics (6)
PHYS3450 Electromagnetism (6)
PHYS3550 Statistical mechanics & thermodynamics (6)
PHYS3551 Introductory solid state physics (6)
PHYS3650 Observational astronomy (6)
PHYS3651 The physical universe (6)
PHYS3652 Principles of astronomy (6)
PHYS3750 Laser and spectroscopy (6)
PHYS3751 Physics of nanomaterials (6)
PHYS3850 Waves and optics (6)
PHYS3851 Atomic and nuclear physics (6)
PHYS4150 Computational physics (6)
PHYS4151 Data analysis and modeling in physics (6)
PHYS4350 Advanced classical mechanics (6)
PHYS4450 Advanced electromagnetism (6)
PHYS4550 Advanced statistical mechanics (6)
PHYS4551 Solid state physics (6)
PHYS4650 Stellar physics (6)
PHYS4651 Selected topics in astrophysics (6)
PHYS4652 Planetary science (6)
PHYS4653 Cosmology (6)
PHYS4664 General relativity (6)
PHYS4665 Interstellar medium (6)
PHYS4750 Experimental physics (6)
PHYS4850 Particle physics (6)
PHYS7350 Graduate classical mechanics (6)
PHYS7351 Graduate quantum mechanics (6)
PHYS7450 Graduate electromagnetism (6)
PHYS7550 Graduate statistical mechanics (6)
PHYS7551 Graduate solid state physics (6)
PHYS7650 Stellar atmospheres (6)
PHYS7750 Nanophysics (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
MATH3999 Directed studies in mathematics (6)
MATH4910 Senior mathematics seminar (6)
MATH4911 Mathematics capstone project (6)
MATH4966 Mathematics internship (6)
MATH4999 Mathematics project (12)
PHYS3999 Directed studies in physics (6)
PHYS4966 Physics internship (6)
PHYS4999 Physics project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (“disciplinary core”) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.
2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (“disciplinary core”) in both the first and second
majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and
(b) Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Molecular Biology & Biotechnology

Offered to students admitted to Year 1 in 2019

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society, and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics, and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 2**: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 3**: communicate in written and oral communication skills and collaborate with other students effectively (by means of coursework, research-based learning, and presentation opportunities in the curriculum)
- **PLO 4**: acquire scientific inquiry and critical thinking skills, including the ability to understand, analyze, and evaluate debated problems in the field and develop solutions, and appraise the related ethical issues (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 5**: gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based, and experiential learning in the curriculum)

Impermissible Combinations:
- Major in Molecular Biology & Biotechnology (Intensive)
- Minor in Molecular Biology & Biotechnology

Required courses (96 credits)

### 1. Introductory level courses (42 credits)

**Disciplinary Core Courses: Science Foundation Courses (12 credits)**

- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

**Disciplinary Core Courses (24 credits)**

- BIOL1110 From molecules to cells (6)
- BIOL2102 Biostatistics (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2220 Principles of biochemistry (6)
  
  Take either BIOL2220 or BIOC2600 to fulfill this 24 credits requirement, but not both.
  
  BIOL2220 and BIOC2600 are mutually exclusive.

- BIOC2600 Basic biochemistry (6)

**Disciplinary Electives (6 credits)**

- BIOL1309 Evolutionary diversity (6)
- BIOL2306 Ecology and evolution (6)

### 2. Advanced level courses (48 credits)

**Disciplinary Core Courses (24 credits)**

- BIOL3401 Molecular biology (6)
- BIOL3402 Cell biology and cell technology (6)
- BIOL4411 Plant and food biotechnology (6)
- BIOL4415 Healthcare biotechnology (6)

**Disciplinary Electives (24 credits)**

At least 24 credits selected from the following courses:

- BIOL3403 Immunology (6)
- BIOL3404 Protein structure and function (6)
- BIOL3406 Reproduction and reproductive biotechnology (6)
- BIOL3408 Genetics (6)
- BIOL3508 Microbial physiology and biotechnology (6)
- BIOL4401 Medical microbiology and applied immunology (6)
- BIOL4409 General virology (6)
- BIOL4416 Stem cells and regenerative biology (6)
- BIOL4417 "Omics" and systems biology (6)
- ENVS4110 Environmental remediation (6)
### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3993</td>
<td>Directed studies in Molecular biology &amp; biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4963</td>
<td>Molecular biology &amp; biotechnology internship</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4993</td>
<td>Molecular biology &amp; biotechnology project</td>
<td>12</td>
</tr>
</tbody>
</table>

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Molecular Biology & Biotechnology
Offered to students admitted to Year 1 in 2018

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 2: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 3: communicate in written and oral communication skills and collaborate with other students effectively (by means of coursework, research-based learning and presentation opportunities in the curriculum)

PLO 4: acquire scientific inquiry and critical thinking skills, including the ability to understand, analyze, and evaluate debated problems in the field and develop solutions, and appraise the related ethical issues (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 5: gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum)

Impermissible Combinations:
Major in Molecular Biology & Biotechnology (Intensive)
Minor in Molecular Biology & Biotechnology

Required courses (96 credits)
1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111    Scientific method and reasoning (6)
   SCNC1112    Fundamentals of modern science (6)

   Disciplinary Core Courses (24 credits)
   BIOL1110    From molecules to cells (6)
   BIOL2102    Biostatistics (6)
   BIOL2103    Biological sciences laboratory course (6)
   BIOL2220    Principles of biochemistry (6)
   BIOC2600    Basic biochemistry (6)

   Take either BIOL2220 or BIOC2600 to fulfill this 24 credits requirement, but not both.
   BIOL2220 and BIOC2600 are mutually exclusive.

   Take either BIOL2220 or BIOC2600 to fulfill this 24 credits requirement, but not both.
   BIOL2220 and BIOC2600 are mutually exclusive.

   Disciplinary Electives (6 credits)
   BIOL1309    Evolutionary diversity (6)
   BIOL2306    Ecology and evolution (6)

   Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

   Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   BIOL3401    Molecular biology (6)
   BIOL3402    Cell biology and cell technology (6)
   BIOL4411    Plant and food biotechnology (6)
   BIOL4415    Healthcare biotechnology (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   BIOL3403    Immunology (6)
   BIOL3404    Protein structure and function (6)
   BIOL3406    Reproduction and reproductive biotechnology (6)
   BIOL3408    Genetics (6)
   BIOL3508    Membrane physiology and biotechnology (6)
   BIOL4401    Medical microbiology and applied immunology (6)
   BIOL4409    General virology (6)
   BIOL4416    Stem cells and regenerative biology (6)
   BIOL4417    'Omics' and systems biology (6)
   ENVS4110    Environmental remediation (6)
### 3. Capstone requirement (6 credits)

**At least 6 credits selected from the following courses:**

<table>
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<tr>
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<tbody>
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</tr>
<tr>
<td>BIOL4963</td>
<td>Molecular biology &amp; biotechnology internship (6)</td>
</tr>
<tr>
<td>BIOL4993</td>
<td>Molecular biology &amp; biotechnology project (12)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Molecular Biology & Biotechnology

Offered to students admitted to Year 1 in 2017

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 2: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 3: communicate in written and oral communication skills and collaborate with other students effectively (by means of coursework, research-based learning and presentation opportunities in the curriculum)

PLO 4: acquire scientific inquiry and critical thinking skills, including the ability to understand, analyze, and evaluate debated problems in the field and develop solutions, and appraise the related ethical issues (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 5: gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum)

Impermissible Combinations:
Major in Molecular Biology & Biotechnology (Intensive)
Minor in Molecular Biology & Biotechnology

Required courses (96 credits)

1. Introductory level courses (42 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6</td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6</td>
</tr>
</tbody>
</table>

Disciplinary Core Courses (24 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2102</td>
<td>Biostatistics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2103</td>
<td>Biological sciences laboratory course</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
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</tbody>
</table>

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL2600</td>
<td>Basic biochemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL2220 or BIOC2600 to fulfill this 24 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

Take either BIOL2220 or BIOC2600 to fulfill this 24 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

Disciplinary Electives (6 credits)

<table>
<thead>
<tr>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both. Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

2. Advanced level courses (48 credits)

Disciplinary Core Courses (30 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOL3401</td>
<td>Molecular biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4415</td>
<td>Healthcare biotechnology</td>
<td>6</td>
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</tbody>
</table>

Disciplinary Electives (18 credits)

At least 18 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3403</td>
<td>Immunology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3404</td>
<td>Protein structure and function</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3408</td>
<td>Bioethics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3409</td>
<td>Business aspects of biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4409</td>
<td>General virology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4417</td>
<td>'Oomics’ and systems biology</td>
<td>6</td>
</tr>
</tbody>
</table>
3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:
- BIOL3993 Directed studies in Molecular biology & biotechnology (6)
- BIOL4963 Molecular biology & biotechnology internship (6)
- BIOL4993 Molecular biology & biotechnology project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Molecular Biology & Biotechnology
Offered to students admitted to Year 1 in 2016

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop variouessential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1:** describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 2:** apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 3:** communicate in written and oral communication skills and collaborate with other students effectively (by means of coursework, research-based learning and presentation opportunities in the curriculum)
- **PLO 4:** acquire scientific inquiry and critical thinking skills, including the ability to understand, analyze, and evaluate debated problems in the field and develop solutions, and appraise the related ethical issues (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 5:** gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum)

Impermissible Combinations:
- Major in Molecular Biology & Biotechnology (Intensive)
- Minor in Molecular Biology & Biotechnology

Required courses (96 credits)

1. Introductory level courses (42 credits)
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - **Disciplinary Core Courses (24 credits)**
     - BiOL1110 From molecules to cells (6)
     - BiOL2102 Biostatistics (6)
     - BiOL2103 Biological sciences laboratory course (6)
     - BiOL2220 Principles of biochemistry (6)
     - BiOC2600 Basic biochemistry (6)

   Take either BiOL2220 or BiOC2600 to fulfill this 24 credits requirement, but not both. BiOL2220 and BiOC2600 are mutually exclusive.

   Take either BiOL2220 or BiOC2600 to fulfill this 24 credits requirement, but not both. BiOL2220 and BiOC2600 are mutually exclusive.

2. Advanced level courses (48 credits)
   - **Disciplinary Core Courses (30 credits)**
     - BiOL3401 Molecular biology (6)
     - BiOL3402 Cell biology and cell technology (6)
     - BiOL3508 Microbial physiology and biotechnology (6)
     - BiOL4411 Plant and food biotechnology (6)
     - BiOL4415 Healthcare biotechnology (6)

   - **Disciplinary Electives (18 credits)**
     -  At least 18 credits selected from the following courses:
       - BiOL3403 Immunology (6)
       - BiOL3404 Protein structure and function (6)
       - BiOL3406 Reproduction and reproductive biotechnology (6)
       - BiOL3408 Genomics (6)
       - BiOL3409 Business aspects of biotechnology (6)
       - BiOL4401 Medical microbiology and applied immunology (6)
       - BiOL4409 General virology (6)
       - BiOL4416 Stem cells and regenerative biology (6)
       - BIOL4417 'Omics' and systems biology (6)
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### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3993  | Directed studies in Molecular biology & biotechnology          | (6)     |
- BIOL4963  | Molecular biology & biotechnology internship                   | (6)     |
- BIOL4993  | Molecular biology & biotechnology project                      | (12)    |

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Molecular Biology & Biotechnology
Offered to students admitted to Year 1 in 2015

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 2: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 3: communicate in written and oral communication skills and collaborate with other students effectively (by means of coursework, research-based learning and presentation opportunities in the curriculum)

PLO 4: acquire scientific inquiry and critical thinking skills, including the ability to understand, analyze, and evaluate debated problems in the field and develop solutions, and appraise the related ethical issues (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 5: gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum)

Impermissible Combinations:
Major in Molecular Biology & Biotechnology (Intensive)
Minor in Molecular Biology & Biotechnology

Required courses (96 credits)
1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (24 credits)
   BIOL1110 From molecules to cells (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2220 Principles of biochemistry (6)
   BIOL2220 and BIOC2600 are mutually exclusive.
   BIOC2600 Basic biochemistry (6)
   Take either BIOL2220 or BIOC2600 to fulfill this 24 credits requirement, but not both.

   Disciplinary Electives (6 credits)
   BIOL1309 Evolutionary diversity (6)
   BIOL2306 Ecology and evolution (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (30 credits)
   BIOL3401 Molecular biology (6)
   BIOL3402 Cell biology and cell technology (6)
   BIOL3508 Microbial physiology and biotechnology (6)
   BIOL3508 and BIOL4402 are mutually exclusive.
   BIOL4402 Microbial biotechnology (6)
   Take either BIOL3508 or BIOL4402 to fulfill this 30 credits requirement, but not both.
   BIOL4411 Plant and food biotechnology (6)
   BIOL4415 Healthcare biotechnology (6)
   Disciplinary Electives (18 credits)
   At least 18 credits selected from the following courses:
   BIOL3403 Immunology (6)
   BIOL3404 Protein structure and function (6)
   BIOL3405 Molecular microbiology (6)
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3. **Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

- BIOL3993 Directed studies in Molecular biology & biotechnology (6)
- BIOL4963 Molecular biology & biotechnology internship (6)
- BIOL4993 Molecular biology & biotechnology project (12)

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Molecular Biology & Biotechnology  
Offered to students admitted to Year 1 in 2014

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1:** describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

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Impermissible Combinations:
Major in Molecular Biology & Biotechnology (Intensive)  
Minor in Molecular Biology & Biotechnology

Required courses (96 credits)

1. Introductory level courses (42 credits)
   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

   **Disciplinary Core Courses (24 credit)**
   - BIOL1110 From molecules to cells (6)
   - BIOL2102 Biostatistics (6)
   - BIOL2103 Biological sciences laboratory course (6)
   - BIOL2220 Principles of biochemistry (6)

   - BIOL2220 or BIOC2600 to fulfill this 24 credits requirement, but not both.
   BIOL2220 and BIOC2600 are mutually exclusive.

   - BIOC2600 Basic biochemistry (6)

   - BIOL1309 Evolutionary diversity (6)
   - BIOL2306 Ecology and evolution (6)

   Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

2. Advanced level courses (48 credits)
   **Disciplinary Core Courses (30 credits)**
   - BIOL3401 Molecular biology (6)
   - BIOL3402 Cell biology and cell technology (6)
   - BIOL3508 Microbial physiology and biotechnology (6)

   - BIOL3508 or BIOL4402 to fulfill this 30 credits requirement, but not both.
   BIOL3508 and BIOL4402 are mutually exclusive.

   - BIOL4402 Microbial biotechnology (6)

   - BIOL4411 Plant and food biotechnology (6)
   - BIOL4415 Healthcare biotechnology (6)

   Take either BIOL3508 or BIOL4402 to fulfill this 30 credits requirement, but not both.
   BIOL3508 and BIOL4402 are mutually exclusive.

   - BIOL4402 Microbial biotechnology (6)

   **Disciplinary Electives (18 credits)**
   At least 18 credits selected from the following courses:
   - BIOL3403 Immunology (6)
   - BIOL3404 Protein structure and function (6)
   - BIOL3405 Molecular microbiology (6)
BIOL3406 Reproduction and reproductive biotechnology (6)
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ENVS4110 Environmental remediation (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   BIOL3993 Directed studies in Molecular biology & biotechnology (6)
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4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Molecular Biology & Biotechnology

Offered to students admitted to Year 1 in 2013

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

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Impermissible Combinations:
Major in Molecular Biology & Biotechnology (Intensive)
Minor in Molecular Biology & Biotechnology

Required courses (96 credits)

1. Introductory level courses (42 credits)
   - Disciplinary Core Courses: Science Foundation Courses (12 credits)
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     BIOL1110 From molecules to cells (6)
     BIOL2102 Biostatistics (6)
     BIOL2103 Biological sciences laboratory course (6)
     BIOL2220 Principles of biochemistry (6)
     BIOL2220 or BIOC2600 to fulfill this 24 credits requirement, but not both.
     BIOL2220 and BIOC2600 are mutually exclusive.
     BIOC2600 Basic biochemistry (6)

2. Advanced level courses (48 credits)
   - Disciplinary Core Courses (30 credits)
     BIOL3401 Molecular biology (6)
     BIOL3402 Cell biology and cell technology (6)
     BIOL3508 Microbial physiology and biotechnology (6)
     BIOL3508 or BIOL4402 to fulfill this 30 credits requirement, but not both.
     BIOL3508 and BIOL4402 are mutually exclusive.
     BIOL4402 Microbial biotechnology (6)
     BIOL4411 Plant and food biotechnology (6)
     BIOL4415 Healthcare biotechnology (6)
   - Disciplinary Electives (18 credits)
     At least 18 credits selected from the following courses:
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     BIOL3404 Protein structure and function (6)
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3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3993 Directed studies in Molecular biology & biotechnology (6)
- BIOL4963 Molecular biology & biotechnology internship (6)
- BIOL4993 Molecular biology & biotechnology project (12)

Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Molecular Biology & Biotechnology

Offered to students admitted to Year 1 in 2012

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

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Impermissible Combinations:
Major in Molecular Biology & Biotechnology (Intensive)
Minor in Molecular Biology & Biotechnology

Required courses (96 credits)
1. Introductory level courses (42 credits)
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   BIOL2220 and BIOC2600 are mutually exclusive.
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   BIOL4402 Microbial biotechnology (6)
   Take either BIOL3508 or BIOL4402 to fulfill this 30 credits requirement, but not both.
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   BIOL4415 Healthcare biotechnology (6)
   Take either BIOL3508 or BIOL4402 to fulfill this 30 credits requirement, but not both.
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Disciplinary Electives (6 credits)
   BIOL1309 Evolutionary diversity (6)
   BIOL2306 Ecology and evolution (6)
   Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

Disciplinary Electives (18 credits)
At least 18 credits selected from the following courses:
   BIOL3403 Immunology (6)
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<td>Business aspects of biotechnology</td>
<td>6</td>
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<td>Medical microbiology and applied immunology</td>
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</tr>
<tr>
<td>ENVS4110</td>
<td>Environmental remediation</td>
<td>6</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3993  Directed studies in Molecular biology & biotechnology (6)
- BIOL4963  Molecular biology & biotechnology internship (6)
- BIOL4993  Molecular biology & biotechnology project (12)

### Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
### Major Title
Major in Molecular Biology & Biotechnology (Intensive)

### Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major aims to provide comprehensive training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

The intensive major involves additional coursework and research/capstone experience. It is designed for students with interest on a fuller scope of the discipline or planning to pursue research studies for a higher degree in any area of life science.

This intensive major has been accredited by the Royal Society of Biology (RSB), UK, for the purpose of meeting in part the academic and experience requirement for the Membership and Chartered Biologist (CBiol).

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 2**: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 3**: communicate in written and oral communication skills and collaborate with other students effectively (by means of coursework, research-based learning and presentation opportunities in the curriculum)
- **PLO 4**: acquire scientific inquiry and critical thinking skills, including the ability to understand, analyze, and evaluate debated problems in the field and develop solutions, and appraise the related ethical issues (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 5**: gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum)
- **PLO 6**: equip with knowledges in chemistry, mathematics, statistics, or computer programming, with sufficient depth and breadth to apply these knowledges within a biological context (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 7**: solve a scientific question empirically by designing and implementing experiments, learning new experimental skills and tackling experimental errors, reporting results unbiasedly and systematically (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

### Impermissible Combinations:
- Major in Biological Sciences
- Major in Molecular Biology & Biotechnology
- Minor in Molecular Biology & Biotechnology

#### Required courses (144 credits)

| Disciplinary Core Courses: Science Foundation Courses (12 credits) |
| SCNC1111 Scientific method and reasoning (6) |
| SCNC1112 Fundamentals of modern science (6) |

| Disciplinary Core Courses (42 credits) |
| BIOL1110 From molecules to cells (6) |
| CHEM1042 General chemistry I (6) |
| CHEM1043 General chemistry II (6) |
| BIOL2102 Biostatistics (6) |
| BIOL2103 Biological sciences laboratory course (6) |
| BIOL2220 Principles of biochemistry (6) |
| BIOL2409 Biotechnology industry and entrepreneurship (6) |
| BIOC2600 Basic biochemistry (6) |

- Take either BIOL2220 or BIOC2600 to fulfill this 42 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive. (Note 1)

#### Disciplinary Electives (12 credits)

**Plus at least 12 credits selected from the following courses:**

- BIOL1309 Evolutionary diversity (6)
- BIOL2306 Ecology and evolution (6)
- ... (additional electives)

- May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.
- May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.

(Note 1)
### 2. Advanced level courses (66 credits)

#### Disciplinary Core Courses (30 credits)

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#### Disciplinary Electives (36 credits)

Plus at least 36 credits selected from the following courses:

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<td>ENV54110</td>
<td>Environmental remediation</td>
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</tr>
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### 3. Capstone requirement (12 credits)

- BIOL4993 Molecular biology & biotechnology project (12)

**Notes:**
1. These are core courses in the regular Molecular Biology and Biotechnology Major (96 credits) curriculum.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Science Majors

Major Title: Major in Molecular Biology & Biotechnology (Intensive)

Offered to students admitted to Year 1 in 2018

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major aims to provide comprehensive training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

The intensive major involves additional coursework and research/capstone experience. It is designed for students with interest on a fuller scope of the discipline or planning to pursue research studies for a higher degree in any area of life science.

This intensive major has been accredited by the Royal Society of Biology (RSB), UK, for the purpose of meeting in part the academic and experience requirement for the Membership and Chartered Biologist (CBiol).

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 2**: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
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- **PLO 5**: gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum)
- **PLO 6**: equip with knowledges in chemistry, mathematics, statistics, or computer programming, with sufficient depth and breadth to apply these knowledges within a biological context (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)
- **PLO 7**: solve a scientific question empirically by designing and implementing experiments, learning new experimental skills and tackling experimental errors, reporting results unbiasedly and systematically (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

Impermissible Combinations:
Major in Biological Sciences
Major in Molecular Biology & Biotechnology
Minor in Molecular Biology & Biotechnology

Required courses (144 credits)

1. Introductory level courses (66 credits)

<table>
<thead>
<tr>
<th>Disciplinary Core Courses: Science Foundation Courses (12 credits)</th>
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<tbody>
<tr>
<td>SCNC1111 Scientific method and reasoning (6)</td>
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(Note 1)

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</table>

Take either BIOL2220 or BIOC2600 to fulfill this 42 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive. (Note 1)

(Note 1)

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<tr>
<th>Disciplinary Electives (12 credits)</th>
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</thead>
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<td>Plus at least 12 credits selected from the following courses:</td>
</tr>
<tr>
<td>BIOL1309 Evolutionary diversity (6)</td>
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<td>BIOL2306 Ecology and evolution (6)</td>
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May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.

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2. Advanced level courses (66 credits)

### Disciplinary Core Courses (30 credits)

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<td>BIOL3401</td>
<td>Molecular biology</td>
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<tr>
<td>BIOL3402</td>
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3. Capstone requirement (12 credits)

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<tbody>
<tr>
<td>BIOL4993</td>
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<td>12</td>
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Notes:
1. These are core courses in the regular Molecular Biology and Biotechnology Major (96 credits) curriculum.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title** | **Major in Molecular Biology & Biotechnology (Intensive)**
---|---
**Offered to students admitted to Year 1 in** | **2017**

**Objectives:**
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major aims to provide comprehensive training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

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**Learning Outcomes:**
By the end of this programme, students should be able to:

| PLO 1 | describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum) |
| PLO 2 | apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum) |
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| PLO 5 | gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum) |
| PLO 6 | equip with knowledges in chemistry, mathematics, statistics, or computer programming, with sufficient depth and breadth to apply these knowledges within a biological context (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum) |
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**Impermissible Combinations:**
- Major in Biological Sciences
- Major in Molecular Biology & Biotechnology
- Minor in Molecular Biology & Biotechnology

**Required courses (144 credits)**

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**Disciplinary Electives (12 credits)**

- **Plus at least 12 credits selected from the following courses:**
  - BIOL1309 | Evolutionary diversity (6)
  - BIOL2306 | Ecology and evolution (6)

May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.

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(Note 1) BIOL2220 and BIOC2600 are mutually exclusive. (Note 1) BIOL2220 and BIOC2600 are mutually exclusive. (Note 1) BIOL2220 and BIOC2600 are mutually exclusive. (Note 1)
2. Advanced level courses (66 credits)

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**Notes:**

1. These are core courses in the regular Molecular Biology and Biotechnology Major (96 credits) curriculum.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Science Majors

Major Title: Major in Molecular Biology & Biotechnology (Intensive)
Offered to students admitted to Year 1 in 2016

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major aims to provide comprehensive training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

The intensive major involves additional coursework and research/capstone experience. It is designed for students with interest on a fuller scope of the discipline or planning to pursue research studies for a higher degree in any area of life science.

This intensive major has been accredited by the Royal Society of Biology (RSB), UK, for the purpose of meeting in part the academic and experience requirement for the Membership and Chartered Biologist (CBiol).

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 2: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 3: communicate in written and oral communication skills and collaborate with other students effectively (by means of coursework, research-based learning and presentation opportunities in the curriculum)

PLO 4: acquire scientific inquiry and critical thinking skills, including the ability to understand, analyze, and evaluate debated problems in the field and develop solutions, and appraise the related ethical issues (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 5: gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum)

PLO 6: equip with knowledges in chemistry, mathematics, statistics, or computer programming, with sufficient depth and breadth to apply these knowledges within a biological context (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 7: solve a scientific question empirically by designing and implementing experiments, learning new experimental skills and tackling experimental errors, reporting results unbiasedly and systematically (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

Impermissible Combinations:
Major in Biological Sciences
Major in Molecular Biology & Biotechnology
Minor in Molecular Biology & Biotechnology

Required courses (144 credits)

1. Introductory level courses (66 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

SCNC1111 Scientific method and reasoning (6) (Note 1)
SCNC1112 Fundamentals of modern science (6) (Note 1)

Disciplinary Core Courses (42 credits)

BIOL1110 From molecules to cells (6) (Note 1)
CHEM1042 General chemistry I (6)
CHEM1043 General chemistry II (6)
BIOL2102 Biostatistics (6) (Note 1)
BIOL2220 Principles of biochemistry (6) Take either BIOL2220 or BIOC2600 to fulfill this 42 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive. (Note 1)
BIOL2200 Biotechnology industry and entrepreneurship (6) Take either BIOL2220 or BIOC2600 to fulfill this 42 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive. (Note 1)
BIOC2600 Basic biochemistry (6)

Disciplinary Electives (12 credits)

Plus at least 12 credits selected from the following courses:

BIOL1309 Evolutionary diversity (6) May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.
BIOL2306 Ecology and evolution (6) May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.
2. Advanced level courses (66 credits)

**Disciplinary Core Courses (30 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL2408</td>
<td>Green earth-plants and mankind</td>
<td>6</td>
</tr>
<tr>
<td>COMP1117</td>
<td>Computer programming</td>
<td>6</td>
</tr>
<tr>
<td>MATH1011</td>
<td>University mathematics I</td>
<td>6</td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
</tr>
</tbody>
</table>

**Disciplinary Electives (36 credits)**

*Plus at least 36 credits selected from the following courses:*

<table>
<thead>
<tr>
<th>Course Code</th>
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</tr>
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<tbody>
<tr>
<td>BIOL3401</td>
<td>Molecular biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4415</td>
<td>Healthcare biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4417</td>
<td>‘Omnics’ and systems biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3107</td>
<td>Plant physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3404</td>
<td>Protein structure and function</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3408</td>
<td>Genetics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4409</td>
<td>General virology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology</td>
<td>6</td>
</tr>
<tr>
<td>ENV54110</td>
<td>Environmental remediation</td>
<td>6</td>
</tr>
</tbody>
</table>

3. Capstone requirement (12 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4993</td>
<td>Molecular biology &amp; biotechnology project</td>
<td>12</td>
</tr>
</tbody>
</table>

**Notes:**
1. These are core courses in the regular Molecular Biology and Biotechnology Major (96 credits) curriculum.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
The intensive major involves additional coursework and research/capstone experience. It is designed for students with interest on a fuller scope of the discipline or planning to pursue research studies for a higher degree in any area of life science.

This intensive major has been accredited by the Royal Society of Biology (RSB), UK, for the purpose of meeting in part the academic and experience requirement for the Membership and Chartered Biologist (CBiol).

**Learning Outcomes:**

By the end of this programme, students should be able to:

- **PLO 1**: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

- **PLO 2**: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

- **PLO 3**: communicate in written and oral communication skills and collaborate with other students effectively (by means of coursework, research-based learning and presentation opportunities in the curriculum)

- **PLO 4**: acquire scientific inquiry and critical thinking skills, including the ability to understand, analyze, and evaluate debated problems in the field and develop solutions, and appraise the related ethical issues (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

- **PLO 5**: gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum)

- **PLO 6**: equip with knowledges in chemistry, mathematics, statistics, or computer programming, with sufficient depth and breadth to apply these knowledges within a biological context (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

- **PLO 7**: solve a scientific question empirically by designing and implementing experiments, learning new experimental skills and tackling experimental errors, reporting results unbiasedly and systematically (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

**Impermissible Combinations:**

- Major in Biological Sciences
- Major in Molecular Biology & Biotechnology
- Minor in Molecular Biology & Biotechnology

**Required courses (144 credits)**

**1. Introductory level courses (66 credits)**

<table>
<thead>
<tr>
<th>Disciplinary Core Courses: Science Foundation Courses (12 credits)</th>
</tr>
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<tbody>
<tr>
<td>SCNC1111 Scientific method and reasoning (6)</td>
</tr>
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<td>SCNC1112 Fundamentals of modern science (6)</td>
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<table>
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<th>Disciplinary Core Courses (42 credits)</th>
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<tbody>
<tr>
<td>BIOL1110 From molecules to cells (6)</td>
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</tr>
<tr>
<td>BIOL2102 Biostatistics (6)</td>
</tr>
<tr>
<td>BIOL2103 Biological sciences laboratory course (6)</td>
</tr>
<tr>
<td>BIOL2220 Principles of biochemistry (6)</td>
</tr>
<tr>
<td>BIOL2409 Biotechnology industry and entrepreneurship (6)</td>
</tr>
<tr>
<td>BIOC2600 Basic biochemistry (6)</td>
</tr>
</tbody>
</table>

Take either BIOL2220 or BIOC2600 to fulfill this 42 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive. (Note 1)

<table>
<thead>
<tr>
<th>Disciplinary Electives (12 credits)</th>
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<tbody>
<tr>
<td>BIOL1309 Evolutionary diversity (6)</td>
</tr>
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May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.

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2. Advanced level courses (66 credits)

**Disciplinary Core Courses (30 credits)**

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**Disciplinary Electives (36 credits)**

*Plus at least 36 credits selected from the following courses:*

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3. Capstone requirement (12 credits)

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**Notes:**
1. These are core courses in the regular Molecular Biology and Biotechnology Major (96 credits) curriculum.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title**: Major in Physics  
**Offered to students admitted to Year 1 in**: 2019

**Objectives:**  
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

1. **PLO 1**: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)
2. **PLO 2**: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)
3. **PLO 3**: analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)
4. **PLO 4**: communicate and collaborate effectively with people of different background, culture, gender and nationality in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
5. **PLO 5**: apply scientific and quantitative methods in tackling problems in research or real-word setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

**Impermissible Combinations:**
Minor in Physics

**Required courses (96 credits)**

1. **Introductory level courses (48 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - **Disciplinary Core Courses (24 credits)**
     - PHYS2250 Introductory mechanics (6)
     - PHYS2255 Introductory electricity and magnetism (6)
     - PHYS2261 Introductory heat and thermodynamics (6)
     - PHYS2265 Introductory quantum physics (6)
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - PHYS1150 Problem solving in physics (6)
       - PHYS2055 Introductory relativity (6)
       - PHYS2150 Methods in physics I (6)
       - PHYS2155 Methods in physics II (6)
       - PHYS2160 Introductory computational physics (6)

2. **Advanced level courses (42 credits)**
   - **Disciplinary Electives (42 credits)**
     - At least 24 credits selected from courses in List A:
       - **List A**
         - PHYS3150 Theoretical physics (6)
         - PHYS3350 Classical mechanics (6)
         - PHYS3351 Quantum mechanics (6)
         - PHYS3450 Electromagnetism (6)
         - PHYS3550 Statistical mechanics & thermodynamics (6)
         - PHYS3760 Physics laboratory (6)
     - **List B**
         - PHYS3151 Machine learning in physics (6)
         - PHYS3650 Observational astronomy (6)
         - PHYS3653 Astrophysics (6)
         - PHYS3660 Astronomy laboratory (6)
         - PHYS3750 Laser and spectroscopy (6)
         - PHYS3850 Waves and optics (6)
         - PHYS3851 Atomic and nuclear physics (6)
         - PHYS4150 Computational physics (6)
         - PHYS4151 Data analysis and modeling in physics (6)
         - PHYS4351 Advanced quantum mechanics (6)
         - PHYS4450 Advanced electromagnetism (6)
         - PHYS4551 Solid state physics (6)
         - PHYS4652 Planetary science (6)

   *Plus at least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in Lists A and B and those courses not selected to fulfill the capstone requirements.*
3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- PHYS3999 Directed studies in physics (6)
- PHYS4966 Physics internship (6)
- PHYS4999 Physics project (12)

Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (‘disciplinary core’) in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BED&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

7. Those who want to specialize in the astrophysics theme should pass any three of the following courses: PHYS3650 Observational astronomy, PHYS3653 Astrophysics, PHYS3660 Astronomy laboratory, PHYS4652 Planetary science, PHYS4653 Cosmology, PHYS4654 General relativity, PHYS4655 Interstellar medium, and PHYS4656 Advanced astrophysics, out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in astrophysics.

8. Those who want to specialize in the computational physics theme should pass any three of the following courses: PHYS3150 Theoretical physics, PHYS3151 Machine learning in physics, PHYS4150 Computational physics, and PHYS4151 Data analysis and modeling in physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in computational physics.

9. Those who want to specialize in the experimental physics theme should pass PHYS3760 Physics laboratory, plus any two of the following courses: PHYS3660 Astronomy laboratory, PHYS3750 Laser and spectroscopy, PHYS3850 Physical optics, PHYS3851 Atomic and nuclear physics, PHYS4151 Data analysis and modeling in physics, PHYS4551 Solid state physics, and PHYS4850 Particle physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in experimental physics.

10. Those who want to specialize in the theoretical physics theme should pass any four of the following courses: PHYS3150 Theoretical physics, PHYS3350 Classical mechanics, PHYS3351 Quantum mechanics, PHYS3450 Electromagnetism, PHYS3550 Statistical mechanics & thermodynamics, PHYS4351 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4551 Solid state physics, PHYS4654 General relativity, PHYS4850 Particle physics, PHYS7351 Graduate quantum mechanics, PHYS7450 Graduate electromagnetism, PHYS7550 Graduate statistical mechanics out of which at least two must be 4000+ level courses, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in theoretical physics.

11. Upon prior approval, one may use PHYS4966 Physics internship to replace PHYS3999 Directed studies or PHYS4999 Physics project to fulfill the specialization in a theme.

12. No double counting is allowed if one wants to specialize in more than one theme. In this case, one is allowed to replace the PHYS3999 Directed studies in physics or PHYS4999 Physics project requirement in one of the theme specializations by a regular course in the same theme of specialization.

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Physics
Offered to students admitted to Year 1 in 2018

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3: analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5: apply scientific and quantitative methods in tackling problems in research or real-word setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Minor in Physics

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (24 credits)
   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2261 Introductory heat and thermodynamics (6)
   PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   PHYS1150 Problem solving in physics (6)
   PHYS2055 Introductory relativity (6) [previous title: Introduction to relativity (6)]
   PHYS2150 Methods in physics I (6)
   PHYS2155 Methods in physics II (6)
   PHYS2160 Introductory computational physics (6)

2. Advanced level courses (42 credits)
   Disciplinary Electives (42 credits)
   At least 24 credits selected from courses in List A:
   List A
   PHYS3150 Theoretical physics (6)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS3450 Electromagnetism (6)
   PHYS3550 Statistical mechanics & thermodynamics (6)
   PHYS3760 Physics laboratory (6)
   Plus at least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in Lists A and B and those courses not selected to fulfill the capstone requirements.
   List B
   PHYS3151 Machine learning in physics (6)
   PHYS3650 Observational astronomy (6)
   PHYS3653 Astrophysics (6)
   PHYS3660 Astronomy laboratory (6)
   PHYS3750 Laser and spectroscopy (6)
   PHYS3850 Waves and optics (6)
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   PHYS4351 Advanced quantum mechanics (6)
   PHYS4450 Advanced electromagnetism (6)
   PHYS4551 Solid state physics (6)
   PHYS4652 Planetary science (6)
3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- PHYS3999 Directed studies in physics (6)
- PHYS4966 Physics internship (6)
- PHYS4999 Physics project (12)

Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

7. Those who want to specialize in the astrophysics theme should pass any three of the following courses: PHYS3650 Observational astronomy, PHYS3653 Astrophysics, PHYS3660 Astronomy laboratory, PHYS4652 Planetary science, PHYS4653 Cosmology, PHYS4654 General relativity, PHYS4655 Interstellar medium, and PHYS4656 Advanced astrophysics, out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in astrophysics.

8. Those who want to specialize in the computational physics theme should pass any three of the following courses: PHYS3150 Theoretical physics, PHYS4150 Computational physics, and PHYS4151 Data analysis and modeling in physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in computational physics.

9. Those who want to specialize in the experimental physics theme should pass PHYS3760 Physics laboratory, plus any two of the following courses: PHYS3660 Astronomy laboratory, PHYS3750 Laser and spectroscopy, PHYS3850 Physical optics, PHYS3851 Atomic and nuclear physics, PHYS4151 Data analysis and modeling in physics, PHYS4551 Solid state physics, and PHYS4850 Particle physics, out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in experimental physics.

10. Those who want to specialize in the theoretical physics theme should pass any four of the following courses: PHYS3150 Theoretical physics, PHYS3350 Classical mechanics, PHYS3351 Quantum mechanics, PHYS3450 Electromagnetism, PHYS3550 Statistical mechanics & thermodynamics, PHYS3551 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4551 Solid state physics, PHYS4654 General relativity, PHYS4655 Interstellar medium, and PHYS4656 Advanced astrophysics, out of which at least two must be 4000+ level courses, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in theoretical physics.

11. Upon prior approval, one may use PHYS4966 Physics internship to replace PHYS3999 Directed studies or PHYS4999 Physics project to fulfill the specialization in a theme.

12. No double counting is allowed if one wants to specialize in more than one theme. In this case, one is allowed to replace the PHYS3999 Directed studies in physics or PHYS4999 Physics project requirement in one of the theme specializations by a regular course in the same theme of specialization.

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Physics  
Offered to students admitted to Year 1 in 2017

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3: analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Major in Mathematics/Physics
Minor in Physics

Required courses (96 credits)

1. Introductory level courses (48 credits)
   
   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   SCNC1111 Scientific method and reasoning (6)  
   SCNC1112 Fundamentals of modern science (6)

   **Disciplinary Core Courses (30 credits)**
   PHYS1250 Fundamental physics (6)  
   PHYS2250 Introductory mechanics (6)  
   PHYS2255 Introductory electricity and magnetism (6)  
   PHYS2260 Heat and waves (6)  
   PHYS2265 Introductory quantum physics (6)  

   **Disciplinary Electives (6 credits)**
   At least 6 credits selected from the following courses:
   PHYS1150 Problem solving in physics (6)  
   PHYS2050 Introductory relativity (6)  
   PHYS2150 Methods in physics I (6)  
   PHYS2155 Methods in physics II (6)

2. Advanced level courses (42 credits)
   
   **Disciplinary Core Courses (24 credits)**
   PHYS3350 Classical mechanics (6)  
   PHYS3351 Quantum mechanics (6)  
   PHYS3450 Electromagnetism (6)  
   PHYS3550 Statistical mechanics & thermodynamics (6)

   **Disciplinary Electives (18 credits)**
   At least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.

   **List A**
   PHYS3150 Theoretical physics (6)  
   PHYS3151 Machine learning in physics (6)  
   PHYS3351 Introductory solid state physics (6)  
   PHYS3650 Observational astronomy (6)  
   PHYS3651 The physical universe (6)  
   PHYS3652 Principles of astronomy (6)  
   PHYS3750 Laser and spectroscopy (6)  
   PHYS3751 Physics of nanomaterials (6)  
   PHYS3850 Waves and optics (6)  
   PHYS3851 Atomic and nuclear physics (6)  
   PHYS4150 Computational physics (6)  
   PHYS4151 Data analysis and modeling in physics (6)  
   PHYS4350 Advanced classical mechanics (6)  
   PHYS4351 Advanced quantum mechanics (6)  
   PHYS4450 Advanced electromagnetism (6)
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<td>PHYS7750</td>
<td>Nanophysics</td>
<td>(6)</td>
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### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- PHYS3999 Directed studies in physics (6)
- PHYS4966 Physics internship (6)
- PHYS4999 Physics project (12)

### Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title  Major in Physics
Offered to students admitted to Year 1 in 2016

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1 : identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2 : have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3 : analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4 : communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5 : apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Major in Mathematics/Physics
Minor in Physics

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   PHYS1250 Fundamental physics (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2260 Heat and waves (6)
   PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]

   Disciplinary Electives (6 credits)
   At least 6 credits selected from the following courses:
   PHYS1150 Problem solving in physics (6)
   PHYS2055 Introductory relativity (6) [previous title: Introduction to relativity (6)]
   PHYS2150 Methods in physics I (6)
   PHYS2155 Methods in physics II (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (24 credits)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS3450 Electromagnetism (6)
   PHYS3550 Statistical mechanics & thermodynamics (6)

   Disciplinary Electives (18 credits)
   At least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.

   List A
   PHYS3150 Theoretical physics (6)
   PHYS3151 Machine learning in physics (6)
   PHYS3551 Introductory solid state physics (6)
   PHYS3650 Observational astronomy (6)
   PHYS3651 The physical universe (6)
   PHYS3652 Principles of astronomy (6)
   PHYS3750 Laser and spectroscopy (6)
   PHYS3751 Physics of nanomaterials (6)
   PHYS3850 Waves and optics (6)
   PHYS3851 Atomic and nuclear physics (6)
   PHYS4150 Computational physics (6)
   PHYS4151 Data analysis and modeling in physics (6)
   PHYS4350 Advanced classical mechanics (6)
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### Science Majors

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### Capstone Requirement (6 credits)

At least 6 credits selected from the following courses:

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### Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Physics
Offered to students admitted to Year 1 in 2015

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

Learning Outcomes:
By the end of this programme, students should be able to:
PLO 1: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)
PLO 2: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)
PLO 3: analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)
PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
PLO 5: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Major in Mathematics/Physics
Minor in Physics

Required courses (96 credits)

1. Introductory level courses (48 credits)
   - Disciplinary Core Courses: Science Foundation Courses (12 credits)
     - SCNC1111 Scientific method and reasoning (6)
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   - Disciplinary Core Courses (30 credits)
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       - PHYS4151 Data analysis and modeling in physics (6)
       - PHYS4350 Advanced classical mechanics (6)
       - PHYS4351 Advanced quantum mechanics (6)
       - PHYS4450 Advanced electromagnetism (6)
### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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### Notes:

1. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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6. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Objectives:**
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)
- **PLO 2:** have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)
- **PLO 3:** analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)
- **PLO 4:** communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
- **PLO 5:** apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

**Impermissible Combinations:**
Major in Mathematics/Physics  
Minor in Physics

<table>
<thead>
<tr>
<th>Required courses (96 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (48 credits)</strong></td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses: Science Foundation Courses (12 credits)</strong></td>
</tr>
<tr>
<td>SCNC1111</td>
</tr>
<tr>
<td>SCNC1112</td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (36 credits)</strong></td>
</tr>
<tr>
<td>PHYS1150</td>
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<tr>
<td>PHYS2260</td>
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<tr>
<td>PHYS2265</td>
</tr>
<tr>
<td>[previous title: Modern physics (6)]</td>
</tr>
<tr>
<td><strong>2. Advanced level courses (42 credits)</strong></td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (24 credits)</strong></td>
</tr>
<tr>
<td>PHYS3350</td>
</tr>
<tr>
<td>PHYS3351</td>
</tr>
<tr>
<td>PHYS3450</td>
</tr>
<tr>
<td>PHYS3550</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (18 credits)</strong></td>
</tr>
<tr>
<td>At least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.</td>
</tr>
<tr>
<td><strong>List A</strong></td>
</tr>
<tr>
<td>PHYS3150</td>
</tr>
<tr>
<td>PHYS3551</td>
</tr>
<tr>
<td>PHYS3650</td>
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<td>PHYS3651</td>
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<td>PHYS4150</td>
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<td>PHYS4151</td>
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<td>PHYS4351</td>
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<td>PHYS4550</td>
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<td>PHYS4551</td>
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<td>PHYS4750</td>
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<td>PHYS4850</td>
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<td>PHYS7351</td>
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<td>PHYS7550</td>
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<tr>
<td>PHYS7551</td>
</tr>
<tr>
<td>PHYS7650</td>
</tr>
<tr>
<td>PHYS7750</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- PHYS3999: Directed studies in physics (6)
- PHYS4966: Physics internship (6)
- PHYS4999: Physics project (12)

**Notes:**

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

### Learning Outcomes:

By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3: analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

PLO 5: apply scientific and quantitative methods in tackling problems in research or real-word setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

### Impermissible Combinations:

- Major in Mathematics/Physics
- Minor in Physics

### Required courses (96 credits)

#### 1. Introductory level courses (48 credits)

**Disciplinary Core Courses:** Science Foundation Courses (12 credits)

- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

**Disciplinary Core Courses (36 credits)**

- PHYS1150 Problem solving in physics (6)
- PHYS1250 Fundamental physics (6)
- PHYS2250 Introductory mechanics (6)
- PHYS2255 Introductory electricity and magnetism (6)
- PHYS2260 Heat and waves (6)
- PHYS2265 Introductory quantum physics (6)  
  \[\text{[previous title: Modern physics (6)]}\]

### 2. Advanced level courses (42 credits)

#### Disciplinary Core Courses (24 credits)

- PHYS3350 Classical mechanics (6)
- PHYS3351 Quantum mechanics (6)
- PHYS3450 Electromagnetism (6)
- PHYS3550 Statistical mechanics & thermodynamics (6)

#### Disciplinary Electives (18 credits)

At least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.

**List A**

- PHYS3150 Theoretical physics (6)
- PHYS3551 Introductory solid state physics (6)
- PHYS3650 Observational astronomy (6)
- PHYS3651 The physical universe (6)
- PHYS3652 Principles of astronomy (6)
- PHYS3750 Laser and spectroscopy (6)
- PHYS3751 Physics of nanomaterials (6)
- PHYS3850 Waves and optics (6)
- PHYS3851 Atomic and nuclear physics (6)
- PHYS4150 Computational physics (6)
- PHYS4151 Data analysis and modeling in physics (6)
- PHYS4350 Advanced classical mechanics (6)
- PHYS4351 Advanced quantum mechanics (6)
- PHYS4450 Advanced electromagnetism (6)
- PHYS4550 Advanced statistical mechanics (6)
- PHYS4551 Solid state physics (6)
- PHYS4650 Stellar physics (6)
- PHYS4651 Selected topics in astrophysics (6)
- PHYS4652 Planetary science (6)
- PHYS4653 Cosmology (6)
3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3999</td>
<td>Directed studies in physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4966</td>
<td>Physics internship</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4999</td>
<td>Physics project</td>
<td>12</td>
</tr>
</tbody>
</table>

Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Physics
Offered to students admitted to Year 1 in 2012

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1**: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

**PLO 2**: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

**PLO 3**: analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

**PLO 4**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

**PLO 5**: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Major in Mathematics/Physics
Minor in Physics

**Required courses (96 credits)**

1. **Introductory level courses (48 credits)**
   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   **Disciplinary Core Courses (36 credits)**
   PHYS1150 Problem solving in physics (6)
   PHYS1250 Fundamental physics (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2260 Heat and waves (6)
   PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]

2. **Advanced level courses (42 credits)**
   **Disciplinary Core Courses (24 credits)**
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS3450 Electromagnetism (6)
   PHYS3550 Statistical mechanics & thermodynamics (6)
   **Disciplinary Electives (18 credits)**
   At least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.

<table>
<thead>
<tr>
<th>List A</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3150 Theoretical physics (6)</td>
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</tr>
<tr>
<td>PHYS4652 Planetary science (6)</td>
</tr>
<tr>
<td>PHYS4653 Cosmology (6)</td>
</tr>
</tbody>
</table>
Science Majors

PHYS4654 General relativity (6)
PHYS4655 Interstellar medium (6)
PHYS4750 Experimental physics (6)
PHYS4850 Particle physics (6)
PHYS7350 Graduate classical mechanics (6)
PHYS7351 Graduate quantum mechanics (6)
PHYS7450 Graduate electromagnetism (6)
PHYS7550 Graduate statistical mechanics (6)
PHYS7551 Graduate solid state physics (6)
PHYS7650 Stellar atmospheres (6)
PHYS7750 Nanophysics (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   PHYS3999 Directed studies in physics (6)
   PHYS4966 Physics internship (6)
   PHYS4999 Physics project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

5. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
### Major Title
Major in Physics (Intensive)

### Offered to students admitted to Year 1 in
2019

### Objectives:
The Major in Physics (Intensive) aims to provide students with a solid foundation on the subject in breadth and depth. It covers a wide range of core areas which provides the intensive preparation to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge and competencies in physics and research experience plus the training of analytical thinking, quantitative reasoning, and problem solving methods during their studies. Graduates are expected to be well-prepared for further studies in physics and related disciplines and to pursue careers in scientific or technical fields.

### Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1**: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

**PLO 2**: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

**PLO 3**: analyze problems qualitatively and quantitatively based on a broad foundation of theoretical and experimental knowledge in physics, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

**PLO 4**: communicate and collaborate with people of different background, culture, gender and nationality effectively in scientific issues (by means of group project, tutorial session, presentation, exchange, internship and capstone opportunities in the curriculum)

**PLO 5**: apply scientific and quantitative methods in tackling problems in research or real-word setting in an advanced level which can position them to pursue postgraduate studies in scientific and technical fields (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

### Impermissible Combinations:
- Major in Physics
- Minor in Physics

### Required courses (144 credits)

#### 1. Introductory level courses (72 credits)

**Disciplinary Core Courses: Science Foundation Courses (12 credits)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning (6)</td>
<td></td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science (6)</td>
<td></td>
</tr>
</tbody>
</table>

**Disciplinary Core Courses (48 credits)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS1150</td>
<td>Problem solving in physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2055</td>
<td>Introductory relativity (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2150</td>
<td>Methods in physics I (6)</td>
<td></td>
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<tr>
<td>PHYS2155</td>
<td>Methods in physics II (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2250</td>
<td>Introductory mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2255</td>
<td>Introductory electricity and magnetism (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2261</td>
<td>Introductory heat and thermodynamics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2265</td>
<td>Introductory quantum physics (6)</td>
<td></td>
</tr>
</tbody>
</table>

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1117</td>
<td>Computer programming (6)</td>
<td></td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS1650</td>
<td>Nature of the universe (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2160</td>
<td>Introductory computational physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2650</td>
<td>Modern astronomy (6)</td>
<td></td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics (6)</td>
<td></td>
</tr>
</tbody>
</table>

#### 2. Advanced level courses (60 credits)

**Disciplinary Core Courses (36 credits)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3150</td>
<td>Theoretical physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3350</td>
<td>Classical mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3351</td>
<td>Quantum mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3450</td>
<td>Electromagnetism (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3550</td>
<td>Statistical mechanics &amp; thermodynamics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3760</td>
<td>Physics laboratory (6)</td>
<td></td>
</tr>
</tbody>
</table>

**Disciplinary Electives (24 credits)**

All 24 credits should be advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.

**List A**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3151</td>
<td>Machine learning in physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3650</td>
<td>Observational astronomy (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3653</td>
<td>Astrophysics (6)</td>
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<tr>
<td>PHYS3660</td>
<td>Astronomy laboratory (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3750</td>
<td>Laser and spectroscopy (6)</td>
<td></td>
</tr>
</tbody>
</table>
PHYS3850 Waves and optics (6)
PHYS3851 Atomic and nuclear physics (6)
PHYS4150 Computational physics (6)
PHYS4151 Data analysis and modeling in physics (6)
PHYS4351 Advanced quantum mechanics (6)
PHYS4450 Advanced electromagnetism (6)
PHYS4551 Solid state physics (6)
PHYS4652 Planetary science (6)
PHYS4653 Cosmology (6)
PHYS4654 General relativity (6)
PHYS4655 Interstellar medium (6)
PHYS4656 Advanced astrophysics (6)
PHYS4850 Particle physics (6)
PHYS7350 Graduate classical mechanics (6)
PHYS7351 Graduate quantum mechanics (6)
PHYS7450 Graduate electromagnetism (6)
PHYS7550 Graduate statistical mechanics (6)
PHYS7750 Nanophysics (6)

3. Capstone requirement (12 credits)
At least 12 credits selected from the following courses:
PHYS3999 Directed studies in physics (6)
PHYS4966 Physics internship (6)
PHYS4999 Physics project (12)

Notes:
1. These are core courses in the regular Physics-Major (96 credits) curriculum.
2. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.
3. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.
4. Those who want to specialize in the astrophysics theme should pass any three of the following courses: PHYS3650 Observational astronomy, PHYS3653 Astrophysics, PHYS3660 Astronomy laboratory, PHYS4652 Planetary science, PHYS4653 Cosmology, PHYS4654 General relativity, PHYS4655 Interstellar medium, and PHYS4656 Advanced astrophysics, out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in astrophysics.
5. Those who want to specialize in the computational physics theme should pass any three of the following courses: PHYS3150 Theoretical physics, PHYS3151 Machine learning in physics, PHYS4150 Computational physics, and PHYS4151 Data analysis and modeling in physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in computational physics.
6. Those who want to specialize in the experimental physics theme should pass PHYS3760 Physics laboratory, plus any two of the following courses: PHYS3660 Astronomy laboratory, PHYS3750 Laser and spectroscopy, PHYS3850 Physical optics, PHYS3851 Atomic and nuclear physics, PHYS4151 Data analysis and modeling in physics, PHYS4551 Solid state physics, and PHYS4850 Particle physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in experimental physics.
7. Those who want to specialize in the theoretical physics theme should pass any four of the following courses: PHYS3150 Theoretical physics, PHYS3350 Classical mechanics, PHYS3351 Quantum mechanics, PHYS3450 Electromagnetism, PHYS3550 Statistical mechanics & thermodynamics, PHYS4351 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4551 Solid state physics, PHYS4654 General relativity, PHYS4850 Particle physics, PHYS7351 Graduate quantum mechanics, PHYS7450 Graduate electromagnetism, PHYS7550 Graduate statistical mechanics out of which at least two must be 4000+ level courses, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in theoretical physics.
8. Upon prior approval, one may use PHYS4966 Physics internship to replace PHYS3999 Directed studies or PHYS4999 Physics project to fulfill the specialization in a theme.
9. No double counting is allowed if one wants to specialize in more than one theme. In this case, one is allowed to replace the PHYS3999 Directed studies in physics or PHYS4999 Physics project requirement in one of the theme specializations by a regular course in the same theme of specialization.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Physics (Intensive)  
Offered to students admitted to Year 1 in 2018

**Objectives:**
The Major in Physics (Intensive) aims to provide students with a solid foundation on the subject in breadth and depth. It covers a wide range of core areas which provides the intensive preparation to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge and competencies in physics and research experience plus the training of analytical thinking, quantitative reasoning, and problem solving methods during their studies. Graduates are expected to be well-prepared for further studies in physics and related disciplines and to pursue careers in scientific or technical fields.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)
- **PLO 2:** have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)
- **PLO 3:** analyze problems qualitatively and quantitatively based on a broad foundation of theoretical and experimental knowledge in physics, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)
- **PLO 4:** communicate and collaborate with people of different background, culture, gender and nationality effectively in scientific issues (by means of group project, tutorial session, presentation, exchange, internship and capstone opportunities in the curriculum)
- **PLO 5:** apply scientific and quantitative methods in tackling problems in research or real-world setting in an advanced level which can position them to pursue postgraduate studies in scientific and technical fields (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

**Impermissible Combinations:**
- Major in Physics  
- Minor in Physics

### Required courses (144 credits)

#### 1. Introductory level courses (72 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6</td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6</td>
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</tbody>
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#### Disciplinary Core Courses (48 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS1150</td>
<td>Problem solving in physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2055</td>
<td>Introductory relativity</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2150</td>
<td>Methods in physics I</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2155</td>
<td>Methods in physics II</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2250</td>
<td>Introductory mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2255</td>
<td>Introductory electricity and magnetism</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2261</td>
<td>Introductory heat and thermodynamics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2265</td>
<td>Introductory quantum physics</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1117</td>
<td>Computer programming</td>
<td>6</td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
</tr>
<tr>
<td>PHYS1650</td>
<td>Nature of the universe</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2160</td>
<td>Introductory computational physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2650</td>
<td>Modern astronomy</td>
<td>6</td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics</td>
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</table>

#### 2. Advanced level courses (60 credits)

#### Disciplinary Core Courses (36 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3150</td>
<td>Theoretical physics</td>
<td>6</td>
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<tr>
<td>PHYS3350</td>
<td>Classical mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3351</td>
<td>Quantum mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3450</td>
<td>Electromagnetism</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3550</td>
<td>Statistical mechanics &amp; thermodynamics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3760</td>
<td>Physics laboratory</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Disciplinary Electives (24 credits)

All 24 credits should be advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.

**List A**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3151</td>
<td>Machine learning in physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3650</td>
<td>Observational astronomy</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3653</td>
<td>Astrophysics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3660</td>
<td>Astronomy laboratory</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3750</td>
<td>Laser and spectroscopy</td>
<td>6</td>
</tr>
</tbody>
</table>
3. Capstone requirement (12 credits)
At least 12 credits selected from the following courses:

- PHYS3999 Directed studies in physics (6)
- PHYS4966 Physics internship (6)
- PHYS4999 Physics project (12)

Notes:
1. These are core courses in the regular Physics-Major (96 credits) curriculum.
2. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.
3. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.
4. Those who want to specialize in the astrophysics theme should pass any three of the following courses: PHYS3650 Observational astronomy, PHYS3653 Astrophysics, PHYS3860 Astronomy laboratory, PHYS4652 Planetary science, PHYS4653 Cosmology, PHYS4654 General relativity, PHYS4655 Interstellar medium, and PHYS4656 Advanced astrophysics, out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in astrophysics.
5. Those who want to specialize in the computational physics theme should pass any three of the following courses: PHYS3150 Theoretical physics, PHYS3151 Machine learning in physics, PHYS4150 Computational physics, and PHYS4151 Data analysis and modeling in physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in computational physics.
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7. Those who want to specialize in the theoretical physics theme should pass any four of the following courses: PHYS3150 Theoretical physics, PHYS3350 Classical mechanics, PHYS3351 Quantum mechanics, PHYS3450 Electromagnetism, PHYS3550 Statistical mechanics & thermodynamics, PHYS4351 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4551 Solid state physics, PHYS4654 General relativity, PHYS4850 Particle physics, PHYS7351 Graduate quantum mechanics, PHYS7450 Graduate electromagnetism, PHYS7550 Graduate statistical mechanics out of which at least two must be 4000+ level courses, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in theoretical physics.
8. Upon prior approval, one may use PHYS4966 Physics internship to replace PHYS3999 Directed studies or PHYS4999 Physics project to fulfill the specialization in a theme.
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Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title**: Major in Physics (Intensive)  
**Offered to students admitted to Year 1 in**: 2017

**Objectives:**  
The Major in Physics (Intensive) aims to provide students with a solid foundation on the subject in breadth and depth. It covers a wide range of core areas which provides the intensive preparation to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge and competencies in physics and research experience plus the training of analytical thinking, quantitative reasoning, and problem solving methods during their studies. Graduates are expected to be well-prepared for further studies in physics and related disciplines and to pursue careers in scientific or technical fields.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

**PLO 1**: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)

**PLO 2**: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

**PLO 3**: analyze problems qualitatively and quantitatively based on a broad foundation of theoretical and experimental knowledge in physics, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

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**Impermissible Combinations:**  
Major in Physics  
Minor in Physics

**Required courses (144 credits)**

1. **Introductory level courses (72 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6) *(Note 1)*
     - SCNC1112 Fundamentals of modern science (6) *(Note 1)*
   - **Disciplinary Core Courses (48 credits)**
     - PHYS1150 Problem solving in physics (6)
     - PHYS2055 Introductory relativity (6)
     - PHYS2150 Methods in physics I (6)
     - PHYS2155 Methods in physics II (6)
     - PHYS2250 Introductory mechanics (6) *(Note 1)*
     - PHYS2255 Introductory electricity and magnetism (6) *(Note 1)*
     - PHYS2261 Introductory heat and thermodynamics (6)
     - PHYS2265 Introductory quantum physics (6) *(Note 1)*
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - COMP1117 Computer programming (6)
       - MATH1013 University mathematics II (6)
       - PHYS1650 Nature of the universe (6)
       - PHYS2160 Introductory computational physics (6)
       - PHYS2650 Modern astronomy (6)
       - STAT1603 Introductory statistics (6)

2. **Advanced level courses (60 credits)**
   - **Disciplinary Core Courses (36 credits)**
     - PHYS3150 Theoretical physics (6)
     - PHYS3350 Classical mechanics (6) *(Note 1)*
     - PHYS3351 Quantum mechanics (6) *(Note 1)*
     - PHYS3450 Electromagnetism (6) *(Note 1)*
     - PHYS3550 Statistical mechanics & thermodynamics (6) *(Note 1)*
     - PHYS3760 Physics laboratory (6)
   - **Disciplinary Electives (24 credits)**
     - All 24 credits should be advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.
     - **List A**
       - PHYS3151 Machine learning in physics (6)
       - PHYS3650 Observational astronomy (6)
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3. Capstone requirement (12 credits)
At least 12 credits selected from the following courses:
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Notes:
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Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Major Title**: Major in Physics (Intensive)  
**Offered to students**: admitted to Year 1 in 2016  

**Objectives:**  
The Major in Physics (Intensive) aims to provide students with a solid foundation on the subject in breadth and depth. It covers a wide range of core areas which provides the intensive preparation to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge and competencies in physics and research experience plus the training of analytical thinking, quantitative reasoning, and problem solving methods during their studies. Graduates are expected to be well-prepared for further studies in physics and related disciplines and to pursue careers in scientific or technical fields.

**Learning Outcomes:**  
By the end of this programme, students should be able to:  

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<tr>
<th>PLO 1</th>
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<td><strong>PLO 2</strong>:</td>
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<td><strong>PLO 3</strong>:</td>
<td><strong>analyze problems qualitatively and quantitatively based on a broad foundation of theoretical and experimental knowledge in physics, and appraise the related ethical issues</strong> (by means of coursework, tutorial classes and research-based projects in the curriculum)</td>
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<td><strong>communicate and collaborate with people of different background, culture, gender and nationality effectively in scientific issues</strong> (by means of group project, tutorial session, presentation, exchange, internship and capstone opportunities in the curriculum)</td>
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<td><strong>PLO 5</strong>:</td>
<td><strong>apply scientific and quantitative methods in tackling problems in research or real-world setting in an advanced level which can position them to pursue postgraduate studies in scientific and technical fields</strong> (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)</td>
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**Impermissible Combinations:**  
Major in Physics  
Minor in Physics

**Required courses (144 credits)**  

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| SCNC1112 Fundamentals of modern science (6) | *(Note 1)*  
| **Disciplinary Core Courses (48 credits)** |  
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| PHYS2150 Methods in physics I (6) |  
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| **Disciplinary Electives (12 credits)** |  
| At least 12 credits selected from the following courses: |  
| COMP1117 Computer programming (6) |  
| MATH1013 University mathematics II (6) |  
| PHYS1650 Nature of the universe (6) |  
| PHYS2160 Introductory computational physics (6) |  
| PHYS2650 Modern astronomy (6) |  
| STAT1603 Introductory statistics (6) |  
| **2. Advanced level courses (60 credits)** |  
| **Disciplinary Core Courses (36 credits)** |  
| PHYS3150 Theoretical physics (6) |  
| PHYS3350 Classical mechanics (6) | *(Note 1)*  
| PHYS3351 Quantum mechanics (6) | *(Note 1)*  
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| PHYS3550 Statistical mechanics & thermodynamics (6) | *(Note 1)*  
| PHYS3760 Physics laboratory (6) |  
| **Disciplinary Electives (24 credits)** |  
| All 24 credits should be advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements. |  
| List A |  
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364
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<td>Waves and optics (6)</td>
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<td>PHYS3851</td>
<td>Atomic and nuclear physics (6)</td>
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</tr>
<tr>
<td>PHYS4150</td>
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<td>Data analysis and modeling in physics (6)</td>
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</table>

3. Capstone requirement (12 credits)

At least 12 credits selected from the following courses:

- PHYS3999 Directed studies in physics (6)
- PHYS4966 Physics internship (6)
- PHYS4999 Physics project (12)

Notes:

1. These are core courses in the regular Physics-Major (96 credits) curriculum.

2. Students are strongly advised to consult departmental course selection advisors for course and career planning before selecting the courses.

3. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

4. Those who want to specialize in the astrophysics theme should pass any three of the following courses: PHYS3650 Observational astronomy, PHYS3653 Astrophysics, PHYS3660 Astronomy laboratory, PHYS4652 Planetary science, PHYS4653 Cosmology, PHYS4654 General relativity, PHYS4655 Interstellar medium, and PHYS4656 Advanced astrophysics, out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in astrophysics.

5. Those who want to specialize in the computational physics theme should pass any three of the following courses: PHYS3150 Theoretical physics, PHYS3151 Machine learning in physics, PHYS4150 Computational physics, and PHYS4151 Data analysis and modeling in physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in computational physics.

6. Those who want to specialize in the experimental physics theme should pass PHYS3760 Physics laboratory, plus any two of the following courses: PHYS3660 Astronomy laboratory, PHYS3750 Laser and spectroscopy, PHYS3850 Physical optics, PHYS3851 Atomic and nuclear physics, PHYS4150 Data analysis and modeling in physics, PHYS4551 Solid state physics, and PHYS4850 Particle physics out of which at least one must be a 4000+ level course, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in experimental physics.

7. Those who want to specialize in the theoretical physics theme should pass any four of the following courses: PHYS3150 Theoretical physics, PHYS3350 Classical mechanics, PHYS3351 Quantum mechanics, PHYS3450 Electromagnetism, PHYS3550 Statistical mechanics & thermodynamics, PHYS4351 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4451 Solid state physics, PHYS4454 General relativity, PHYS4850 Particle physics, PHYS4851 Graduate quantum mechanics, PHYS4850 Graduate electromagnetism, PHYS4855 Graduate statistical mechanics out of which at least two must be 4000+ level courses, as well as passing either PHYS3999 Directed studies in physics or PHYS4999 Physics project with topics of study in theoretical physics.

8. Upon prior approval, one may use PHYS4966 Physics internship to replace PHYS3999 Directed studies or PHYS4999 Physics project to fulfill the specialization in a theme.

9. No double counting is allowed if one wants to specialize in more than one theme. In this case, one is allowed to replace the PHYS3999 Directed studies in physics or PHYS4999 Physics project requirement in one of the theme specializations by a regular course in the same theme of specialization.

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Risk Management
Offered to students admitted to Year 1 in 2019

Objectives:
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   - MATH1013 University mathematics II (6)
   - STAT1600 Statistics: ideas and concepts (6)
   - MATH2014 Multivariable calculus and linear algebra (6)
   - STAT2601 Probability and statistics I (6)
   - STAT2602 Probability and statistics II (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   - STAT3600 Linear statistical analysis (6)
   - STAT3609 The statistics of investment risk (6)
   - STAT3615 Practical mathematics for investment (6)
   - STAT4601 Time-series analysis (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   - STAT3603 Stochastic processes (6)
   - STAT3610 Risk management and insurance (6)
   - STAT3612 Statistical machine learning (6)
   - STAT3618 Derivatives and risk management (6)
   - STAT3911 Financial economics II (6)
   - STAT4603 Current topics in risk management (6)
   - STAT4606 Risk management and Basel Accords in banking and finance (6)
   - STAT4607 Credit risk analysis (6)
   - STAT4608 Market risk analysis (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - STAT3799 Directed studies in statistics (6)
   - STAT4710 Capstone experience for statistics undergraduates (6)
   - STAT4766 Statistics internship (6)
   - STAT4799 Statistics project (12)
Notes:

1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Risk Management  
Offered to students admitted to Year 1 in 2018

Objectives:
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

Learning Outcomes:

By the end of this programme, students should be able to:

- **PLO 1**: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
- **PLO 2**: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
- **PLO 3**: critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
- **PLO 4**: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
- **PLO 5**: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)
- **PLO 6**: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:

- Major in Computing and Data Analytics
- Major in Decision Analytics
- Major in Statistics
- Minor in Risk Management
- Minor in Statistics

**Required courses (96 credits)**

1. **Introductory level courses (42 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111: Scientific method and reasoning (6)
     - SCNC1112: Fundamentals of modern science (6)
   - **Disciplinary Core Courses (30 credits)**
     - MATH1013: University mathematics II (6)
     - STAT1600: Statistics: ideas and concepts (6)
     - MATH2014: Multivariable calculus and linear algebra (6)
     - STAT2601: Probability and statistics I (6)
     - STAT2602: Probability and statistics II (6)

2. **Advanced level courses (48 credits)**
   - **Disciplinary Core Courses (24 credits)**
     - STAT3600: Linear statistical analysis (6)
     - STAT3609: The statistics of investment risk (6)
     - STAT3615: Practical mathematics for investment (6)
     - STAT4601: Time-series analysis (6)
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits selected from the following courses:
       - STAT3603: Stochastic processes (6) [previous title: Probability modelling (6)]
       - STAT3610: Risk management and insurance (6)
       - STAT3612: Statistical machine learning (6) [previous title: Data mining (6)]
       - STAT3618: Derivatives and risk management (6)
       - STAT3911: Financial economics II (6)
       - STAT4603: Current topics in risk management (6)
       - STAT4606: Risk management and Basel Accords in banking and finance (6)
       - STAT4607: Credit risk analysis (6)
       - STAT4608: Market risk analysis (6)

3. **Capstone requirement (6 credits)**
   - At least 6 credits selected from the following courses:
     - STAT3799: Directed studies in statistics (6)
     - STAT4710: Capstone experience for statistics undergraduates (6)
     - STAT4766: Statistics internship (6)
     - STAT4799: Statistics project (12)
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Major Title
Major in Risk Management

## Offered to students admitted to Year 1 in
2017

## Objectives:
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

## Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1:** identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 2:** analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 3:** critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 4:** make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 5:** communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

**PLO 6:** gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

## Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

## Required courses (96 credits)

### 1. Introductory level courses (42 credits)

#### Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111: Scientific method and reasoning (6)
- SCNC1112: Fundamentals of modern science (6)

#### Disciplinary Core Courses (30 credits)
- MATH1013: University mathematics II (6)
- STAT1600: Statistics: ideas and concepts (6)
- MATH2014: Multivariable calculus and linear algebra (6)
- STAT2601: Probability and statistics I (6)
- STAT2602: Probability and statistics II (6)

### 2. Advanced level courses (48 credits)

#### Disciplinary Core Courses (24 credits)
- STAT3600: Linear statistical analysis (6)
- STAT3609: The statistics of investment risk (6)
- STAT3615: Practical mathematics for investment (6)
- STAT4601: Time-series analysis (6)

#### Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
- STAT3603: Stochastic processes (6)  
  [previous title: Probability modelling (6)]
- STAT3610: Risk management and insurance (6)
- STAT3612: Statistical machine learning (6)  
  [previous title: Data mining (6)]
- STAT3618: Derivatives and risk management (6)
- STAT3911: Financial economics II (6)
- STAT4603: Current topics in risk management (6)
- STAT4606: Risk management and Basel Accords in banking and finance (6)
- STAT4607: Credit risk analysis (6)
- STAT4608: Market risk analysis (6)

### 3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
- STAT3799: Directed studies in statistics (6)
- STAT4710: Capstone experience for statistics undergraduates (6)
- STAT4766: Statistics internship (6)
- STAT4799: Statistics project (12)
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ('disciplinary core') in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Risk Management

Offered to students admitted to Year 1 in 2016

Objectives:
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   - SCNC1111: Scientific method and reasoning (6)
   - SCNC1112: Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   - MATH1013: University mathematics II (6)
   - STAT1600: Statistics: ideas and concepts (6)
   - MATH2014: Multivariable calculus and linear algebra (6)
   - STAT2601: Probability and statistics I (6)
   - STAT2602: Probability and statistics II (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   - STAT3600: Linear statistical analysis (6)
   - STAT3609: The statistics of investment risk (6)
   - STAT3615: Practical mathematics for investment (6)
   - STAT4601: Time-series analysis (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   - STAT3603: Stochastic processes (6)
   - STAT3610: Risk management and insurance (6)
   - STAT3612: Statistical machine learning (6)
   - STAT3618: Derivatives and risk management (6)
   - STAT3911: Financial economics II (6)
   - STAT4603: Current topics in risk management (6)
   - STAT4606: Risk management and Basel Accords in banking and finance (6)
   - STAT4607: Credit risk analysis (6)
   - STAT4608: Market risk analysis (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - STAT3799: Directed studies in statistics (6)
   - STAT4710: Capstone experience for statistics undergraduates (6)
   - STAT4766: Statistics internship (6)
   - STAT4799: Statistics project (12)
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinar core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinar core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Risk Management
Offered to students admitted to Year 1 in 2015

Objectives:
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   MATH1013 University mathematics II (6)
   STAT1600 Statistics: ideas and concepts (6)
   MATH2014 Multivariable calculus and linear algebra (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   STAT3600 Linear statistical analysis (6)
   STAT3609 The statistics of investment risk (6)
   STAT3615 Practical mathematics for investment (6)
   STAT4601 Time-series analysis (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   STAT3603 Stochastic processes (6)
   STAT3610 Risk management and insurance (6)
   STAT3612 Statistical machine learning (6)
   STAT3618 Derivatives and risk management (6)
   STAT3911 Financial economics II (6)
   STAT4603 Current topics in risk management (6)
   STAT4606 Risk management and Basel Accords in banking and finance (6)
   STAT4607 Credit risk analysis (6)
   STAT4608 Market risk analysis (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   STAT3799 Directed studies in statistics (6)
   STAT4710 Capstone experience for statistics undergraduates (6)
   STAT4766 Statistics internship (6)
   STAT4799 Statistics project (12)
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title Major in Risk Management
Offered to students admitted to Year 1 in 2014

Objectives:
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)
1. Introductory level courses (42 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6)
SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (30 credits)
MATH1013 University mathematics II (6)
STAT1600 Statistics: ideas and concepts (6)
MATH2014 Multivariable calculus and linear algebra (6)
STAT2601 Probability and statistics I (6)
STAT2602 Probability and statistics II (6)

2. Advanced level courses (48 credits)
Disciplinary Core Courses (24 credits)
STAT3600 Linear statistical analysis (6)
STAT3609 The statistics of investment risk (6)
STAT3615 Practical mathematics for investment (6)
STAT4601 Time-series analysis (6)

Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
STAT3603 Stochastic processes (6) [previous title: Probability modelling (6)]
STAT3610 Risk management and insurance (6)
STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
STAT3618 Derivatives and risk management (6)
STAT3911 Financial economics II (6)
STAT4603 Current topics in risk management (6)
STAT4606 Risk management and Basel Accords in banking and finance (6)
STAT4607 Credit risk analysis (6)
STAT4608 Market risk analysis (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
STAT3799 Directed studies in statistics (6)
STAT4710 Capstone experience for statistics undergraduates (6)
STAT4766 Statistics internship (6)
STAT4799 Statistics project (12)
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Major Title

Major in Risk Management

## Offered to students admitted to Year 1 in

2013

## Objectives:

The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

## Learning Outcomes:

By the end of this programme, students should be able to:

**PLO 1**: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 2**: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 3**: critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 4**: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 5**: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

**PLO 6**: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

## Impermissible Combinations:

- Major in Decision Analytics
- Major in Statistics
- Minor in Risk Management
- Minor in Statistics

## Required courses (96 credits)

### 1. Introductory level courses (42 credits)

**Disciplinary Core Courses: Science Foundation Courses (12 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6</td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6</td>
</tr>
</tbody>
</table>

**Disciplinary Core Courses (30 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT1600</td>
<td>Statistics: ideas and concepts</td>
<td>6</td>
</tr>
<tr>
<td>STAT2601</td>
<td>Probability and statistics I</td>
<td>6</td>
</tr>
<tr>
<td>STAT2602</td>
<td>Probability and statistics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT2603</td>
<td>Data management with SAS</td>
<td>6</td>
</tr>
</tbody>
</table>

### 2. Advanced level courses (48 credits)

**Disciplinary Core Courses (24 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3600</td>
<td>Linear statistical analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT3609</td>
<td>The statistics of investment risk</td>
<td>6</td>
</tr>
<tr>
<td>STAT3615</td>
<td>Practical mathematics for investment</td>
<td>6</td>
</tr>
<tr>
<td>STAT4601</td>
<td>Time-series analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

**Disciplinary Electives (24 credits)**

At least 24 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3603</td>
<td>Stochastic processes</td>
<td>6</td>
</tr>
<tr>
<td>STAT3610</td>
<td>Risk management and insurance</td>
<td>6</td>
</tr>
<tr>
<td>STAT3612</td>
<td>Statistical machine learning</td>
<td>6</td>
</tr>
<tr>
<td>STAT3618</td>
<td>Derivatives and risk management</td>
<td>6</td>
</tr>
<tr>
<td>STAT3911</td>
<td>Financial economics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT4603</td>
<td>Current topics in risk management</td>
<td>6</td>
</tr>
<tr>
<td>STAT4606</td>
<td>Risk management and Basel Accords in banking and finance</td>
<td>6</td>
</tr>
<tr>
<td>STAT4607</td>
<td>Credit risk analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT4608</td>
<td>Market risk analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3799</td>
<td>Directed studies in statistics</td>
<td>6</td>
</tr>
<tr>
<td>STAT4710</td>
<td>Capstone experience for statistics undergraduates</td>
<td>6</td>
</tr>
<tr>
<td>STAT4766</td>
<td>Statistics internship</td>
<td>6</td>
</tr>
<tr>
<td>STAT4799</td>
<td>Statistics project</td>
<td>12</td>
</tr>
</tbody>
</table>
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Risk Management

Offered to students admitted to Year 1 in 2012

Objectives:
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1 : identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2 : analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3 : critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4 : make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5 : communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6 : gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

2. Advanced level courses (48 credits)
   - STAT3600 Linear statistical analysis (6)
   - STAT3609 The statistics of investment risk (6)
   - STAT3615 Practical mathematics for investment (6)
   - STAT3601 Time-series analysis (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   - STAT3603 Stochastic processes (6) [previous title: Probability modelling (6)]
   - STAT3610 Risk management and insurance (6)
   - STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
   - STAT3618 Derivatives and risk management (6)
   - STAT3911 Financial economics II (6)
   - STAT4603 Current topics in risk management (6)
   - STAT4606 Risk management and Basel Accords in banking and finance (6)
   - STAT4607 Credit risk analysis (6)
   - STAT4608 Market risk analysis (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - STAT3799 Directed studies in statistics (6)
   - STAT4710 Capstone experience for statistics undergraduates (6)
   - STAT4766 Statistics internship (6)
   - STAT4799 Statistics project (12)
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

3. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

4. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
### Major Title
Major in Statistics

### Offered to students
admitted to Year 1 in 2019

### Objectives:
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

### Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1**: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 2**: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 3**: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 4**: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

**PLO 5**: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

**PLO 6**: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

### Impermissible Combinations:
- Major in Computing and Data Analytics
- Major in Decision Analytics
- Major in Risk Management
- Minor in Risk Management
- Minor in Statistics

### Required courses (96 credits)

#### 1. Introductory level courses (42 credits)

**Disciplinary Core Courses: Science Foundation Courses (12 credits)**
- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

**Disciplinary Core Courses (30 credits)**
- MATH1013 University mathematics II (6)
- STAT1600 Statistics: ideas and concepts (6)
- MATH2014 Multivariable calculus and linear algebra (6)
- STAT2601 Probability and statistics I (6)
- STAT2602 Probability and statistics II (6)

#### 2. Advanced level courses (48 credits)

**Disciplinary Core Courses (24 credits)**
- STAT3600 Linear statistical analysis (6)
- STAT3603 Stochastic processes (6)
- STAT4601 Time-series analysis (6)
- STAT4602 Multivariate data analysis (6)
- [previous title: Probability modelling (6)]

**Disciplinary Electives (24 credits)**

At least 24 credits from Lists A and B, among which at least 6 credits from List A:

**List A**
- STAT3602 Statistical inference (6)
- STAT3604 Design and analysis of experiments (6)
- STAT3620 Modern nonparametric statistics (6)
- STAT3621 Statistical data analysis (6)

**List B**
- STAT3605 Quality control and management (6)
- STAT3606 Business logistics (6)
- STAT3607 Statistics in clinical medicine and bio-medical research (6)
- STAT3608 Statistical genetics (6)
- STAT3612 Statistical machine learning (6)
- STAT3613 Marketing analytics (6)
- STAT3617 Sample survey methods (6)

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3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - STAT3799 Directed studies in statistics (6)
   - STAT4710 Capstone experience for statistics undergraduates (6)
   - STAT4766 Statistics internship (6)
   - STAT4799 Statistics project (12)

Notes:
1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613 and STAT3621. Note that students who wish to take STAT3621 are strongly recommended to take STAT2603 first.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Risk Management
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   MATH1013 University mathematics II (6)
   STAT1600 Statistics: ideas and concepts (6)
   MATH2014 Multivariable calculus and linear algebra (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   STAT3600 Linear statistical analysis (6)
   STAT3603 Stochastic processes (6)
   STAT4601 Time-series analysis (6)
   STAT4602 Multivariate data analysis (6)

   Disciplinary Electives (24 credits)
   At least 24 credits from Lists A and B, among which at least 6 credits from List A:
   List A
   STAT3602 Statistical inference (6)
   STAT3604 Design and analysis of experiments (6)
   STAT3620 Modern nonparametric statistics (6)
   STAT3621 Statistical data analysis (6)

   List B
   STAT3605 Quality control and management (6)
   STAT3606 Business logistics (6)
   STAT3607 Statistics in clinical medicine and bio-medical research (6)
   STAT3608 Statistical genetics (6)
   STAT3612 Statistical machine learning (6)
   STAT3613 Marketing analytics (6)
   STAT3617 Sample survey methods (6)

   [previous title: Data mining (6) ]
   [previous title: Marketing engineering (6) ]
3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:

- STAT3799 Directed studies in statistics (6)
- STAT4710 Capstone experience for statistics undergraduates (6)
- STAT4766 Statistics internship (6)
- STAT4799 Statistics project (12)

Notes:
1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613 and STAT3621. Note that students who wish to take STAT3621 are strongly recommended to take STAT2603 first.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title  Major in Statistics
Offered to students  admitted to Year 1 in 2017

Objectives:
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision-making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Risk Management
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111  Scientific method and reasoning (6)
SCNC1112  Fundamentals of modern science (6)

Disciplinary Core Courses (30 credits)
MATH1013  University mathematics II (6)
STAT1600  Statistics: ideas and concepts (6)
MATH2014  Multivariable calculus and linear algebra (6)
STAT2601  Probability and statistics I (6)
STAT2602  Probability and statistics II (6)

2. Advanced level courses (48 credits)

Disciplinary Core Courses (24 credits)
STAT3600  Linear statistical analysis (6)
STAT3603  Stochastic processes (6)
STAT4601  Time-series analysis (6)
STAT4602  Multivariate data analysis (6)

Disciplinary Electives (24 credits)
At least 24 credits from Lists A and B, among which at least 6 credits from List A:

List A
STAT3602  Statistical inference (6)
STAT3604  Design and analysis of experiments (6)
STAT3620  Modern nonparametric statistics (6)
STAT3621  Statistical data analysis (6)

List B
STAT3605  Quality control and management (6)
STAT3606  Business logistics (6)
STAT3607  Statistics in clinical medicine and bio-medical research (6)
STAT3608  Statistical genetics (6)

STAT3612  Statistical machine learning (6)
STAT3613  Marketing analytics (6)

STAT3616  Advanced SAS programming (6)
3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - STAT3799 Directed studies in statistics (6)
   - STAT4710 Capstone experience for statistics undergraduates (6)
   - STAT4766 Statistics internship (6)
   - STAT4799 Statistics project (12)

Notes:
1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Statistics
Offered to students admitted to Year 1 in 2016

Objectives:
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Risk Management
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)
- SCNC1111 Scientific method and reasoning (6)
- SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (30 credits)
- MATH1013 University mathematics II (6)
- STAT1600 Statistics: ideas and concepts (6)
- MATH2014 Multivariable calculus and linear algebra (6)
- STAT2601 Probability and statistics I (6)
- STAT2602 Probability and statistics II (6)

2. Advanced level courses (48 credits)
Disciplinary Core Courses (24 credits)
- STAT3600 Linear statistical analysis (6)
- STAT3603 Stochastic processes (6)
- STAT4601 Time-series analysis (6)
- STAT4602 Multivariate data analysis (6)

Disciplinary Electives (24 credits)
At least 24 credits from Lists A and B, among which at least 6 credits from List A:

List A
- STAT3602 Statistical inference (6)
- STAT3604 Design and analysis of experiments (6)
- STAT3620 Modern nonparametric statistics (6)
- STAT3621 Statistical data analysis (6)

List B
- STAT3605 Quality control and management (6)
- STAT3606 Business logistics (6)
- STAT3607 Statistics in clinical medicine and bio-medical research (6)
- STAT3608 Statistical genetics (6)
- STAT3612 Statistical machine learning (6)
- STAT3613 Marketing analytics (6)
- STAT3616 Advanced SAS programming (6)

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STAT3617 Sample survey methods (6)
STAT3955 Survival analysis (6)

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:
- STAT3799 Directed studies in statistics (6)
- STAT4710 Capstone experience for statistics undergraduates (6)
- STAT4766 Statistics internship (6)
- STAT4799 Statistics project (12)

Notes:
1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.
2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.
3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.
4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.
5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Statistics
Offered to students: 2015
admitted to Year 1 in

**Objectives:**
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

**Learning Outcomes:**
By the end of this programme, students should be able to:

PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

**Impermissible Combinations:**
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Risk Management
Minor in Risk Management
Minor in Statistics

**Required courses (96 credits)**

1. **Introductory level courses (42 credits)**

   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

   **Disciplinary Core Courses (30 credits)**
   - MATH1013 University mathematics II (6)
   - STAT1600 Statistics: ideas and concepts (6)
   - MATH2014 Multivariable calculus and linear algebra (6)
   - STAT2601 Probability and statistics I (6)
   - STAT2602 Probability and statistics II (6)

2. **Advanced level courses (48 credits)**

   **Disciplinary Core Courses (24 credits)**
   - STAT3600 Linear statistical analysis (6)
   - STAT3603 Stochastic processes (6)
   - STAT4601 Time-series analysis (6)
   - STAT4602 Multivariate data analysis (6)

   **Disciplinary Electives (24 credits)**
   - At least 24 credits from Lists A and B, among which at least 6 credits from List A:
     
     **List A**
     - STAT3602 Statistical inference (6)
     - STAT3604 Design and analysis of experiments (6)
     - STAT3620 Modern nonparametric statistics (6)
     - STAT3621 Statistical data analysis (6)

     **List B**
     - STAT3605 Quality control and management (6)
     - STAT3606 Business logistics (6)
     - STAT3607 Statistics in clinical medicine and bio-medical research (6)
     - STAT3608 Statistical genetics (6)
     - STAT3612 Statistical machine learning (6)
     - STAT3613 Marketing analytics (6)
     - STAT3616 Advanced SAS programming (6)

     [previous title: Data mining (6)]
     [previous title: Marketing engineering (6)]

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### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3799</td>
<td>Directed studies in statistics (6)</td>
<td></td>
</tr>
<tr>
<td>STAT4710</td>
<td>Capstone experience for statistics undergraduates (6)</td>
<td></td>
</tr>
<tr>
<td>STAT4766</td>
<td>Statistics internship (6)</td>
<td></td>
</tr>
<tr>
<td>STAT4799</td>
<td>Statistics project (12)</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:

1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Major in Statistics

Offered to students admitted to Year 1 in 2014

### Objectives:

The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

### Learning Outcomes:

By the end of this programme, students should be able to:

1. **PLO 1**: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

2. **PLO 2**: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

3. **PLO 3**: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

4. **PLO 4**: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

5. **PLO 5**: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

6. **PLO 6**: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

### Impermissible Combinations:

- Major in Computing and Data Analytics
- Major in Decision Analytics
- Major in Risk Management
- Minor in Risk Management
- Minor in Statistics

### Required courses (96 credits)

1. **1. Introductory level courses (42 credits)**

   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)

   **Disciplinary Courses (30 credits)**
   - MATH1013 University mathematics II (6)
   - STAT1600 Statistics: ideas and concepts (6)
   - MATH2014 Multivariable calculus and linear algebra (6)
   - STAT2601 Probability and statistics I (6)
   - STAT2602 Probability and statistics II (6)

2. **2. Advanced level courses (48 credits)**

   **Disciplinary Core Courses (24 credits)**
   - STAT3600 Linear statistical analysis (6)
   - STAT3603 Stochastic processes (6) [previous title: Probability modelling (6)]
   - STAT4601 Time-series analysis (6)
   - STAT4602 Multivariate data analysis (6)

   **Disciplinary Electives (24 credits)**
   At least 24 credits from Lists A and B, among which at least 6 credits from List A:

   **List A**
   - STAT3602 Statistical inference (6)
   - STAT3604 Design and analysis of experiments (6)
   - STAT3620 Modern nonparametric statistics (6)
   - STAT3621 Statistical data analysis (6)

   **List B**
   - STAT3605 Quality control and management (6)
   - STAT3606 Business logistics (6)
   - STAT3607 Statistics in clinical medicine and bio-medical research (6)
   - STAT3608 Statistical genetics (6)
   - STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
   - STAT3613 Marketing analytics (6) [previous title: Marketing engineering (6)]
   - STAT3616 Advanced SAS programming (6)
### 3. Capstone requirement (6 credits)

**At least 6 credits selected from the following courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3617</td>
<td>Sample survey methods</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3955</td>
<td>Survival analysis</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3799</td>
<td>Directed studies in statistics</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4710</td>
<td>Capstone experience for statistics undergraduates</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4766</td>
<td>Statistics internship</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4799</td>
<td>Statistics project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Statistics
Offered to students: 2013
admitted to Year 1 in

Objectives:
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
- Major in Decision Analytics
- Major in Risk Management
- Minor in Risk Management
- Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)

   Disciplinary Core Courses (30 credits)
   MATH1013 University mathematics II (6)
   STAT1600 Statistics: ideas and concepts (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)
   STAT2603 Data management with SAS (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   STAT3600 Linear statistical analysis (6)
   STAT3603 Stochastic processes (6)
   STAT4601 Time-series analysis (6)
   STAT4602 Multivariate data analysis (6)

   Previous title: Probability modelling (6)

   Disciplinary Electives (24 credits)
   At least 24 credits from Lists A and B, among which at least 6 credits from List A:
   List A
   STAT3602 Statistical inference (6)
   STAT3604 Design and analysis of experiments (6)
   STAT3620 Modern nonparametric statistics (6)
   STAT3621 Statistical data analysis (6)

   List B
   STAT3605 Quality control and management (6)
   STAT3606 Business logistics (6)
   STAT3607 Statistics in clinical medicine and bio-medical research (6)
   STAT3608 Statistical genetics (6)
   STAT3612 Statistical machine learning (6)
   STAT3613 Marketing analytics (6)
   STAT3616 Advanced SAS programming (6)
   STAT3617 Sample survey methods (6)

   Previous title: Data mining (6)
   Previous title: Marketing engineering (6)
### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3799</td>
<td>Directed studies in statistics</td>
<td>6</td>
</tr>
<tr>
<td>STAT4710</td>
<td>Capstone experience for statistics undergraduates</td>
<td>6</td>
</tr>
<tr>
<td>STAT4766</td>
<td>Statistics internship</td>
<td>6</td>
</tr>
<tr>
<td>STAT4799</td>
<td>Statistics project</td>
<td>12</td>
</tr>
</tbody>
</table>

**Notes:**

1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title: Major in Statistics
Offered to students admitted to Year 1 in 2012

Objectives:
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

Learning Outcomes:
By the end of this programme, students should be able to:
PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)
PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Decision Analytics
Major in Risk Management
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
Disciplinary Core Courses: Science Foundation Courses (12 credits)
SCNC1111 Scientific method and reasoning (6)
SCNC1112 Fundamentals of modern science (6)

Disciplinary Core Courses (30 credits)
MATH1013 University mathematics II (6)
STAT1600 Statistics: ideas and concepts (6)
STAT2601 Probability and statistics I (6)
STAT2602 Probability and statistics II (6)
STAT2603 Data management with SAS (6)

2. Advanced level courses (48 credits)
Disciplinary Core Courses (24 credits)
STAT3600 Linear statistical analysis (6)
STAT3603 Stochastic processes (6) [previous title: Probability modelling (6)]
STAT4601 Time-series analysis (6)
STAT4602 Multivariate data analysis (6)

Disciplinary Electives (24 credits)
At least 24 credits from Lists A and B, among which at least 6 credits from List A:
List A
STAT3602 Statistical inference (6)
STAT3604 Design and analysis of experiments (6)
STAT3620 Modern nonparametric statistics (6)
STAT3621 Statistical data analysis (6)

List B
STAT3605 Quality control and management (6)
STAT3606 Business logistics (6)
STAT3607 Statistics in clinical medicine and bio-medical research (6)
STAT3608 Statistical genetics (6)
STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
STAT3613 Marketing analytics (6) [previous title: Marketing engineering (6)]
STAT3616 Advanced SAS programming (6)
STAT3617 Sample survey methods (6)
### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
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<td>Statistics internship</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4799</td>
<td>Statistics project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

### Notes:

1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (“disciplinary core”) in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.

5. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Science Minors 2019-2020

SCIENCE
Minors offered by Science Faculty

Minors

Actuarial Studies (not for BSc(ActuarSc) students)
Astronomy
Biochemistry
Chemistry
Computational & Financial Mathematics
Earth Sciences
Ecology & Biodiversity
Environmental Science
Food & Nutritional Science
Marine Biology
Mathematics
Molecular Biology & Biotechnology
Operations Research & Mathematical Programming
Physics
Plant Science
Risk Management
Science Entrepreneurship (for 2017 cohort and thereafter)
Statistics
Minor Title: Minor in Actuarial Studies

Offered to students admitted to Year 1 in 2019

Objectives:
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum)

PLO 2: develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum)

Impermissible Combinations:
Bachelor of Science in Actuarial Science

Required courses (42 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINA1310</td>
<td>Corporate finance</td>
<td>6</td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT2601</td>
<td>Probability and statistics I</td>
<td>6</td>
</tr>
<tr>
<td>STAT2602</td>
<td>Probability and statistics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT2605</td>
<td>Demographic and socio-economic statistics</td>
<td>6</td>
</tr>
<tr>
<td>STAT2901</td>
<td>Probability and statistics: foundations of actuarial science</td>
<td>6</td>
</tr>
</tbody>
</table>

2. Advanced level courses (30 credits)

Disciplinary Electives (30 credits)

At least 30 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3615</td>
<td>Practical mathematics for investment</td>
<td>6</td>
</tr>
<tr>
<td>STAT3901</td>
<td>Life contingencies I</td>
<td>6</td>
</tr>
<tr>
<td>STAT3904</td>
<td>Corporate finance for actuarial science</td>
<td>6</td>
</tr>
<tr>
<td>STAT3906</td>
<td>Risk theory I</td>
<td>6</td>
</tr>
<tr>
<td>STAT3908</td>
<td>Credibility theory and loss distributions</td>
<td>6</td>
</tr>
<tr>
<td>STAT3910</td>
<td>Financial economics I</td>
<td>6</td>
</tr>
<tr>
<td>STAT3911</td>
<td>Financial economics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT4903</td>
<td>Actuarial techniques for general insurance</td>
<td>6</td>
</tr>
</tbody>
</table>

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Actuarial Studies

Offered to students admitted to Year 1 in 2018

Objectives:
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum)

PLO 2: develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum)

Impermissible Combinations:
Bachelor of Science in Actuarial Science

Required courses (42 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:

- FINA1310 Corporate finance (6)
- MATH1013 University mathematics II (6)
- STAT2601 Probability and statistics I (6)
- STAT2602 Probability and statistics II (6)
- STAT2605 Demographic and socio-economic statistics (6)
- STAT2901 Probability and statistics: foundations of actuarial science (6)

2. Advanced level courses (30 credits)

Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:

- STAT3615 Practical mathematics for investment (6)
- STAT3901 Life contingencies I (6)
- STAT3904 Corporate finance for actuarial science (6)
- STAT3906 Risk theory I (6)
- STAT3908 Credibility theory and loss distributions (6)
- STAT3910 Financial economics I (6)
- STAT3911 Financial economics II (6)
- STAT4903 Actuarial techniques for general insurance (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**: Minor in Actuarial Studies  
**Offered to students**: admitted to Year 1 in 2017

**Objectives:**
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum)

- **PLO 2**: develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum)

**Impermissible Combinations:**
Bachelor of Science in Actuarial Science

### Required courses (42 credits)

1. **Introductory level courses (12 credits)**
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - FINA1310: Corporate finance (6)
       - MATH1013: University mathematics II (6)
       - STAT2601: Probability and statistics I (6)
       - STAT2602: Probability and statistics II (6)
       - STAT2605: Demographic and socio-economic statistics (6)
       - STAT2901: Probability and statistics: foundations of actuarial science (6)

2. **Advanced level courses (30 credits)**
   - **Disciplinary Electives (30 credits)**
     - At least 30 credits selected from the following courses:
       - STAT3615: Practical mathematics for investment (6)
       - STAT3901: Life contingencies I (6)
       - STAT3904: Corporate finance for actuarial science (6)
       - STAT3906: Risk theory I (6)
       - STAT3908: Credibility theory and loss distributions (6)
       - STAT3910: Financial economics I (6)
       - STAT3911: Financial economics II (6)
       - STAT4903: Actuarial techniques for general insurance (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Actuarial Studies
Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum)

PLO 2: develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum)

Impermissible Combinations:
Bachelor of Science in Actuarial Science

Required courses (42 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - FINA1310 Corporate finance (6)
   - MATH1013 University mathematics II (6)
   - STAT2601 Probability and statistics I (6)
   - STAT2602 Probability and statistics II (6)
   - STAT2605 Demographic and socio-economic statistics (6)
   - STAT2901 Probability and statistics: foundations of actuarial science (6)

2. Advanced level courses (30 credits)
   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   - STAT3615 Practical mathematics for investment (6)
   - STAT3901 Life contingencies I (6)
   - STAT3904 Corporate finance for actuarial science (6)
   - STAT3906 Risk theory I (6)
   - STAT3908 Credibility theory and loss distributions (6)
   - STAT3910 Financial economics I (6)
   - STAT3911 Financial economics II (6)
   - STAT4903 Actuarial techniques for general insurance (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Actuarial Studies
Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum)

PLO 2: develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum)

Impermissible Combinations:
Bachelor of Science in Actuarial Science

Required courses (42 credits)

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<table>
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<th>2. Advanced level courses (30 credits)</th>
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</thead>
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<td>DISCIPLINARY ELECTIVES (30 credits)</td>
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Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled.
Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Actuarial Studies

Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum)

PLO 2: develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum)

Impermissible Combinations:
Bachelor of Science in Actuarial Science

Required courses (42 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

- FINA1310 Corporate finance (6)
- MATH1013 University mathematics II (6)
- STAT2601 Probability and statistics I (6)
- STAT2602 Probability and statistics II (6)
- STAT2605 Demographic and socio-economic statistics (6)
- STAT2901 Probability and statistics: foundations of actuarial science (6)

2. Advanced level courses (30 credits)

Disciplinary Electives (30 credits)

At least 30 credits selected from the following courses:

- STAT3615 Practical mathematics for investment (6)
- STAT3901 Life contingencies I (6)
- STAT3904 Corporate finance for actuarial science (6)
- STAT3906 Risk theory I (6)
- STAT3908 Credibility theory and loss distributions (6)
- STAT3910 Financial economics I (6)
- STAT3911 Financial economics II (6)
- STAT4903 Actuarial techniques for general insurance (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**  
Minor in Actuarial Studies

**Offered to students admitted to Year 1 in 2013**

**Objectives:**  
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

1. **PLO 1**: understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum).

2. **PLO 2**: develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum).

**Impermissible Combinations:**  
Bachelor of Science in Actuarial Science

**Required courses (42 credits)**

1. **Introductory level courses (12 credits)**

   **Disciplinary Electives (12 credits)**  
   At least 12 credits selected from the following courses:
   - FINA1310 Corporate finance (6)
   - MATH1013 University mathematics II (6)
   - STAT2601 Probability and statistics I (6)
   - STAT2602 Probability and statistics II (6)
   - STAT2605 Demographic and socio-economic statistics (6)
   - STAT2901 Probability and statistics: foundations of actuarial science (6)

2. **Advanced level courses (30 credits)**

   **Disciplinary Electives (30 credits)**  
   At least 30 credits selected from the following courses:
   - STAT3615 Practical mathematics for investment (6)
   - STAT3901 Life contingencies I (6)
   - STAT3904 Corporate finance for actuarial science (6)
   - STAT3906 Risk theory I (6)
   - STAT3908 Credibility theory and loss distributions (6)
   - STAT3910 Financial economics I (6)
   - STAT3911 Financial economics II (6)
   - STAT4903 Actuarial techniques for general insurance (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Actuarial Studies

Offered to students admitted to Year 1 in 2012

Objectives:
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum)

PLO 2: develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum)

Impermissible Combinations:
Bachelor of Science in Actuarial Science

Required courses (42 credits)

1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - FINA1310 Corporate finance (6)
   - MATH1013 University mathematics II (6)
   - STAT2601 Probability and statistics I (6)
   - STAT2602 Probability and statistics II (6)
   - STAT2605 Demographic and socio-economic statistics (6)
   - STAT2901 Probability and statistics: foundations of actuarial science (6)

2. Advanced level courses (30 credits)
   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   - STAT3615 Practical mathematics for investment (6)
   - STAT3901 Life contingencies I (6)
   - STAT3904 Corporate finance for actuarial science (6)
   - STAT3906 Risk theory I (6)
   - STAT3908 Credibility theory and loss distributions (6)
   - STAT3910 Financial economics I (6)
   - STAT3911 Financial economics II (6)
   - STAT4903 Actuarial techniques for general insurance (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Astronomy
Offered to students admitted to Year 1 in 2019

Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe astrophysical phenomena with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: develop their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and opportunities of field activities in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (18 credits)
   Disciplinary Core Courses (12 credits)
   PHYS1650 Nature of the universe (6)
   PHYS2650 Modern astronomy (6)
   Disciplinary Electives (6 credits)
   At least 6 credits selected from the following courses:
   PHYS1250 Fundamental physics (6)
   PHYS2055 Introductory relativity (6)
   PHYS2160 Introductory computational physics (6)
   EASC2408 Planetary geology (6)

2. Advanced level courses (18 credits)
   Disciplinary Core Courses (6 credits)
   PHYS3650 Observational astronomy (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   PHYS3653 Astrophysics (6)
   PHYS3660 Astronomy laboratory (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Cosmology (6)
   PHYS4654 General relativity (6)
   PHYS4655 Interstellar medium (6)
   PHYS4656 Advanced astrophysics (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**: Minor in Astronomy  
**Offered to students**: admitted to Year 1 in 2018

**Objectives:**
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: identify and describe astrophysical phenomena with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: develop their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and opportunities of field activities in the curriculum)
- **PLO 3**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

**Impermissible Combinations:**
NIL

**Required courses (36 credits)**
1. **Introductory level courses (18 credits)**
   **Disciplinary Core Courses (12 credits)**
   - PHYS1650 Nature of the universe (6)
   - PHYS2650 Modern astronomy (6)

   **Disciplinary Electives (6 credits)**
   At least 6 credits selected from the following courses:
   - PHYS1250 Fundamental physics (6)
   - PHYS2055 Introductory relativity (6)  
   - EASC2408 Planetary geology (6)

2. **Advanced level courses (18 credits)**
   **Disciplinary Core Courses (6 credits)**
   - PHYS3650 Observational astronomy (6)

   **Disciplinary Electives (12 credits)**
   At least 12 credits selected from the following courses:
   - PHYS3653 Astrophysics (6)
   - PHYS3660 Astronomy laboratory (6)
   - PHYS4652 Planetary science (6)
   - PHYS4653 Cosmology (6)
   - PHYS4654 General relativity (6)
   - PHYS4655 Interstellar medium (6)
   - PHYS4656 Advanced astrophysics (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor in Astronomy

Offered to students admitted to Year 1 in 2017

### Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: identify and describe astrophysical phenomena with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: develop their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and opportunities of field activities in the curriculum)
- **PLO 3**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

### Impermissible Combinations:
Major in Astronomy

### Required courses (42 credits)

#### 1. Introductory level courses (18 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Nature of the universe</td>
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</tr>
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<td>PHYS2265</td>
<td>Introductory quantum physics</td>
<td>6</td>
</tr>
</tbody>
</table>

#### 2. Advanced level courses (24 credits)

<table>
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<th>Course Code</th>
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<tr>
<td>PHYS3652</td>
<td>Principles of astronomy</td>
<td>6</td>
</tr>
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<td>PHYS4650</td>
<td>Stellar physics</td>
<td>6</td>
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<td>PHYS4651</td>
<td>Selected topics in astrophysics</td>
<td>6</td>
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<tr>
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<td>Planetary science</td>
<td>6</td>
</tr>
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</tr>
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<td>6</td>
</tr>
<tr>
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<td>Stellar atmospheres</td>
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</tr>
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### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.
2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Astronomy
Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe astrophysical phenomena with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: develop their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and opportunities of field activities in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Astronomy

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Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Astronomy

Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: identify and describe astrophysical phenomena with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: develop their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and opportunities of field activities in the curriculum)
- **PLO 3**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Astronomy

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Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Astronomy
Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

1. PLO 1: identify and describe astrophysical phenomena with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)
2. PLO 2: develop their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and opportunities of field activities in the curriculum)
3. PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Astronomy

Required courses (42 credits)

1. Introductory level courses (18 credits)
   Disciplinary Core Courses (18 credits)
   - PHYS1250 Fundamental physics (6)
   - PHYS1650 Nature of the universe (6)
   - PHYS2265 Introductory quantum physics (6)
     [previous title: Modern physics (6)]

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   - PHYS3650 Observational astronomy (6)
   - PHYS3651 The physical universe (6)
   - PHYS3652 Principles of astronomy (6)
   - PHYS4660 Stellar physics (6)
   - PHYS4661 Selected topics in astrophysics (6)
   - PHYS4662 Planetary science (6)
   - PHYS4663 Cosmology (6)
   - PHYS4664 General relativity (6)
   - PHYS4665 Interstellar medium (6)
   - PHYS7650 Stellar atmospheres (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.
2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Astronomy
Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe astrophysical phenomena with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: develop their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and opportunities of field activities in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Astronomy

Required courses (42 credits)

1. Introductory level courses (18 credits)
   Disciplinary Core Courses (18 credits)
   PHYS1250 Fundamental physics (6)
   PHYS1650 Nature of the universe (6)
   PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   PHYS3650 Observational astronomy (6)
   PHYS3651 The physical universe (6)
   PHYS3652 Principles of astronomy (6)
   PHYS4650 Stellar physics (6)
   PHYS4651 Selected topics in astrophysics (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Cosmology (6)
   PHYS4654 General relativity (6)
   PHYS4655 Interstellar medium (6)
   PHYS7650 Stellar atmospheres (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Astronomy
Offered to students admitted to Year 1 in 2012

Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe astrophysical phenomena with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: develop their scientific intuition, abilities and techniques to tackle astrophysical problems either theoretical or observational in nature (by means of coursework, tutorial classes, and opportunities of field activities in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Astronomy

Required courses (42 credits)
1. Introductory level courses (18 credits)
   Disciplinary Core Courses (18 credits)
   PHYS1250 Fundamental physics (6)
   PHYS1650 Nature of the universe (6)
   PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   PHYS3650 Observational astronomy (6)
   PHYS3651 The physical universe (6)
   PHYS3652 Principles of astronomy (6)
   PHYS4650 Stellar physics (6)
   PHYS4651 Selected topics in astrophysics (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Cosmology (6)
   PHYS4654 General relativity (6)
   PHYS4655 Interstellar medium (6)
   PHYS7650 Stellar atmospheres (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**: Minor in Biochemistry  
**Offered to students**: admitted to Year 1 in 2019

**Objectives:**
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student's Major.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2**: integrate knowledge regarding the structure and function of biological molecules and how they come together to form the systems that make up life (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 3**: develop a general interest in biochemistry and recognize the inter-relationship of biochemistry with other disciplines (by means of coursework and laboratory-based learning in the curriculum)

**Impermissible Combinations:**
- Major in Biochemistry

---

<table>
<thead>
<tr>
<th>Required courses (36 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (12 credits)</strong></td>
</tr>
<tr>
<td><strong>Disciplinary Electives (12 credits)</strong></td>
</tr>
<tr>
<td>At least 12 credits selected from the following courses:</td>
</tr>
<tr>
<td>BIOC1600 Perspectives in biochemistry (6)</td>
</tr>
<tr>
<td>BIOL1110 From molecules to cells (6)</td>
</tr>
<tr>
<td>BIOC2600 Basic biochemistry (6)</td>
</tr>
<tr>
<td>BIOL2220 Principles of biochemistry (6)</td>
</tr>
<tr>
<td>Take either BIOC2600 or BIOL2220 to fulfill this 12 credits requirement, but not both. BIOC2600 and BIOL2220 are mutually exclusive.</td>
</tr>
</tbody>
</table>

| 2. Advanced level courses (24 credits) |
| **Disciplinary Electives (24 credits)** |
| At least 24 credits selected from the following courses: |
| BIOC3601 Basic metabolism (6) |
| BIOC3604 Essential techniques in biochemistry and molecular biology (6) |
| BIOC3605 Sequence bioinformatics (6) |
| BIOC3606 Molecular medicine (6) |
| BIOL3202 Nutritional biochemistry (6) |
| BIOL3401 Molecular biology (6) |
| BIOL3402 Cell biology and cell technology (6) |
| BIOL3403 Immunology (6) |
| BIOL3404 Protein structure and function (6) |
| BIOC4610 Advanced biochemistry (6) |
| BIOC4612 Molecular biology of the gene (6) |
| BIOC4613 Advanced techniques in biochemistry & molecular biology (6) |
| BIOL4417 'Omics' and systems biology (6) |
| CHEM4444 Chemical biology (6) |

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (*disciplinary core*) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Biochemistry  
Offered to students admitted to Year 1 in 2018

Objectives:  
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student's Major.

Learning Outcomes:  
By the end of this programme, students should be able to:

- **PLO 1**: describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2**: integrate knowledge regarding the structure and function of biological molecules and how they come together to form the systems that make up life (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 3**: develop a general interest in biochemistry and recognize the inter-relationship of biochemistry with other disciplines (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:  
Major in Biochemistry

### Required courses (36 credits)

1. **Introductory level courses (12 credits)**
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - BIOL1110: From molecules to cells (6)
       - BIOL2220: Principles of biochemistry (6)
       - BIOC2600: Basic biochemistry (6)
       - Take either BIOC2600 or BIOL2220 to fulfill this 12 credits requirement, but not both.
       - BIOC2600 and BIOL2220 are mutually exclusive.

2. **Advanced level courses (24 credits)**
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits selected from the following courses:
       - BIOC3601: Basic metabolism (6)
       - BIOC3604: Essential techniques in biochemistry and molecular biology (6)
       - BIOC3605: Sequence bioinformatics (6)
       - BIOC3606: Molecular medicine (6)
       - BIOL3202: Nutritional biochemistry (6)
       - BIOL3401: Molecular biology (6)
       - BIOL3402: Cell biology and cell technology (6)
       - BIOL3403: Immunology (6)
       - BIOL3404: Protein structure and function (6)
       - BIOC4610: Advanced biochemistry (6)
       - BIOC4612: Molecular biology of the gene (6)
       - BIOC4613: Advanced techniques in biochemistry & molecular biology (6)
       - BIOL4417: 'Omics' and systems biology (6)
       - CHEM4444: Chemical biology (6)

Notes:  
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:  
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor in Biochemistry

**Offered to students admitted to Year 1 in 2017**

### Objectives:
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student’s Major.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2**: integrate knowledge regarding the structure and function of biological molecules and how they come together to form the systems that make up life (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 3**: develop a general interest in biochemistry and recognize the inter-relationship of biochemistry with other disciplines (by means of coursework and laboratory-based learning in the curriculum)

### Impermissible Combinations:
Major in Biochemistry

### Required courses (36 credits)

1. **Introductory level courses (12 credits)**
   **Disciplinary Electives (12 credits)**
   At least 12 credits selected from the following courses:
   - BIOL1110 From molecules to cells (6)
   - BIOL2220 Principles of biochemistry (6)
   - BIOL3202 Nutritional biochemistry (6)
   - BIOL3401 Molecular biology (6)
   - BIOL3402 Cell biology and cell technology (6)
   - BIOL3403 Immunology (6)
   - BIOL3404 Protein structure and function (6)
   - BIOL4417 'Omnis' and systems biology (6)
   - CHEM4444 Chemical biology (6)

   Take either BIOC2600 or BIOL2220 to fulfill this 12 credits requirement, but not both. BIOC2600 and BIOL2220 are mutually exclusive.

2. **Advanced level courses (24 credits)**
   **Disciplinary Electives (24 credits)**
   At least 24 credits selected from the following courses:
   - BIOC3601 Basic metabolism (6)
   - BIOC3604 Essential techniques in biochemistry and molecular biology (6)
   - BIOC3605 Sequence bioinformatics (6)
   - BIOC3606 Molecular medicine (6)
   - BIOL3401 Molecular biology (6)
   - BIOL3402 Cell biology and cell technology (6)
   - BIOL3403 Immunology (6)
   - BIOL3404 Protein structure and function (6)
   - BIOC4610 Advanced biochemistry (6)
   - BIOC4612 Molecular biology of the gene (6)
   - BIOC4613 Advanced techniques in biochemistry & molecular biology (6)
   - BIOL4417 'Omnis' and systems biology (6)
   - CHEM4444 Chemical biology (6)

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
# Minor in Biochemistry

**Offered to students admitted to Year 1 in 2016**

## Objectives:
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student's Major.

## Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1**: describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)

**PLO 2**: integrate knowledge regarding the structure and function of biological molecules and how they come together to form the systems that make up life (by means of coursework and laboratory-based learning in the curriculum)

**PLO 3**: develop a general interest in biochemistry and recognize the inter-relationship of biochemistry with other disciplines (by means of coursework and laboratory-based learning in the curriculum)

## Impermissible Combinations:
Major in Biochemistry

### Required courses (36 credits)

#### 1. Introductory level courses (12 credits)

**Disciplinary Electives (12 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC1600</td>
<td>Perspectives in biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

*Take either BIOC2600 or BIOL2220 to fulfill this 12 credits requirement, but not both. BIOC2600 and BIOL2220 are mutually exclusive.*

**Disciplinary Electives (12 credits)**

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<tr>
<th>Course Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOC3601</td>
<td>Basic metabolism</td>
<td>6</td>
</tr>
<tr>
<td>BIOC3604</td>
<td>Essential techniques in biochemistry and molecular biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOC3605</td>
<td>Sequence bioinformatics</td>
<td>6</td>
</tr>
<tr>
<td>BIOC3606</td>
<td>Molecular medicine</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3202</td>
<td>Nutritional biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3401</td>
<td>Molecular biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3404</td>
<td>Protein structure and function</td>
<td>6</td>
</tr>
<tr>
<td>BIOC4610</td>
<td>Advanced biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOC4612</td>
<td>Molecular biology of the gene</td>
<td>6</td>
</tr>
<tr>
<td>BIOC4613</td>
<td>Advanced techniques in biochemistry &amp; molecular biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4417</td>
<td>'Omics' and systems biology</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology</td>
<td>6</td>
</tr>
</tbody>
</table>

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**  
Minor in Biochemistry  

**Offered to students**  
admitted to Year 1 in **2015**  

**Objectives:**  
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student’s Major.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

- **PLO 1:** describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)

- **PLO 2:** integrate knowledge regarding the structure and function of biological molecules and how they come together to form the systems that make up life (by means of coursework and laboratory-based learning in the curriculum)

- **PLO 3:** develop a general interest in biochemistry and recognize the inter-relationship of biochemistry with other disciplines (by means of coursework and laboratory-based learning in the curriculum)

**Impermissible Combinations:**  
Major in Biochemistry

### Required courses (36 credits)

1. **Introductory level courses (12 credits)**
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - BIOL1110  From molecules to cells (6)
       - BIOL2220  Principles of biochemistry (6)
       - **BIOC1600**  Perspectives in biochemistry (6)
       - **BIOC2600**  Basic biochemistry (6)
       - **BIOL2220**  Principles of biochemistry (6)
       - Take either BIOC2600 or BIOL2220 to fulfill this 12 credits requirement, but not both. BIOC2600 and BIOL2220 are mutually exclusive.

2. **Advanced level courses (24 credits)**
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits selected from the following courses:
       - BIOL3202  Nutritional biochemistry (6)
       - BIOL3401  Molecular biology (6)
       - BIOL3402  Cell biology and cell technology (6)
       - BIOL3403  Immunology (6)
       - BIOL3404  Protein structure and function (6)
       - BIOL3405  Sequence bioinformatics (6)
       - BIOC3601  Basic metabolism (6)
       - BIOC3604  Essential techniques in biochemistry and molecular biology (6)
       - BIOC3606  Molecular medicine (6)
       - BIOC3608  Sequence bioinformatics (6)
       - BIOC3610  Advanced biochemistry (6)
       - BIOC3612  Molecular biology of the gene (6)
       - BIOC4610  Advanced techniques in biochemistry & molecular biology (6)
       - BIOL4417  ‘Omics’ and systems biology (6)
       - CHEM4444  Chemical biology (6)

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title | Minor in Biochemistry  
Offered to students | 2014  
admitted to Year 1 in  

**Objectives:**  
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student's Major.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

**PLO 1:** describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)

**PLO 2:** integrate knowledge regarding the structure and function of biological molecules and how they come together to form the systems that make up life (by means of coursework and laboratory-based learning in the curriculum)

**PLO 3:** develop a general interest in biochemistry and recognize the inter-relationship of biochemistry with other disciplines (by means of coursework and laboratory-based learning in the curriculum)

**Impermissible Combinations:**  
Major in Biochemistry

**Required courses (36 credits)**

1. **Introductory level courses (12 credits)**

**Disciplinary Electives (12 credits)**

   At least 12 credits selected from the following courses:
   - BIOC1600 Perspectives in biochemistry (6)
   - BIOL1110 From molecules to cells (6)
   - BIOC2600 Basic biochemistry (6)

2. **Advanced level courses (24 credits)**

**Disciplinary Electives (24 credits)**

   At least 24 credits selected from the following courses:
   - BIOC3601 Basic metabolism (6)
   - BIOC3604 Essential techniques in biochemistry and molecular biology (6)
   - BIOC3605 Sequence bioinformatics (6)
   - BIOC3606 Molecular medicine (6)
   - BIOL3202 Nutritional biochemistry (6)
   - BIOL3401 Molecular biology (6)
   - BIOL3402 Cell biology and cell technology (6)
   - BIOL3403 Immunology (6)
   - BIOL3404 Protein structure and function (6)
   - BIOC4610 Advanced biochemistry (6)
   - BIOC4612 Molecular biology of the gene (6)
   - BIOC4613 Advanced techniques in biochemistry & molecular biology (6)
   - BIOL4417 'Omics' and systems biology (6)
   - CHEM4444 Chemical biology (6)

**Notes:**

1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title Minor in Biochemistry
Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student’s Major.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: integrate knowledge regarding the structure and function of biological molecules and how they come together to form the systems that make up life (by means of coursework and laboratory-based learning in the curriculum)

PLO 3: develop a general interest in biochemistry and recognize the inter-relationship of biochemistry with other disciplines (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Biochemistry

Required courses (36 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- BIOC1600 Perspectives in biochemistry (6)
- BIOL1110 From molecules to cells (6)
- BIOC2600 Basic biochemistry (6)

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
- BIOC3601 Basic metabolism (6)
- BIOC3604 Essential techniques in biochemistry and molecular biology (6)
- BIOC3605 Sequence bioinformatics (6)
- BIOC3606 Molecular medicine (6)
- BIOL3202 Nutritional biochemistry (6)
- BIOL3401 Molecular biology (6)
- BIOL3402 Cell biology and cell technology (6)
- BIOL3403 Immunology (6)
- BIOL3404 Protein structure and function (6)
- BIOC4610 Advanced biochemistry (6)
- BIOC4612 Molecular biology of the gene (6)
- BIOC4613 Advanced techniques in biochemistry & molecular biology (6)
- BIOL4417 ‘Omics’ and systems biology (6)
- CHEM4444 Chemical biology (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
### Objectives:
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student's Major.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2**: integrate knowledge regarding the structure and function of biological molecules and how they come together to form the systems that make up life (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 3**: develop a general interest in biochemistry and recognize the inter-relationship of biochemistry with other disciplines (by means of coursework and laboratory-based learning in the curriculum)

### Impermissible Combinations:
Major in Biochemistry

### Required courses (36 credits)
1. Introductory level courses (12 credits)
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - BIOC1600 Perspectives in biochemistry (6)
       - BIOL1110 From molecules to cells (6)
       - BIOC2600 Basic biochemistry (6)

2. Advanced level courses (24 credits)
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits selected from the following courses:
       - BIOC3601 Basic metabolism (6)
       - BIOC3604 Essential techniques in biochemistry and molecular biology (6)
       - BIOC3605 Sequence bioinformatics (6)
       - BIOC3606 Molecular medicine (6)
       - BIOL3202 Nutritional biochemistry (6)
       - BIOL3401 Molecular biology (6)
       - BIOL3402 Cell biology and cell technology (6)
       - BIOL3403 Immunology (6)
       - BIOL3404 Protein structure and function (6)
       - BIOC4610 Advanced biochemistry (6)
       - BIOC4612 Molecular biology of the gene (6)
       - BIOC4613 Advanced techniques in biochemistry & molecular biology (6)
       - BIOL4417 'Omics' and systems biology (6)
       - CHEM4444 Chemical biology (6)

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled.

Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor Title
Minor in Chemistry

## Offered to students
Admitted to Year 1 in 2019

## Objectives:
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

## Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1**: understand and apply the basic concepts of chemistry (by means of coursework and laboratory-based learning in the curriculum)

**PLO 2**: apply chemistry concepts in other subjects (by means of coursework and laboratory-based learning in the curriculum)

**PLO 3**: transfer the basic concepts to complement their major area of study (by means of coursework and laboratory-based learning in the curriculum)

## Impermissible Combinations:
Major in Chemistry
Major in Chemistry (Intensive)

### Required courses (42 credits)

#### 1. Introductory level courses (24 credits)

**Disciplinary Core Courses (12 credits)**
- CHEM1042: General chemistry I (6)
- CHEM1043: General chemistry II (6)

**Disciplinary Electives (12 credits)**
At least 12 credits selected from the following courses:
- CHEM2241: Analytical chemistry I (6)
- CHEM2341: Inorganic chemistry I (6)
- CHEM2441: Organic chemistry I (6)
- CHEM2442: Fundamentals of organic chemistry (6)
- CHEM2541: Introductory physical chemistry (6)

**CHEM2441 and CHEM2442** are mutually exclusive.

#### 2. Advanced level courses (18 credits)

**Disciplinary Electives (18 credits)**
At least 18 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

**List A**
- CHEM3141: Environmental chemistry (6)
- CHEM3142: Chemical process industries and analysis (6)
- CHEM3143: Introduction to materials chemistry (6)
- CHEM3146: Principles and applications of spectroscopic and analytical techniques (6)
- CHEM3241: Analytical chemistry II: chemical instrumentation (6)
- CHEM3242: Food and water analysis (6)
- CHEM3243: Introductory instrumental chemical analysis (6)
- CHEM3244: Analytical techniques for pharmacy students (6)
- CHEM3341: Inorganic chemistry II (6)
- CHEM3342: Bioinorganic chemistry (6)
- CHEM3344: Organic chemistry II (6)
- CHEM3344: Organic chemistry of biomolecules (6)
- CHEM3343: Organic chemistry laboratory (6)
- CHEM3345: Integrated laboratory (6)
- CHEM3541: Physical chemistry: Introduction to quantum chemistry (6)
- CHEM3542: Physical chemistry: statistical thermodynamics and kinetics theory (6)
- CHEM3999: Directed studies in chemistry (6)
- CHEM4142: Symmetry, group theory and applications (6)
- CHEM4143: Interfacial science and technology (6)
- CHEM4144: Advanced materials (6)
- CHEM4145: Medicinal chemistry (6)
- CHEM4147: Supramolecular chemistry (6)
- CHEM4148: Frontiers in Modern Chemical Science (6)
- CHEM4241: Modern chemical instrumentation and applications (6)
- CHEM4242: Analytical chemistry (6)
- CHEM4341: Advanced inorganic chemistry (6)
- CHEM4342: Organometallic chemistry (6)
- CHEM4441: Advanced organic chemistry (6)
- CHEM4443: Integrated organic synthesis (6)
- CHEM4444: Chemical biology (6)
- CHEM4542: Computational chemistry (6)
- CHEM4543: Advanced physical chemistry (6)
- CHEM4544: Electrochemical science and technology (6)
- CHEM4910: Chemistry literacy and research (6)
CHEM4911 Capstone experience for chemistry undergraduates: HKUtopia (6)
CHEM4966 Chemistry internship (6)
CHEM4999 Chemistry project (12)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Chemistry

Offered to students admitted to Year 1 in 2018

Objectives:
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and apply the basic concepts of chemistry (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: apply chemistry concepts in other subjects (by means of coursework and laboratory-based learning in the curriculum)

PLO 3: transfer the basic concepts to complement their major area of study (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Chemistry
Major in Chemistry (Intensive)

Required courses (42 credits)

1. Introductory level courses (24 credits)

   Disciplinary Core Courses (12 credits)
   CHEM1042 General chemistry I (6)
   CHEM1043 General chemistry II (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   CHEM2241 Analytical chemistry I (6)
   CHEM2341 Inorganic chemistry I (6)
   CHEM2441 Organic chemistry I (6)
   CHEM2442 Fundamentals of organic chemistry (6)
   CHEM2541 Introductory physical chemistry (6)

2. Advanced level courses (18 credits)

   Disciplinary Electives (18 credits)
   At least 18 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

   List A
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   CHEM3142 Chemical process industries and analysis (6)
   CHEM3143 Introduction to materials chemistry (6)
   CHEM3146 Principles and applications of spectroscopic and analytical techniques (6)
   CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   CHEM3242 Food and water analysis (6)
   CHEM3243 Introductory instrumental chemical analysis (6)
   CHEM3244 Analytical techniques for pharmacy students (6)
   CHEM3341 Inorganic chemistry II (6)
   CHEM3342 Bioinorganic chemistry (6)
   CHEM3344 Organic chemistry II (6)
   CHEM3344 Organic chemistry of biomolecules (6)
   CHEM3345 Organic chemistry laboratory (6)
   CHEM3346 Integrated laboratory (6)
   CHEM3541 Physical chemistry: Introduction to quantum chemistry (6)
   CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory (6)
   CHEM3999 Directed studies in chemistry (6)
   CHEM4142 Symmetry, group theory and applications (6)
   CHEM4143 Interfacial science and technology (6)
   CHEM4144 Advanced materials (6)
   CHEM4145 Medicinal chemistry (6)
   CHEM4147 Supramolecular chemistry (6)
   CHEM4148 Frontiers in Modern Chemical Science (6)
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   CHEM4242 Analytical chemistry (6)
   CHEM4341 Advanced inorganic chemistry (6)
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   CHEM4444 Chemical biology (6)
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   CHEM4544 Electrochemical science and technology (6)
   CHEM4910 Chemistry literacy and research (6)
CHEM4911 Capstone experience for chemistry undergraduates:
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CHEM4966 Chemistry internship (6)
CHEM4999 Chemistry project (12)

Notes:
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Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Chemistry  
Offered to students admitted to Year 1 in 2017

**Objectives:**
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

**Learning Outcomes:**
By the end of this programme, students should be able to:

**PLO 1:** understand and apply the basic concepts of chemistry (by means of coursework and laboratory-based learning in the curriculum)

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**PLO 3:** transfer the basic concepts to complement their major area of study (by means of coursework and laboratory-based learning in the curriculum)

**Impermissible Combinations:**
Major in Chemistry  
Major in Chemistry (Intensive)

### Required courses (42 credits)

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CHEM4966 Chemistry internship (6)
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Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Chemistry
Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

Learning Outcomes:
By the end of this programme, students should be able to:
- PLO 1: understand and apply the basic concepts of chemistry (by means of coursework and laboratory-based learning in the curriculum)
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- PLO 3: transfer the basic concepts to complement their major area of study (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Chemistry
Major in Chemistry (Intensive)

Required courses (42 credits)

1. Introductory level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - CHEM1042: General chemistry I (6)
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   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - CHEM2041: Principles of chemistry (6)
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2. Advanced level courses (18 credits)
   Disciplinary Electives (18 credits)
   At least 18 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:
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Remarks:
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Minor Title: Minor in Chemistry
Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

Learning Outcomes:
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Impermissible Combinations:
Major in Chemistry
Major in Chemistry (Intensive)

Required courses (42 credits)

1. Introductory level courses (24 credits)

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Objectives:
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Impermissible Combinations:
Major in Chemistry
Major in Chemistry (Intensive)

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<tr>
<td>CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory (6)</td>
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<tr>
<td>CHEM3999 Directed studies in chemistry (6)</td>
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<tr>
<td>CHEM4142 Symmetry, group theory and applications (6)</td>
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<tr>
<td>CHEM4143 Interfacial science and technology (6)</td>
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<tr>
<td>CHEM4144 Advanced materials (6)</td>
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<tr>
<td>CHEM4145 Medicinal chemistry (6)</td>
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<td>CHEM4147 Supramolecular chemistry (6)</td>
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<tr>
<td>CHEM4148 Frontiers in Modern Chemical Science (6)</td>
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<tr>
<td>CHEM4241 Modern chemical instrumentation and applications (6)</td>
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<td>CHEM4341 Advanced inorganic chemistry (6)</td>
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<td>CHEM4342 Organometallic chemistry (6)</td>
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<td>CHEM4444 Chemical biology (6)</td>
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<tr>
<td>CHEM4542 Computational chemistry (6)</td>
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<tr>
<td>CHEM4543 Advanced physical chemistry (6)</td>
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<td>CHEM4544 Electrochemical science and technology (6)</td>
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<tr>
<td>Course Code</td>
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<tr>
<td>CHEM4910</td>
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<tr>
<td>CHEM4911</td>
</tr>
<tr>
<td>CHEM4966</td>
</tr>
<tr>
<td>CHEM4999</td>
</tr>
</tbody>
</table>

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title
Minor in Chemistry
Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and apply the basic concepts of chemistry (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: apply chemistry concepts in other subjects (by means of coursework and laboratory-based learning in the curriculum)

PLO 3: transfer the basic concepts to complement their major area of study (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Chemistry
Major in Chemistry (Intensive)

Required courses (42 credits)
1. Introductory level courses (18 credits)
   Disciplinary Core Courses (6 credits)
   CHEM1041 General chemistry I (6) [previous title: General chemistry (6)]

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   CHEM2041 Principles of chemistry (6)
   CHEM2241 Analytical chemistry I (6)
   CHEM2341 Inorganic chemistry I (6)
   CHEM2441 Organic chemistry I (6) [CHEM2441 and CHEM2442 are mutually exclusive.]
   CHEM2442 Fundamentals of organic chemistry I (6) [CHEM2441 and CHEM2442 are mutually exclusive.]
   CHEM2541 Introductory physical chemistry (6) [previous title: Physical chemistry I (6)]

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:
   List A
   CHEM3141 Environmental chemistry (6)
   CHEM3142 Chemical process industries and analysis (6)
   CHEM3143 Introduction to materials chemistry (6)
   CHEM3146 Principles and applications of spectroscopic and analytical techniques (6)
   CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   CHEM3242 Food and water analysis (6)
   CHEM3243 Introductory instrumental chemical analysis (6)
   CHEM3244 Analytical techniques for pharmacy students (6)
   CHEM3341 Inorganic chemistry II (6)
   CHEM3342 Bioinorganic chemistry (6)
   CHEM3441 Organic chemistry II (6)
   CHEM3442 Organic chemistry of biomolecules (6)
   CHEM3443 Organic chemistry laboratory (6)
   CHEM3445 Integrated laboratory (6)
   CHEM3541 Physical chemistry: introduction to quantum chemistry (6) [previous title: Physical chemistry II: introduction to quantum chemistry (6)]
   CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory (6)
   CHEM3999 Directed studies in chemistry (6)
   CHEM4142 Symmetry, group theory and applications (6)
   CHEM4143 Interfacial science and technology (6)
   CHEM4144 Advanced materials (6)
   CHEM4145 Medicinal chemistry (6)
   CHEM4147 Supramolecular chemistry (6)
   CHEM4148 Frontiers in Modern Chemical Science (6)
   CHEM4241 Modern chemical instrumentation and applications (6)
   CHEM4242 Analytical chemistry (6)
   CHEM4341 Advanced inorganic chemistry (6)
   CHEM4342 Organometallic chemistry (6)
   CHEM4441 Advanced organic chemistry (6)
   CHEM4443 Integrated organic synthesis (6)
   CHEM4444 Chemical biology (6)
   CHEM4541 Physical chemistry III: statistical thermodynamics and kinetics theory (6)
   CHEM4542 Computational chemistry (6)
Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Chemistry

Offered to students admitted to Year 1 in 2012

Objectives:
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and apply the basic concepts of chemistry (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: apply chemistry concepts in other subjects (by means of coursework and laboratory-based learning in the curriculum)

PLO 3: transfer the basic concepts to complement their major area of study (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Chemistry
Major in Chemistry (Intensive)

Required courses (42 credits)

1. Introductory level courses (18 credits)

Disciplinary Core Courses (6 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM104</td>
<td>General chemistry I (6)</td>
</tr>
</tbody>
</table>

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM2041</td>
<td>Principles of chemistry (6)</td>
</tr>
<tr>
<td>CHEM2241</td>
<td>Analytical chemistry I (6)</td>
</tr>
<tr>
<td>CHEM2341</td>
<td>Inorganic chemistry I (6)</td>
</tr>
<tr>
<td>CHEM2441</td>
<td>Organic chemistry I (6)</td>
</tr>
<tr>
<td>CHEM2442</td>
<td>Fundamentals of organic chemistry (6)</td>
</tr>
<tr>
<td>CHEM2541</td>
<td>Introductory physical chemistry (6)</td>
</tr>
</tbody>
</table>

CHEM2441 and CHEM2442 are mutually exclusive.

2. Advanced level courses (24 credits)

Disciplinary Electives (24 credits)

At least 24 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

List A

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3141</td>
<td>Environmental chemistry (6)</td>
</tr>
<tr>
<td>CHEM3142</td>
<td>Chemical process industries and analysis (6)</td>
</tr>
<tr>
<td>CHEM3143</td>
<td>Introduction to materials chemistry (6)</td>
</tr>
<tr>
<td>CHEM3146</td>
<td>Principles and applications of spectroscopic and analytical techniques (6)</td>
</tr>
<tr>
<td>CHEM3241</td>
<td>Analytical chemistry II: chemical instrumentation (6)</td>
</tr>
<tr>
<td>CHEM3242</td>
<td>Food and water analysis (6)</td>
</tr>
<tr>
<td>CHEM3243</td>
<td>Introductory instrumental chemical analysis (6)</td>
</tr>
<tr>
<td>CHEM3244</td>
<td>Analytical techniques for pharmacy students (6)</td>
</tr>
<tr>
<td>CHEM3341</td>
<td>Inorganic chemistry II (6)</td>
</tr>
<tr>
<td>CHEM3342</td>
<td>Bioinorganic chemistry (6)</td>
</tr>
<tr>
<td>CHEM3441</td>
<td>Organic chemistry II (6)</td>
</tr>
<tr>
<td>CHEM3442</td>
<td>Organic chemistry of biomolecules (6)</td>
</tr>
<tr>
<td>CHEM3443</td>
<td>Organic chemistry laboratory (6)</td>
</tr>
<tr>
<td>CHEM3445</td>
<td>Integrated laboratory (6)</td>
</tr>
<tr>
<td>CHEM3541</td>
<td>Physical chemistry: Introduction to quantum chemistry (6)</td>
</tr>
<tr>
<td>CHEM3542</td>
<td>Physical chemistry: statistical thermodynamics and kinetics theory (6)</td>
</tr>
<tr>
<td>CHEM3999</td>
<td>Directed studies in chemistry (6)</td>
</tr>
<tr>
<td>CHEM4142</td>
<td>Symmetry, group theory and applications (6)</td>
</tr>
<tr>
<td>CHEM4143</td>
<td>Interfacial science and technology (6)</td>
</tr>
<tr>
<td>CHEM4144</td>
<td>Advanced materials (6)</td>
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<tr>
<td>CHEM4145</td>
<td>Medicinal chemistry (6)</td>
</tr>
<tr>
<td>CHEM4147</td>
<td>Supramolecular chemistry (6)</td>
</tr>
<tr>
<td>CHEM4148</td>
<td>Frontiers in Modern Chemical Science (6)</td>
</tr>
<tr>
<td>CHEM4241</td>
<td>Modern chemical instrumentation and applications (6)</td>
</tr>
<tr>
<td>CHEM4242</td>
<td>Analytical chemistry (6)</td>
</tr>
<tr>
<td>CHEM4341</td>
<td>Advanced inorganic chemistry (6)</td>
</tr>
<tr>
<td>CHEM4342</td>
<td>Organometallic chemistry (6)</td>
</tr>
<tr>
<td>CHEM4441</td>
<td>Advanced organic chemistry (6)</td>
</tr>
<tr>
<td>CHEM4443</td>
<td>Integrated organic synthesis (6)</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology (6)</td>
</tr>
<tr>
<td>CHEM4541</td>
<td>Physical chemistry III: statistical thermodynamics and kinetics theory (6)</td>
</tr>
<tr>
<td>CHEM4542</td>
<td>Computational chemistry (6)</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
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</tr>
<tr>
<td>CHEM4543</td>
<td>Advanced physical chemistry</td>
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<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology</td>
</tr>
<tr>
<td>CHEM4910</td>
<td>Chemistry literacy and research</td>
</tr>
<tr>
<td>CHEM4911</td>
<td>Capstone experience for chemistry</td>
</tr>
<tr>
<td></td>
<td>undergraduates: HKUtopia</td>
</tr>
<tr>
<td>CHEM4966</td>
<td>Chemistry internship</td>
</tr>
<tr>
<td>CHEM4999</td>
<td>Chemistry project</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Computational & Financial Mathematics

Offered to students admitted to Year 1 in 2019

Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

Learning Outcomes:
By the end of this programme, students should be able to:

1. PLO 1: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)
2. PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)
3. PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
- Major in Mathematics
- Major in Mathematics (Intensive)
- Minor in Mathematics
- Minor in Operations Research & Mathematical Programming

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   - Disciplinary Core Course (6 credits)
     MATH1013 University mathematics II (6)
   - Disciplinary Electives (12 credits)
     Select either List A or List B:
     - List A
       MATH2101 Linear algebra I (6)
       MATH2211 Multivariable calculus (6)
     - List B
       MATH2012 Fundamental concepts of mathematics (6)
       MATH2014 Multivariable calculus and linear algebra (6)

2. Advanced level courses (24 credits)
   - Disciplinary Core Courses (12 credits)
     MATH3601 Numerical analysis (6)
     MATH3906 Financial calculus (6)
   - Disciplinary Electives (12 credits)
     At least 12 credits selected from the following courses:
     MATH3408 Computational methods and differential equations with applications (6)
     MATH3603 Probability theory (6)
     MATH3904 Introduction to optimization (6)
     MATH3911 Game theory and strategy (6)
     MATH4602 Scientific computing (6)
     MATH4907 Numerical methods for financial calculus (6)
     MATH7217 Topics in financial mathematics (6)
     MATH7224 Topics in advanced probability theory (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.
2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.
3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**: Minor in Computational & Financial Mathematics  
**Offered to students admitted to Year 1 in**: 2018

**Objectives:**  
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

- **PLO 1**: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2**: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3**: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

**Impermissible Combinations:**  
Major in Mathematics  
Major in Mathematics (Intensive)  
Minor in Mathematics  
Minor in Operations Research & Mathematical Programming

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### Required courses (42 credits)

1. **Introductory level courses (18 credits)** (note 3)
   - **Disciplinary Core Course (6 credits)**:  
     - MATH1013 University mathematics II (6)
   - **Disciplinary Electives (12 credits)**:  
     - Select either List A or List B:  
       - **List A**:  
         - MATH2101 Linear algebra I (6)
         - MATH2211 Multivariable calculus (6)
       - **List B**:  
         - MATH2012 Fundamental concepts of mathematics (6)
         - MATH2014 Multivariable calculus and linear algebra (6)

2. **Advanced level courses (24 credits)**
   - **Disciplinary Core Courses (12 credits)**:  
     - MATH3601 Numerical analysis (6)
     - MATH3906 Financial calculus (6)
   - **Disciplinary Electives (12 credits)**:  
     - At least 12 credits selected from the following courses:  
       - MATH3408 Computational methods and differential equations with applications (6)
       - MATH3603 Probability theory (6)
       - MATH3904 Introduction to optimization (6)
       - MATH3911 Game theory and strategy (6)
       - MATH4602 Scientific computing (6)
       - MATH4907 Numerical methods for financial calculus (6)
       - MATH7217 Topics in financial mathematics (6)
       - MATH7224 Topics in advanced probability theory (6)

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**Notes:**

1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

**Remarks:**  
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Computational & Financial Mathematics

Offered to students admitted to Year 1 in 2017

Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics (Intensive)
Major in Mathematics/Physics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming

Required courses (42 credits)
1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Course (6 credits)
   MATH1013 University mathematics II (6)
   Disciplinary Electives (12 credits)
   Select either List A or List B:
   List A
   MATH2101 Linear algebra I (6)
   MATH2211 Multivariable calculus (6)
   List B
   MATH2012 Fundamental concepts of mathematics (6)
   MATH2014 Multivariable calculus and linear algebra (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   MATH3601 Numerical analysis (6)
   MATH3906 Financial calculus (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   MATH3408 Computational methods and differential equations with applications (6)
   MATH3603 Probability theory (6)
   MATH3904 Introduction to optimization (6)
   MATH3911 Game theory and strategy (6)
   MATH4602 Scientific computing (6)
   MATH4907 Numerical methods for financial calculus (6)
   MATH7217 Topics in financial mathematics (6)
   MATH7224 Topics in advanced probability theory (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Computational & Financial Mathematics

Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics (Intensive)
Major in Mathematics/Physics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)

Disciplinary Core Course (6 credits)
MATH1013 University mathematics II (6)

Disciplinary Electives (12 credits)
Select either List A or List B:

List A
MATH2101 Linear algebra I (6)
MATH2211 Multivariable calculus (6)

List B
MATH2012 Fundamental concepts of mathematics (6)
MATH2014 Multivariable calculus and linear algebra (6)

2. Advanced level courses (24 credits)

Disciplinary Core Courses (12 credits)
MATH3601 Numerical analysis (6)
MATH3906 Financial calculus (6)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
MATH3408 Computational methods and differential equations with applications (6)
MATH3603 Probability theory (6)
MATH3904 Introduction to optimization (6)
MATH3911 Game theory and strategy (6)
MATH4602 Scientific computing (6)
MATH4907 Numerical methods for financial calculus (6)
MATH7217 Topics in financial mathematics (6)
MATH7224 Topics in advanced probability theory (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

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Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Objectives:**
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2:** apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3:** communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

**Impermissible Combinations:**
Major in Mathematics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming

<table>
<thead>
<tr>
<th>Required courses (42 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (18 credits) (note 3)</td>
</tr>
<tr>
<td><strong>Disciplinary Core Course (6 credits)</strong></td>
</tr>
<tr>
<td>MATH1013 University mathematics II (6)</td>
</tr>
<tr>
<td>Disciplinary Electives (12 credits)</td>
</tr>
<tr>
<td>Select either List A or List B:</td>
</tr>
<tr>
<td><strong>List A</strong></td>
</tr>
<tr>
<td>MATH2101 Linear algebra I (6)</td>
</tr>
<tr>
<td>MATH2211 Multivariable calculus (6)</td>
</tr>
<tr>
<td><strong>List B</strong></td>
</tr>
<tr>
<td>MATH2012 Fundamental concepts of mathematics (6)</td>
</tr>
<tr>
<td>MATH2014 Multivariable calculus and linear algebra (6)</td>
</tr>
<tr>
<td>2. Advanced level courses (24 credits)</td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (12 credits)</strong></td>
</tr>
<tr>
<td>MATH3601 Numerical analysis (6)</td>
</tr>
<tr>
<td>MATH3906 Financial calculus (6)</td>
</tr>
<tr>
<td>Disciplinary Electives (12 credits)</td>
</tr>
<tr>
<td>At least 12 credits selected from the following courses:</td>
</tr>
<tr>
<td>MATH3408 Computational methods and differential equations with applications (6)</td>
</tr>
<tr>
<td>MATH3603 Probability theory (6)</td>
</tr>
<tr>
<td>MATH3904 Introduction to optimization (6)</td>
</tr>
<tr>
<td>MATH3911 Game theory and strategy (6)</td>
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<tr>
<td>MATH4602 Scientific computing (6)</td>
</tr>
<tr>
<td>MATH4907 Numerical methods for financial calculus (6)</td>
</tr>
</tbody>
</table>

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title  
Minor in Computational & Financial Mathematics

Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Courses (18 credits)
   - MATH1013 University mathematics II (6)
   - MATH2101 Linear algebra I (6)
   - MATH2211 Multivariable calculus (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - MATH3601 Numerical analysis (6)
   - MATH3906 Financial calculus (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - MATH3408 Computational methods and differential equations with applications (6)
   - MATH3603 Probability theory (6)
   - MATH3904 Introduction to optimization (6)
   - MATH3911 Game theory and strategy (6)
   - MATH4602 Scientific computing (6)
   - MATH4907 Numerical methods for financial calculus (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Computational & Financial Mathematics

Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Courses (18 credits)
   - MATH1013 University mathematics II (6)
   - MATH2101 Linear algebra I (6)
   - MATH2211 Multivariable calculus (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - MATH3601 Numerical analysis (6)
   - MATH3906 Financial calculus (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - MATH3408 Computational methods and differential equations with applications (6)
   - MATH3603 Probability theory (6)
   - MATH3904 Introduction to optimization (6)
   - MATH3911 Game theory and strategy (6)
   - MATH4602 Scientific computing (6)
   - MATH4907 Numerical methods for financial calculus (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Computational & Financial Mathematics

Offered to students: 2012
admitted to Year 1 in

Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Minor in Mathematics

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Courses (18 credits)
   MATH1013 University mathematics II (6)
   MATH2101 Linear algebra I (6)
   MATH2211 Multivariable calculus (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   MATH3601 Numerical analysis (6)
   MATH3906 Financial calculus (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   MATH3408 Computational methods and differential equations with applications (6)
   MATH3603 Probability theory (6)
   MATH3904 Introduction to optimization (6)
   MATH3911 Game theory and strategy (6)
   MATH4602 Scientific computing (6)
   MATH4907 Numerical methods for financial calculus (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Earth Sciences
Offered to students admitted to Year 1 in 2019

Objectives:
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 2: understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 3: discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

Impermissible Combinations:
Major in Earth System Science
Major in Geology
Major in Geology (Intensive)

Required courses (36 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - EASC1401 Blue Planet (6)
   - EASC1402 Principles of geology (6)
   - EASC2401 Fluid/solid interactions in earth processes (6)

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:
   - List A
     - EASC3020 Global change: anthropogenic impacts (6)
     - EASC3402 Petrology (6)
     - EASC3403 Sedimentary environments (6)
     - EASC3404 Structural geology (6)
     - EASC3405 Environmental remote sensing (6)
     - EASC3406 Reconstruction of past climate (6)
     - EASC3408 Geophysics (6)
     - EASC3409 Igneous and metamorphic petrogenesis (6)
     - EASC3410 Hydrogeology (6)
     - EASC3412 Earth resources (6)
     - EASC3413 Engineering geology (6)
     - EASC3414 Soil and rock mechanics (6)
     - EASC3415 Meteorology (6)
     - EASC3416 Advanced geochemistry and geochronology (6)
     - EASC3417 Earth through time (6)
     - EASC3998 Directed studies in earth sciences (6)
     - EASC4403 Biogeochemical cycles (6)
     - EASC4406 Earth dynamics & global tectonics (6)
     - EASC4407 Regional geology (6)
     - EASC4408 Special topics in earth sciences (6)
     - EASC4911 Earth system: contemporary issues (6)
     - EASC4955 Integrated field studies (6)
     - EASC4966 Earth sciences internship (6)
     - EASC4999 Earth sciences project (12)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Earth Sciences
Offered to students admitted to Year 1 in 2018

Objectives:
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)
PLO 2: understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)
PLO 3: discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

Impermissible Combinations:
Major in Earth System Science
Major in Geology
Major in Geology (Intensive)

Required courses (36 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
   - EASC1401 Blue Planet (6)
   - EASC1402 Principles of geology (6)
   - EASC2401 Fluid/solid interactions in earth processes (6)

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)
At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

List A
- EASC3020 Global change: anthropogenic impacts (6)
- EASC3402 Petrology (6)
- EASC3403 Sedimentary environments (6)
- EASC3404 Structural geology (6)
- EASC3405 Environmental remote sensing (6)
- EASC3406 Reconstruction of past climate (6)
- EASC3408 Geophysics (6)
- EASC3409 Igneous and metamorphic petrogenesis (6)
- EASC3410 Hydrogeology (6)
- EASC3412 Earth resources (6)
- EASC3413 Engineering geology (6)
- EASC3414 Soil and rock mechanics (6)
- EASC3415 Meteorology (6)
- EASC3416 Advanced geochemistry and geochronology (6)
- EASC3417 Earth through time (6)
- EASC3999 Directed studies in earth sciences (6)
- EASC4403 Biogeochemical cycles (6)
- EASC4406 Earth dynamics & global tectonics (6)
- EASC4407 Regional geology (6)
- EASC4408 Special topics in earth sciences (6)
- EASC4911 Earth system: contemporary issues (6)
- EASC4955 Integrated field studies (6)
- EASC4966 Earth sciences internship (6)
- EASC4999 Earth sciences project (12)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Earth Sciences
Offered to students admitted to Year 1 in 2017

Objectives:
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 2: understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 3: discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

Impermissible Combinations:
Major in Earth System Science
Major in Geology
Major in Geology (Intensive)

Required courses (36 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- EASC1401 Blue Planet (6)
- EASC1402 Principles of geology (6)
- EASC2401 Fluid/solid interactions in earth processes (6)

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)
At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

List A
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- EASC3408 Geophysics (6)
- EASC3409 Igneous and metamorphic petrogenesis (6)
- EASC3410 Hydrogeology (6)
- EASC3412 Earth resources (6)
- EASC3413 Engineering geology (6)
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- EASC3415 Meteorology (6)
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- EASC3417 Earth through time (6)
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- EASC4911 Earth system: contemporary issues (6)
- EASC4955 Integrated field studies (6)
- EASC4966 Earth sciences internship (6)
- EASC4999 Earth sciences project (12)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title          Minor in Earth Sciences
Offered to students  2016 ad
mitted to Year 1 in

Objectives:
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 2: understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 3: discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

Impermissible Combinations:
Major in Earth System Science
Major in Geology
Major in Geology (Intensive)

Required courses (36 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   EASC1401 Blue Planet (6)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)
   At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:
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   EASC3408 Geophysics (6)
   EASC3409 Igneous and metamorphic petrogenesis (6)
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   EASC3412 Earth resources (6)
   EASC3413 Engineering geology (6)
   EASC3414 Soil and rock mechanics (6)
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   EASC4966 Earth sciences internship (6)
   EASC4999 Earth sciences project (12)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor in Earth Sciences

Objectives:
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 2: understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 3: discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

Impermissible Combinations:
Major in Earth System Science
Major in Geology
Major in Geology (Intensive)

Required courses (36 credits)

1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:

- EASC1401 Blue Planet (6)
- EASC1402 Principles of geology (6)
- EASC2401 Fluid/solid interactions in earth processes (6)

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)
At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

**List A**

- EASC3020 Global change: anthropogenic impacts (6)
- EASC3402 Petrology (6)
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Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
### Minor in Earth Sciences

**Offered to students admitted to Year 1 in 2014**

**Objectives:**
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)
- **PLO 2:** understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)
- **PLO 3:** discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

**Impermissible Combinations:**
- Major in Earth System Science
- Major in Geology
- Major in Geology (Intensive)

### Required courses (36 credits)

#### 1. Introductory level courses (12 credits)

**Disciplinary Electives (12 credits)**
At least 12 credits selected from the following courses:

- EASC1401 Blue Planet (6)
- EASC1402 Principles of geology (6)
- EASC2401 Fluid/solid interactions in earth processes (6)

#### 2. Advanced level courses (24 credits)

**Disciplinary Electives (24 credits)**
At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

**List A**

- EASC3020 Global change: anthropogenic impacts (6)
- EASC3402 Petrology (6)
- EASC3403 Sedimentary environments (6)
- EASC3404 Structural geology (6)
- EASC3405 Environmental remote sensing (6)
- EASC3406 Reconstruction of past climate (6)
- EASC3408 Geophysics (6)
- EASC3409 Igneous and metamorphic petrogenesis (6)
- EASC3410 Hydrogeology (6)
- EASC3412 Earth resources (6)
- EASC3413 Engineering geology (6)
- EASC3414 Soil and rock mechanics (6)
- EASC3415 Meteorology (6)
- EASC3416 Advanced geochemistry and geochronology (6)
- EASC3417 Earth through time (6)
- EASC3999 Directed studies in earth sciences (6)
- EASC4403 Biogeochemical cycles (6)
- EASC4406 Earth dynamics & global tectonics (6)
- EASC4407 Regional geology (6)
- EASC4408 Special topics in earth sciences (6)
- EASC4911 Earth system: contemporary issues (6)
- EASC4955 Integrated field studies (6)
- EASC4966 Earth sciences internship (6)
- EASC4999 Earth sciences project (12)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor Title
Minor in Earth Sciences

## Offered to students
admitted to Year 1 in 2013

### Objectives:
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)
- **PLO 2**: understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)
- **PLO 3**: discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

### Impermissible Combinations:
- Major in Earth System Science
- Major in Geology
- Major in Geology (Intensive)

### Required courses (36 credits)

1. **Introductory level courses (12 credits)**
   
   **Disciplinary Electives (12 credits)**
   
   At least 12 credits selected from the following courses:
   
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC1401</td>
<td>Blue Planet</td>
<td>6</td>
</tr>
<tr>
<td>EASC1402</td>
<td>Principles of geology</td>
<td>6</td>
</tr>
<tr>
<td>EASC2401</td>
<td>Fluid/solid interactions in earth processes</td>
<td>6</td>
</tr>
</tbody>
</table>

2. **Advanced level courses (24 credits)**
   
   **Disciplinary Electives (24 credits)**
   
   At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

   **List A**
   
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
<td>6</td>
</tr>
<tr>
<td>EASC3402</td>
<td>Petrology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3403</td>
<td>Sedimentary environments</td>
<td>6</td>
</tr>
<tr>
<td>EASC3404</td>
<td>Structural geology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing</td>
<td>6</td>
</tr>
<tr>
<td>EASC3406</td>
<td>Reconstruction of past climate</td>
<td>6</td>
</tr>
<tr>
<td>EASC3408</td>
<td>Geophysics</td>
<td>6</td>
</tr>
<tr>
<td>EASC3409</td>
<td>Igneous and metamorphic petrogenesis</td>
<td>6</td>
</tr>
<tr>
<td>EASC3410</td>
<td>Hydrogeology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3412</td>
<td>Earth resources</td>
<td>6</td>
</tr>
<tr>
<td>EASC3413</td>
<td>Engineering geology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3414</td>
<td>Soil and rock mechanics</td>
<td>6</td>
</tr>
<tr>
<td>EASC3415</td>
<td>Meteorology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3416</td>
<td>Advanced geochemistry and geochronology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3417</td>
<td>Earth through time</td>
<td>6</td>
</tr>
<tr>
<td>EASC3998</td>
<td>Directed studies in earth sciences</td>
<td>6</td>
</tr>
<tr>
<td>EASC4403</td>
<td>Biogeochemical cycles</td>
<td>6</td>
</tr>
<tr>
<td>EASC4406</td>
<td>Earth dynamics &amp; global tectonics</td>
<td>6</td>
</tr>
<tr>
<td>EASC4407</td>
<td>Regional geology</td>
<td>6</td>
</tr>
<tr>
<td>EASC4408</td>
<td>Special topics in earth sciences</td>
<td>6</td>
</tr>
<tr>
<td>EASC4911</td>
<td>Earth system: contemporary issues</td>
<td>6</td>
</tr>
<tr>
<td>EASC4955</td>
<td>Integrated field studies</td>
<td>6</td>
</tr>
<tr>
<td>EASC4966</td>
<td>Earth sciences internship</td>
<td>6</td>
</tr>
<tr>
<td>EASC4999</td>
<td>Earth sciences project</td>
<td>12</td>
</tr>
</tbody>
</table>

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**
Minor in Earth Sciences

**Offered to students**
admitted to Year 1 in 2012

**Objectives:**
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)
- **PLO 2:** understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)
- **PLO 3:** discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

**Impermissible Combinations:**
Major in Earth System Science
Major in Geology
Major in Geology (Intensive)

**Required courses (36 credits)**

1. **Introductory level courses (12 credits)**
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - EASC1401 Blue Planet (6)
       - EASC1402 Principles of geology (6)
       - EASC2401 Fluid/solid interactions in earth processes (6)

2. **Advanced level courses (24 credits)**
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:
       - **List A**
         - EASC3020 Global change: anthropogenic impacts (6)
         - EASC3402 Petrology (6)
         - EASC3403 Sedimentary environments (6)
         - EASC3404 Structural geology (6)
         - EASC3405 Environmental remote sensing (6)
         - EASC3406 Reconstruction of past climate (6)
         - EASC3408 Geophysics (6)
         - EASC3409 Igneous and metamorphic petrogenesis (6)
         - EASC3410 Hydrogeology (6)
         - EASC3412 Earth resources (6)
         - EASC3413 Engineering geology (6)
         - EASC3414 Soil and rock mechanics (6)
         - EASC3415 Meteorology (6)
         - EASC3416 Advanced geochemistry and geochronology (6)
         - EASC3417 Earth through time (6)
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         - EASC4403 Biogeochemical cycles (6)
         - EASC4406 Earth dynamics & global tectonics (6)
         - EASC4407 Regional geology (6)
         - EASC4408 Special topics in earth sciences (6)
         - EASC4911 Earth system: contemporary issues (6)
         - EASC4955 Integrated field studies (6)
         - EASC4966 Earth sciences internship (6)
         - EASC4999 Earth sciences project (12)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Objectives:**
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

**Learning Outcomes:**
By the end of this programme, students should be able to:

PLO 1: appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

**Impermissible Combinations:**
Major in Ecology & Biodiversity
Major in Ecology & Biodiversity (Intensive)

**Required courses (36 credits)**

1. **Introductory level courses (12 credits)**
   - BIOL1309 Evolutionary diversity (6)
   - BIOL2306 Ecology and evolution (6)

2. **Advanced level courses (24 credits)**
   - BIOL3101 Animal behaviour (6)
   - BIOL3301 Marine biology (6)
   - BIOL3302 Systematics and phylogenetics (6)
   - BIOL3303 Conservation biology (6)
   - BIOL3313 Freshwater ecology (6)
   - BIOL3314 Plant structure and evolution (6)
   - BIOL3318 Experimental intertidal ecology (6)
   - BIOL3319 Tropical terrestrial ecology (6)
   - BIOL3419 Insect ecology: the little things that run the world (6)
   - BIOL3506 Evolutionary biology (6)
   - BIOL4301 Fish and fisheries (6)
   - BIOL4302 Environmental impact assessment (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor Title
Minor in Ecology & Biodiversity

## Offered to students
admitted to Year 1 in
2018

## Objectives:
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

## Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1**: appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

**PLO 2**: understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

**PLO 3**: appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

## Impermissible Combinations:
Major in Ecology & Biodiversity
Major in Ecology & Biodiversity (Intensive)

## Required courses (36 credits)

1. **Introductory level courses (12 credits)**
   - **Disciplinary Core Courses (12 credits)**
     - BIOL1309 Evolutionary diversity (6)
     - BIOL2306 Ecology and evolution (6)

2. **Advanced level courses (24 credits)**
   - **Disciplinary Electives (24 credits)**
     - BIOL3101 Animal behaviour (6)
     - BIOL3301 Marine biology (6)
     - BIOL3302 Systematics and phylogenetics (6)
     - BIOL3303 Conservation biology (6)
     - BIOL3313 Freshwater ecology (6)
     - BIOL3314 Plant structure and evolution (6)
     - BIOL3318 Experimental intertidal ecology (6)
     - BIOL3319 Tropical terrestrial ecology (6)
     - BIOL3419 Insect ecology: the little things that run the world (6)
     - BIOL3506 Evolutionary biology (6)
     - BIOL4301 Fish and fisheries (6)
     - BIOL4302 Environmental impact assessment (6)

## Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

## Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Objectives:**
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

**Learning Outcomes:**
By the end of this programme, students should be able to:
- **PLO 1:** appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2:** understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3:** appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

**Impermissible Combinations:**
Major in Ecology & Biodiversity
Major in Ecology & Biodiversity (Intensive)

**Required courses (36 credits)**

<table>
<thead>
<tr>
<th><strong>1. Introductory level courses (12 credits)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1309  Evolutionary diversity (6)</td>
</tr>
<tr>
<td>BIOL2306  Ecology and evolution (6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>2. Advanced level courses (24 credits)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3101  Animal behaviour (6)</td>
</tr>
<tr>
<td>BIOL3301  Marine biology (6)</td>
</tr>
<tr>
<td>BIOL3302  Systematics and phylogenetics (6)</td>
</tr>
<tr>
<td>BIOL3303  Conservation biology (6)</td>
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<td>BIOL3313  Freshwater ecology (6)</td>
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<td>BIOL4301  Fish and fisheries (6)</td>
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<td>BIOL4302  Environmental impact assessment (6)</td>
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</tbody>
</table>

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
### Minor in Ecology & Biodiversity

**Offered to students:** admitted to Year 1 in 2016

**Objectives:**
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2:** understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3:** appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

**Impermissible Combinations:**
- Major in Ecology & Biodiversity
- Major in Ecology & Biodiversity (Intensive)

**Required courses (36 credits)**

1. **Introductory level courses (12 credits)**
   - **Disciplinary Core Courses (12 credits)**
     - BIOL1309 Evolutionary diversity (6)
     - BIOL2306 Ecology and evolution (6)

2. **Advanced level courses (24 credits)**
   - **Disciplinary Electives (24 credits)**
     - BIOL3101 Animal behaviour (6)
     - BIOL3301 Marine biology (6)
     - BIOL3302 Systematics and phylogenetics (6)
     - BIOL3303 Conservation biology (6) [previous title: Conservation ecology (6)]
     - BIOL3313 Freshwater ecology (6)
     - BIOL3314 Plant structure and evolution (6)
     - BIOL3318 Experimental intertidal ecology (6)
     - BIOL3319 Tropical terrestrial ecology (6) [previous title: Terrestrial ecology (6)]
     - BIOL3320 The biology of marine mammals (6)
     - BIOL3419 Insect ecology: the little things that run the world (6)
     - BIOL3506 Evolutionary biology (6)
     - BIOL4301 Fish and fisheries (6)
     - BIOL4302 Environmental impact assessment (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Ecology & Biodiversity
Offered to students admitted to Year 1 in 2015

Objectives:
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity
Major in Ecology & Biodiversity (Intensive)

Required courses (36 credits)

1. Introductory level courses (12 credits)
   Disciplinary Core Courses (12 credits)
   BIOL1309 Evolutionary diversity (6)
   BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   BIOL3101 Animal behaviour (6)
   BIOL3301 Marine biology (6)
   BIOL3302 Systematics and phylogenetics (6)
   BIOL3303 Conservation biology (6)
   BIOL3313 Freshwater ecology (6)
   BIOL3314 Plant structure and evolution (6)
   BIOL3318 Experimental intertidal ecology (6)
   BIOL3319 Tropical terrestrial ecology (6)
   BIOL3320 The biology of marine mammals (6)
   BIOL3419 Insect ecology: the little things that run the world (6)
   BIOL3506 Evolutionary biology (6)
   BIOL4301 Fish and fisheries (6)
   BIOL4302 Environmental impact assessment (6)
   BIOL4303 Animal behaviour (6)

   Take either BIOL3101 or BIOL4303 to fulfill this 24 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**: Minor in Ecology & Biodiversity  
**Offered to students** admitted to Year 1 in **2014**

**Objectives:**  
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

**Learning Outcomes:**  
By the end of this programme, students should be able to:  
**PLO 1**: appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)  
**PLO 2**: understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)  
**PLO 3**: appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

**Impermissible Combinations:**  
Major in Ecology & Biodiversity  
Major in Ecology & Biodiversity (Intensive)

**Required courses (36 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution</td>
<td>6</td>
</tr>
</tbody>
</table>

**1. Introductory level courses (12 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution</td>
<td>6</td>
</tr>
</tbody>
</table>

**2. Advanced level courses (24 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3101</td>
<td>Animal behaviour</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3101</td>
<td>Marine biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3302</td>
<td>Systematics and phylogenetics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3303</td>
<td>Conservation biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3313</td>
<td>Freshwater ecology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3318</td>
<td>Experimental intertidal ecology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3319</td>
<td>Tropical terrestrial ecology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3320</td>
<td>The biology of marine mammals</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3419</td>
<td>Insect ecology: the little things that run the world</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4301</td>
<td>Fish and fisheries</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4303</td>
<td>Animal behaviour</td>
<td>6</td>
</tr>
</tbody>
</table>

*Take either BIOL3101 or BIOL4303 to fulfill this 24 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.*

**Notes:**  
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

**Remarks:**  
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Ecology & Biodiversity

Offered to students admitted to Year 1 in 2013

Objectives:
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity
Major in Ecology & Biodiversity (Intensive)

Required courses (36 credits)
1. Introductory level courses (12 credits)

BIOL1309 Evolutionary diversity (6)
BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)

Disciplinary Core Courses (12 credits)
BIOL3101 Animal behaviour (6)
BIOL3301 Marine biology (6)
BIOL3302 Systematics and phylogenetics (6)
BIOL3303 Conservation biology (6)
BIOL3313 Freshwater ecology (6)
BIOL3314 Plant structure and evolution (6)
BIOL3318 Experimental intertidal ecology (6)
BIOL3319 Tropical terrestrial ecology (6)
BIOL3320 The biology of marine mammals (6)
BIOL3419 Insect ecology: the little things that run the world (6)
BIOL4301 Fish and fisheries (6)
BIOL4302 Environmental impact assessment (6)
BIOL4303 Animal behaviour (6)

Take either BIOL3101 or BIOL4303 to fulfill this 24 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.

BIOL3303 [previous title: Conservation ecology (6)]
BIOL3318 [previous title: Terrestrial ecology (6)]

Impermissible Combinations:

Take either BIOL3101 or BIOL4303 to fulfill this 24 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Ecology & Biodiversity  
Offered to students admitted to Year 1 in 2012

Objectives:
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity
Major in Ecology & Biodiversity (Intensive)

Required courses (36 credits)
1. Introductory level courses (12 credits)
   - BIOL1309 Evolutionary diversity (6)
   - BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   - BIOL3101 Animal behaviour (6)
   - BIOL3301 Marine biology (6)
   - BIOL3302 Systematics and phylogenetics (6)
   - BIOL3303 Conservation biology (6)
   - BIOL3313 Freshwater ecology (6)
   - BIOL3314 Plant structure and evolution (6)
   - BIOL3319 Tropical terrestrial ecology (6)
   - BIOL3320 The biology of marine mammals (6)
   - BIOL3419 Insect ecology: the little things that run the world (6)
   - BIOL4301 Fish and fisheries (6)
   - BIOL4302 Environmental impact assessment (6)
   - BIOL4303 Animal behaviour (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor Title
Minor in Environmental Science

## Offered to students
admitted to Year 1 in 2019

## Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help students understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

## Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1:** identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

**PLO 2:** observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

**PLO 3:** appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

**PLO 4:** gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/laboratory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

## Impermissible Combinations:
Major in Environmental Science

### Required courses (42 credits)

#### 1. Introductory level courses (18 credits)

**Disciplinary Core Courses (6 credits)**
- ENVS1401 Introduction to environmental science (6)

**Disciplinary Electives (12 credits)**
- At least 12 credits selected from the following courses (Level 1 & 2):
  - CHEM1042 General chemistry I (6)
  - EASC1020 Introduction to climate science (6)
  - EASC1401 Blue Planet (6)
  - EASC2404 Introduction to atmosphere and hydrosphere (6)
  - ENVS1301 Environmental life science (6)
  - ENVS2001 Methods in environmental science (6)
  - ENVS2002 Environmental data analysis (6)

#### 2. Advanced level courses (24 credits)

**Disciplinary Core Courses (6 credits)**
- ENVS3004 Environment, society and economics (6)

**Disciplinary Electives (18 credits)**
- At least 18 credits selected from the following courses:
  - BIOL3110 Environmental toxicology (6)
  - BIOL3303 Conservation biology (6)
  - BIOL4302 Environmental impact assessment (6)
  - CHEM3141 Environmental chemistry (6)
  - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
  - EASC3020 Global change: anthropogenic impacts (6)
  - EASC3405 Environmental remote sensing (6)
  - ENVS3007 Natural hazards and mitigation (6)
  - ENVS3010 Sustainable energy and environment (6)
  - ENVS3019 Urban ecology (6)
  - ENVS3020 Global change ecology (6)
  - ENVS3042 Pollution (6)
  - ENVS3313 Environmental oceanography (6)
  - ENVS4110 Environmental remediation (6)

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor in Environmental Science

Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help student understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 4: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/laboratory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Major in Environmental Science

Required courses (42 credits)

1. Introductory level courses (18 credits)
   Disciplinary Core Courses (6 credits)
   ENVS1401 Introduction to environmental science (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses (Level 1 & 2):
   CHEM1042 General chemistry I (6)
   EASC1020 Introduction to climate science (6)
   EASC1401 Blue Planet (6)
   EASC2404 Introduction to atmosphere and hydrosphere (6)
   ENVS1301 Environmental life science (6)
   ENVS2001 Methods in environmental science (6)
   ENVS2002 Environmental data analysis (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (6 credits)
   ENVS3004 Environment, society and economics (6)

   Disciplinary Electives (18 credits)
   At least 18 credits selected from the following courses:
   BIOL3110 Environmental toxicology (6)
   BIOL3303 Conservation biology (6)
   BIOL4302 Environmental impact assessment (6)
   CHEM3141 Environmental chemistry (6)
   CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   EASC3020 Global change: anthropogenic impacts (6)
   EASC3405 Environmental remote sensing (6)
   ENVS3007 Natural hazards and mitigation (6)
   ENVS3010 Sustainable energy and environment (6)
   ENVS3019 Urban ecology (6)
   ENVS3020 Global change ecology (6)
   ENVS3042 Pollution (6)
   ENVS3313 Environmental oceanography (6)
   ENVS4110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Environmental Science

Offered to students admitted to Year 1 in 2017

Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help students understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 4: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Major in Environmental Science

Required courses (42 credits)

1. Introductory level courses (18 credits)
   - Disciplinary Core Courses (6 credits)
     - ENVS1401 Introduction to environmental science (6)
   - Disciplinary Electives (12 credits)
     - At least 12 credits selected from the following courses (Level 1 & 2):
       - CHEM1042 General chemistry I (6)
       - CHEM2041 Principles of chemistry (6)
       - CHEM2241 Analytical chemistry I (6)
       - CHEM2442 Fundamentals of organic chemistry (6)
       - EASC1020 Introduction to climate science (6)
       - EASC1401 Blue Planet (6)
       - EASC2404 Introduction to atmosphere and hydrosphere (6)
       - ENVS1301 Environmental life science (6)
       - ENVS2001 Methods in environmental science (6)
       - ENVS2002 Environmental data analysis (6)

2. Advanced level courses (24 credits)
   - Disciplinary Core Courses (6 credits)
     - ENVS3004 Environment, society and economics (6)
   - Disciplinary Electives (18 credits)
     - At least 18 credits selected from the following courses:
       - BIOL3110 Environmental toxicology (6)
       - BIOL3303 Conservation biology (6)
       - BIOL4302 Environmental impact assessment (6)
       - CHEM3141 Environmental chemistry (6)
       - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
       - CHEM3242 Food and water analysis (6)
       - EASC3020 Global change: anthropogenic impacts (6)
       - EASC3405 Environmental remote sensing (6)
       - ENV5306 Environmental radiation (6)
       - ENV5307 Natural hazards and mitigation (6)
       - ENV5310 Sustainable energy and environment (6)
       - ENV5319 Urban ecology (6)
       - ENV5320 Global change ecology (6)
       - ENV5342 Pollution (6)
       - ENV5313 Environmental oceanography (6)
       - ENV54110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Environmental Science

Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help students understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 4: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Major in Environmental Science

Required courses (42 credits)
1. Introductory level courses (18 credits)
   Disciplinary Core Courses (6 credits)
   - ENV51401 Introduction to environmental science (6)
   Disciplinary Electives (12 credits)
   - At least 12 credits selected from the following courses (Level 1 & 2):
     - CHEM1402 General chemistry I (6)
     - CHEM2404 Principles of chemistry (6)
     - CHEM2241 Analytical chemistry I (6)
     - CHEM2442 Fundamentals of organic chemistry (6)
     - EASC1401 Introduction to climate science (6)
     - EASC2404 Introduction to atmosphere and hydrosphere (6)
     - ENVS1401 Environmental life science (6)
     - ENVS2001 Methods in environmental science (6)
     - ENVS2002 Environmental data analysis (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (6 credits)
   - ENVS3004 Environment, society and economics (6)
   Disciplinary Electives (18 credits)
   - At least 18 credits selected from the following courses:
     - BIOL3110 Environmental toxicology (6)
     - BIOL3303 Conservation biology (6)
     - BIOL4302 Environmental impact assessment (6)
     - CHEM3141 Environmental chemistry (6)
     - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
     - CHEM3242 Food and water analysis (6)
     - EASC3020 Global change: anthropogenic impacts (6)
     - EASC3405 Environmental remote sensing (6)
     - ENVS3006 Environmental radiation (6)
     - ENVS3007 Natural hazards and mitigation (6)
     - ENVS3010 Sustainable energy and environment (6)
     - ENVS3019 Urban ecology (6)
     - ENVS3020 Global change ecology (6)
     - ENVS3042 Pollution (6)
     - ENVS3313 Environmental oceanography (6)
     - ENVS4110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**: Minor in Environmental Science  
**Offered to students**: admitted to Year 1 in 2015

**Objectives**:  
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help students understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

**Learning Outcomes**:  
By the end of this programme, students should be able to:  

- **PLO 1**: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

- **PLO 2**: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

- **PLO 3**: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

- **PLO 4**: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/laboratory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

**Impermissible Combinations**:  
Major in Environmental Science

**Required courses (42 credits)**

1. **Introductory level courses (18 credits)**
   **Disciplinary Core Courses (6 credits)**
   - ENVS1401 Introduction to environmental science (6)

2. **Disciplinary Electives (12 credits)**
   **At least 12 credits selected from the following courses (Level 1 & 2):**
   - CHEM1042 General chemistry I (6)
   - CHEM2041 Principles of chemistry (6)
   - CHEM2241 Analytical chemistry I (6)
   - CHEM2442 Fundamentals of organic chemistry (6)
   - EASC1020 Introduction to climate science (6)
   - EASC1401 Blue Planet (6)
   - EASC2404 Introduction to atmosphere and hydrosphere (6)
   - ENVIS1301 Environmental life science (6)
   - ENVIS2001 Methods in environmental science (6)
   - ENVIS2002 Environmental data analysis (6)

2. **Advanced level courses (24 credits)**
   **Disciplinary Core Courses (6 credits)**
   - ENVS3004 Environment, society and economics (6)

   **Disciplinary Electives (18 credits)**
   **At least 18 credits selected from the following courses:**
   - BIOL3110 Environmental toxicology (6)
   - BIOL3303 Conservation biology (6)
   - BIOL4302 Environmental impact assessment (6)
   - CHEM3141 Environmental chemistry (6)
   - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   - CHEM3242 Food and water analysis (6)
   - EASC3020 Global change: anthropogenic impacts (6)
   - EASC3405 Environmental remote sensing (6)
   - ENVIS3006 Environmental radiation (6)
   - ENVIS3007 Natural hazards and mitigation (6)
   - ENVIS3010 Sustainable energy and environment (6)
   - ENVIS3019 Urban ecology (6)
   - ENVIS3020 Global change ecology (6)
   - ENVIS3042 Pollution (6)
   - ENVIS3313 Environmental oceanography (6)
   - ENVIS4110 Environmental remediation (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Environmental Science

Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help students understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 4: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/laboratory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Major in Environmental Science

Required courses (42 credits)

1. Introductory level courses (18 credits)

Disciplinary Core Courses (6 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVS1401</td>
<td>Introduction to environmental science</td>
<td>6</td>
</tr>
</tbody>
</table>

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses (Level 1 & 2):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2041</td>
<td>Principles of chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2241</td>
<td>Analytical chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2442</td>
<td>Fundamentals of organic chemistry</td>
<td>6</td>
</tr>
<tr>
<td>EASC1020</td>
<td>Introduction to climate science</td>
<td>6</td>
</tr>
<tr>
<td>EASC1401</td>
<td>Blue Planet</td>
<td>6</td>
</tr>
<tr>
<td>EASC2404</td>
<td>Introduction to atmosphere and hydrosphere</td>
<td>6</td>
</tr>
<tr>
<td>ENV1301</td>
<td>Environmental life science</td>
<td>6</td>
</tr>
<tr>
<td>ENV2001</td>
<td>Methods in environmental science</td>
<td>6</td>
</tr>
<tr>
<td>ENV3002</td>
<td>Environmental data analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

2. Advanced level courses (24 credits)

Disciplinary Core Courses (6 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVS3004</td>
<td>Environment, society and economics</td>
<td>6</td>
</tr>
</tbody>
</table>

Disciplinary Electives (18 credits)

At least 18 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3110</td>
<td>Environmental toxicology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3303</td>
<td>Conservation biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3141</td>
<td>Environmental chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3241</td>
<td>Analytical chemistry II: chemical instrumentation</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3242</td>
<td>Food and water analysis</td>
<td>6</td>
</tr>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
<td>6</td>
</tr>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing</td>
<td>6</td>
</tr>
<tr>
<td>ENV3006</td>
<td>Environmental radiation</td>
<td>6</td>
</tr>
<tr>
<td>ENV3007</td>
<td>Natural hazards and mitigation</td>
<td>6</td>
</tr>
<tr>
<td>ENV3010</td>
<td>Sustainable energy and environment</td>
<td>6</td>
</tr>
<tr>
<td>ENV3019</td>
<td>Urban ecology</td>
<td>6</td>
</tr>
<tr>
<td>ENV3020</td>
<td>Global change ecology</td>
<td>6</td>
</tr>
<tr>
<td>ENV3042</td>
<td>Pollution</td>
<td>6</td>
</tr>
<tr>
<td>ENV3313</td>
<td>Environmental oceanography</td>
<td>6</td>
</tr>
<tr>
<td>ENV4110</td>
<td>Environmental remediation</td>
<td>6</td>
</tr>
</tbody>
</table>

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Environmental Science

Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help students understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)

PLO 4: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/laboratory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Major in Environmental Science

Required courses (42 credits)

1. Introductory level courses (18 credits)
   Disciplinary Core Courses (6 credits)
   ENVS1401 Introduction to environmental science (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses (Level 1 & 2):
   CHEM1042 General chemistry I (6)
   CHEM2041 Principles of chemistry (6)
   CHEM2241 Analytical chemistry I (6)
   CHEM2442 Fundamentals of organic chemistry (6)
   EASC1020 Introduction to climate science (6)
   EASC1401 Blue Planet (6)
   EASC2404 Introduction to atmosphere and hydrosphere (6)
   ENVS1301 Environmental life science (6)
   ENVS2001 Methods in environmental science (6)
   ENVS2002 Environmental data analysis (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (6 credits)
   ENVS3004 Environment, society and economics (6)

   Disciplinary Electives (18 credits)
   At least 18 credits selected from the following courses:
   BIOL3110 Environmental toxicology (6)
   BIOL3303 Conservation biology (6)
   BIOL4302 Environmental impact assessment (6)
   CHEM3141 Environmental chemistry (6)
   CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   CHEM3242 Food and water analysis (6)
   EASC3020 Global change: anthropogenic impacts (6)
   EASC3405 Environmental remote sensing (6)
   ENV53006 Environmental radiation (6)
   ENV53007 Natural hazards and mitigation (6)
   ENV53010 Sustainable energy and environment (6)
   ENV53019 Urban ecology (6)
   ENV53020 Global change ecology (6)
   ENV53042 Pollution (6)
   ENV53313 Environmental oceanography (6)
   ENV54110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**: Minor in Environmental Science  
**Offered to students admitted to Year 1 in**: 2012

**Objectives:**
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help student understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 2**: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 3**: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 4**: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

**Impermissible Combinations:**
Major in Environmental Science

**Required courses (42 credits)**

1. **Introductory level courses (18 credits)**
   - **Disciplinary Core Courses (6 credits)**
     - ENVS1401 Introduction to environmental science (6)
   - **Disciplinary Electives (12 credits)**
     - At least 6 credits selected from the following courses (Level 1) in List A:
       - CHEM1042 General chemistry I (6)
       - EASC1401 Blue Planet (6)
       - ENVS1301 Environmental life science (6)
     - At least 6 credits selected from the following courses (Level 2) in List B:
       - BIOL2102 Biostatistics (6)
       - CHEM2041 Principles of chemistry (6)
       - CHEM2241 Analytical chemistry I (6)
       - CHEM2442 Fundamentals of organic chemistry (6)
       - EASC2404 Introduction to atmosphere and hydrosphere (6)
       - ENVS2001 Methods in environmental science (6)
       - ENVS2002 Environmental data analysis (6)

2. **Advanced level courses (24 credits)**
   - **Disciplinary Core Courses (6 credits)**
     - ENVS3004 Environment, society and economics (6)
   - **Disciplinary Electives (18 credits)**
     - At least 18 credits selected from the following courses:
       - BIOL3110 Environmental toxicology (6)
       - BIOL3303 Conservation biology (6)
       - BIOL4302 Environmental impact assessment (6)
       - CHEM3141 Environmental chemistry (6)
       - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
       - CHEM3342 Food and water analysis (6)
       - EASC3020 Global change: anthropogenic impacts (6)
       - EASC3405 Environmental remote sensing (6)
       - ENV3306 Environmental radiation (6)
       - ENV3307 Natural hazards and mitigation (6)
       - ENV33010 Sustainable energy and environment (6)
       - ENV33019 Urban ecology (6)
       - ENV33020 Global change ecology (6)
       - ENV33042 Pollution (6)
       - ENV3313 Environmental oceanography (6)
       - ENV34110 Environmental remediation (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.
Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Food & Nutritional Science
Offered to students admitted to Year 1 in 2019

Objectives:
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: recognize and describe the health risks associated with food and specific nutrients, and discuss how to prevent these risks (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand and describe ethical perspectives and practice in food product development, food safety and public health nutrition (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: synthesize and summarize information from a wide range of sources and draw reasoned conclusions with particular reference to food and nutritional sciences and related global and commercial issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Food & Nutritional Science

Required courses (36 credits)

1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1201</td>
<td>Introduction to food and nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2101</td>
<td>Principles of food chemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Basic biochemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL2220 or BIOC2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)

At least 24 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3202</td>
<td>Nutritional biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3203</td>
<td>Food microbiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3204</td>
<td>Nutrition and the life cycle</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3207</td>
<td>Principles of toxicology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3209</td>
<td>Food and nutrient analysis</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3211</td>
<td>Nutrigenomics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3216</td>
<td>Food waste management</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3217</td>
<td>Food, environment and health</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3218</td>
<td>Food hygiene and quality control</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3606</td>
<td>Diet and disease</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3608</td>
<td>Food commodities</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4201</td>
<td>Public health nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4202</td>
<td>Nutrition and sports performance</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4204</td>
<td>Diet, brain function and behavior</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4205</td>
<td>Food technology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4209</td>
<td>Functional foods</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology</td>
<td>6</td>
</tr>
</tbody>
</table>

[previous title: Food and nutritional toxicology (6)]

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Food & Nutritional Science
Offered to students admitted to Year 1 in 2018

Objectives:
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
PLO 2: recognize and describe the health risks associated with food and specific nutrients, and discuss how to prevent these risks (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
PLO 3: understand and describe ethical perspectives and practice in food product development, food safety and public health nutrition (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
PLO 4: synthesize and summarize information from a wide range of sources and draw reasoned conclusions with particular reference to food and nutritional sciences and related global and commercial issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Food & Nutritional Science

Required courses (36 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1201</td>
<td>Introduction to food and nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2101</td>
<td>Principles of food chemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2600</td>
<td>Basic biochemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOL2600 are mutually exclusive.

2. Advanced level courses (24 credits)

Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3202</td>
<td>Nutritional biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3203</td>
<td>Food microbiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3204</td>
<td>Nutrition and the life cycle</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3206</td>
<td>Clinical nutrition</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.

Take either BIOL3207 or BIOL3209 or BIOL3211 or BIOL3216 or BIOL3217 or BIOL3218 or BIOL3606 or BIOL3608 or BIOL3609 or BIOL4201 or BIOL4202 or BIOL4204 or BIOL4205 or BIOL4208 or BIOL4209 or BIOL4411 to fulfill the remaining 24 credits.

Take either BIOL3207 or BIOL3209 or BIOL3211 or BIOL3216 or BIOL3217 or BIOL3218 or BIOL3606 or BIOL3608 or BIOL3609 or BIOL4201 or BIOL4202 or BIOL4204 or BIOL4205 or BIOL4208 or BIOL4209 or BIOL4411 to fulfill the remaining 24 credits.

[previous title: Food and nutritional toxicology (6) ]
Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor in Food & Nutritional Science

**Objectives:**
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2:** recognize and describe the health risks associated with food and specific nutrients, and discuss how to prevent these risks (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3:** understand and describe ethical perspectives and practice in food product development, food safety and public health nutrition (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 4:** synthesize and summarize information from a wide range of sources and draw reasoned conclusions with particular reference to food and nutritional sciences and related global and commercial issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

### Impermissible Combinations:
Major in Food & Nutritional Science

### Required courses (36 credits)

#### 1. Introductory level courses (12 credits)

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
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<th>Credits</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>BIOL1201</td>
<td>Introduction to food and nutrition</td>
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</tr>
<tr>
<td>BIOL2101</td>
<td>Principles of food chemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2600</td>
<td>Basic biochemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

- Take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOL2600 are mutually exclusive.

#### 2. Advanced level courses (24 credits)

**Disciplinary Electives (24 credits)**

At least 24 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3202</td>
<td>Nutritional biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3203</td>
<td>Food microbiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3204</td>
<td>Nutrition and the life cycle</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3206</td>
<td>Clinical nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3207</td>
<td>Principles of toxicology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3209</td>
<td>Food and nutrient analysis</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3211</td>
<td>Nutrigenomics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3216</td>
<td>Food waste management</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3217</td>
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- Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.

- [previous title: Food and nutritional toxicology (6)]

- Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.

- Take either BIOL3608 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3608 and BIOL4208 are mutually exclusive.

- [previous title: Food processing and engineering (6)]

- Take either BIOL3608 or BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3608 and BIOL4208 are mutually exclusive.
Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objective:
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: recognize and describe the health risks associated with food and specific nutrients, and discuss how to prevent these risks (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand and describe ethical perspectives and practice in food product development, food safety and public health nutrition (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: synthesize and summarize information from a wide range of sources and draw reasoned conclusions with particular reference to food and nutritional sciences and related global and commercial issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Food & Nutritional Science

Required courses (36 credits)

1. Introductory level courses (12 credits)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL1110 From molecules to cells (6)
   - BIOL1201 Introduction to food and nutrition (6)
   - BIOL2220 Principles of biochemistry (6)
   - BIOL2600 Basic biochemistry (6)

   Take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOL2600 are mutually exclusive.

2. Advanced level courses (24 credits)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   - BIOL3201 Food chemistry (6)
   - BIOL3202 Nutritional biochemistry (6)
   - BIOL3203 Food microbiology (6)
   - BIOL3204 Nutrition and the life cycle (6)
   - BIOL3205 Human physiology (6)
   - BIOL3206 Clinical nutrition (6)
   - BIOL3207 Principles of toxicology (6)
   - BIOL3208 Food safety and quality management (6)
   - BIOL3209 Food and nutrient analysis (6)
   - BIOL3210 Grain production and utilization (6)
   - BIOL3211 Nutrigenomics (6)
   - BIOL3216 Food waste management (6)
   - BIOL3217 Food, environment and health (6)
   - BIOL3218 Food hygiene and quality control (6)
   - BIOL3606 Diet and disease (6)
   - BIOL3608 Food commodities (6)

   Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.

   Take either BIOL3208 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3208 and BIOL3218 are mutually exclusive.

   Take either BIOL3209 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3209 and BIOL3218 are mutually exclusive.

   Take either BIOL3210 or BIOL4208 or BIOL3608 to fulfill this 24 credits requirement, but not both. BIOL3210 and BIOL4208 or BIOL3608 are mutually exclusive.

   Take either BIOL3211 or BIOL4207 or BIOL3608 to fulfill this 24 credits requirement, but not both. BIOL3211 and BIOL4207 or BIOL3608 are mutually exclusive.

   Take either BIOL3208 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3208 and BIOL3218 are mutually exclusive.

   Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.

   Take either BIOL3606 or BIOL4207 or BIOL3608 to fulfill this 24 credits requirement, but not both. BIOL3606 and BIOL4207 or BIOL3608 are mutually exclusive.

   Take either BIOL3210 or BIOL4208 or BIOL3608 to fulfill this 24 credits requirement, but not both. BIOL3210, BIOL4208 and BIOL3608 are mutually exclusive.
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**Notes:**
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**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Food & Nutritional Science
Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2**: recognize and describe the health risks associated with food and specific nutrients, and discuss how to prevent these risks (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
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Impermissible Combinations:
Major in Food & Nutritional Science

Required courses (36 credits)

1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL1110 From molecules to cells (6)
   - BIOL1201 Introduction to food and nutrition (6)
   - BIOL2220 Principles of biochemistry (6)
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   Take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOL2600 are mutually exclusive.

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   - BIOL3201 Food chemistry (6)
   - BIOL3202 Nutritional biochemistry (6)
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   - BIOL3206 Clinical nutrition (6)
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   - BIOL3216 Food waste management (6)
   - BIOL3217 Food, environment and health (6)
   - BIOL3218 Food hygiene and quality control (6)
   - BIOL3206 Diet and disease (6)
   - BIOL3606 Diet and disease (6)

   Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3606 are mutually exclusive.

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<td>[previous title: Food processing and engineering (6)]</td>
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**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title | Minor in Food & Nutritional Science  
Offered to students admitted to Year 1 in | 2014

**Objectives:**
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2:** recognize and describe the health risks associated with food and specific nutrients, and discuss how to prevent these risks (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
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**Impermissible Combinations:**
Major in Food & Nutritional Science

**Required courses (36 credits)**

| 1. Introductory level courses (12 credits) |  
| Disciplinary Electives (12 credits) |  
| At least 12 credits selected from the following courses: |  
| BIOL1110 From molecules to cells (6) |  
| BIOL1201 Introduction to food and nutrition (6) |  
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| Take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOL2600 are mutually exclusive. |  

| 2. Advanced level courses (24 credits) |  
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| At least 24 credits selected from the following courses: |  
| BIOL3201 Food chemistry (6) |  
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| BIOL3206 Diet and disease (6) |  
| BIOL3606 Food commodities (6) |  
| Take either BIOL3206 or BIOL3218 to fulfill this 24 credits requirement, but not both. BIOL3206 and BIOL3218 are mutually exclusive. |  

{[previous title: Food and nutritional toxicology (6)]}
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### Notes:
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### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Food & Nutritional Science
Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
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Impermissible Combinations:
Major in Food & Nutritional Science

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**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Food & Nutritional Science

Offered to students admitted to Year 1 in 2012

Objectives:
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

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Impermissible Combinations:
Major in Food & Nutritional Science

Required courses (36 credits)

1. Introductory level courses (12 credits)
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   - BIOL1110 From molecules to cells (6)
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   Take either BIOL2220 or BIOLC2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOLC2600 are mutually exclusive.

2. Advanced level courses (24 credits)
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   At least 24 credits selected from the following courses:
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4201</td>
<td>Public health nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4202</td>
<td>Nutrition and sports performance</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4204</td>
<td>Diet, brain function and behavior</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4205</td>
<td>Food technology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4207</td>
<td>Meat and dairy sciences</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4208</td>
<td>Meat, dairy and grain sciences</td>
<td>6</td>
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<tr>
<td>BIOL4209</td>
<td>Functional foods</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4210</td>
<td>Food product development</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology</td>
<td>6</td>
</tr>
</tbody>
</table>

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Marine Biology
Offered to students admitted to Year 1 in 2019

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g. business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 2: gain a comprehensive foundation for pursuing marine-oriented studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 3: have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 4: understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 5: appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL1309 Evolutionary diversity (6)
   - ENV51301 Environmental life science (6)
   - BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - BIOL3301 Marine biology (6)
   - ENV5313 Environmental oceanography (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL3303 Conservation biology (6)
   - BIOL3305 Tropical and temperate marine ecology field course (6)
   - BIOL3318 Experimental intertidal ecology (6)
   - BIOL3322 Marine invertebrate zoology (6)
   - BIOL3328 Neartshore marine and estuarine ecology (6)
   - BIOL4301 Fish and fisheries (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Marine Biology  
Offered to students admitted to Year 1 in 2018  

**Objectives:**  
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g., business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

- **PLO 1:** appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
- **PLO 2:** gain a comprehensive foundation for pursuing marine-oriented studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
- **PLO 3:** have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
- **PLO 4:** understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
- **PLO 5:** appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

**Impermissible Combinations:**  
NIL

**Required courses (36 credits)**

1. **Introductory level courses (12 credits)**

   **Disciplinary Electives (12 credits)**

   At least 12 credits selected from the following courses:
   - BIOL1309 Evolutionary diversity (6)
   - ENV51301 Environmental life science (6)
   - BIOL2306 Ecology and evolution (6)

2. **Advanced level courses (24 credits)**

   **Disciplinary Core Courses (12 credits)**
   - BIOL3301 Marine biology (6)
   - ENV53313 Environmental oceanography (6)

   **Disciplinary Electives (12 credits)**

   At least 12 credits selected from the following courses:
   - BIOL3303 Conservation biology (6)
   - BIOL3305 Tropical and temperate marine ecology field course (6)
   - BIOL3318 Experimental intertidal ecology (6)
   - BIOL3322 Marine invertebrate zoology (6)
   - BIOL3328 Nearshore marine and estuarine ecology (6)
   - BIOL4301 Fish and fisheries (6)

**Notes:**

1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Marine Biology
Offered to students admitted to Year 1 in 2017

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g., business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 2: gain a comprehensive foundation for pursuing marine-oriented studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 3: have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 4: understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 5: appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL1309 Evolutionary diversity (6)
   - ENV51301 Environmental life science (6)
   - BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - BIOL3301 Marine biology (6)
   - ENV53313 Environmental oceanography (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL3303 Conservation biology (6)
   - BIOL3305 Tropical and temperate marine ecology field course (6)
   - BIOL3318 Experimental intertidal ecology (6)
   - BIOL3322 Marine invertebrate zoology (6)
   - BIOL3328 Nearshore marine and estuarine ecology (6)
   - BIOL4301 Fish and fisheries (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g. business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

Learning Outcomes:
By the end of this programme, students should be able to:
PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
PLO 2: gain a comprehensive foundation for pursuing marine-oriented studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
PLO 3: have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
PLO 4: understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
PLO 5: appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   BIOL1309 Evolutionary diversity (6)
   ENVS1301 Environmental life science (6)
   BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   BIOL3301 Marine biology (6)
   ENVS3313 Environmental oceanography (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   BIOL3303 Conservation biology (6)
   BIOL3305 Tropical and temperate marine ecology field course (6)
   BIOL3318 Experimental intertidal ecology (6)
   BIOL3320 The biology of marine mammals (6)
   BIOL3322 Marine invertebrate zoology (6)
   BIOL3328 Nearshore marine and estuarine ecology (6)
   BIOL4301 Fish and fisheries (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (*disciplinary core*) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title:Minor in Marine Biology
Offered to students admitted to Year 1 in 2015

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g. business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 2: gain a comprehensive foundation for pursuing marine-orientated studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 3: have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 4: understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 5: appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)
1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- BIOL1309 Evolutionary diversity (6)
- ENVS1301 Environmental life science (6)
- BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)

Disciplinary Core Courses (12 credits)
- BIOL3301 Marine biology (6)
- ENVS3313 Environmental oceanography (6)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- BIOL3301 Conservation biology (6)
- BIOL3301 Tropical and temperate marine ecology field course (6)
- BIOL3301 Experimental intertidal ecology (6)
- BIOL3301 The biology of marine mammals (6)
- BIOL3301 Marine invertebrate zoology (6)
- BIOL3301 Nearshore marine and estuarine ecology (6)
- BIOL3301 Fish and fisheries (6)

Notes:
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Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Marine Biology

Offered to students admitted to Year 1 in 2014

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g. business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 2: gain a comprehensive foundation for pursuing marine-oriented studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 3: have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 4: understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 5: appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- BIOL1309 Evolutionary diversity (6)
- ENVS1301 Environmental life science (6)
- BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)

Disciplinary Core Courses (12 credits)
- BIOL3301 Marine biology (6)
- ENV3313 Environmental oceanography (6)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- BIOL3303 Conservation biology (6)
- BIOL3305 Tropical and temperate marine ecology field course (6)
- BIOL3318 Experimental intertidal ecology (6)
- BIOL3320 The biology of marine mammals (6)
- BIOL3322 Marine invertebrate zoology (6)
- BIOL3328 Nearshore marine and estuarine ecology (6)
- BIOL4301 Fish and fisheries (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Marine Biology
Offered to students admitted to Year 1 in 2013

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g., business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 2: gain a comprehensive foundation for pursuing marine-oriented studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 3: have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 4: understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 5: appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL1309 Evolutionary diversity (6)
   - ENVS1301 Environmental life science (6)
   - BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - BIOL3301 Marine biology (6)
   - ENVS3313 Environmental oceanography (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL3303 Conservation biology (6)
   - BIOL3305 Tropical and temperate marine ecology field course (6)
   - BIOL3318 Experimental intertidal ecology (6)
   - BIOL3320 The biology of marine mammals (6)
   - BIOL3322 Marine invertebrate zoology (6)
   - BIOL3328 Nearshore marine and estuarine ecology (6)
   - BIOL4301 Fish and fisheries (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (*disciplinary core*) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title Minor in Marine Biology
Offered to students admitted to Year 1 in 2012

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g. business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 2: gain a comprehensive foundation for pursuing marine-orientated studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 3: have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 4: understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 5: appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   BIOL1309 Evolutionary diversity (6)
   ENVS1301 Environmental life science (6)
   BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   BIOL3301 Marine biology (6)
   ENVS3313 Environmental oceanography (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   BIOL3303 Conservation biology (6)
   BIOL3305 Tropical and temperate marine ecology field course (6)
   BIOL3318 Experimental intertidal ecology (6)
   BIOL3320 The biology of marine mammals (6)
   BIOL3322 Marine invertebrate zoology (6)
   BIOL3328 Nearshore marine and estuarine ecology (6)
   BIOL4301 Fish and fisheries (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Mathematics
Offered to students admitted to Year 1 in 2019

Objectives:
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics (Intensive)
Minor in Computational & Financial Mathematics
Minor in Operations Research & Mathematical Programming

Required courses (36 credits)
1. Introductory level courses (18 credits) (note 4)
Disciplinary Core Course (6 credits)
MATH1013 University mathematics II (6)

Disciplinary Electives (12 credits)
Select either List A or List B:
List A
MATH2101 Linear algebra I (6)
MATH2211 Multivariable calculus (6)
List B
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MATH2014 Multivariable calculus and linear algebra (6)

2. Advanced level courses (18 credits)
Disciplinary Electives (18 credits)
At least 18 credits of advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), subject to pre-requisite requirements. The current course list includes courses in List A:
List A
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MATH3002 Mathematics seminar (6)
MATH3301 Algebra I (6)
MATH3303 Matrix theory and its applications (6)
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MATH3405 Differential equations (6)
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MATH3541 Introduction to topology (6)
MATH3600 Discrete mathematics (6)
MATH3601 Numerical analysis (6)
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MATH3901 Operations research I (6)
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MATH3905 Queueing theory and simulation (6)
MATH3906 Financial calculus (6)
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MATH3943 Network models in operations research (6)
MATH3999 Directed studies in mathematics (6)
MATH4302 Algebra II (6)
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MATH4406 Introduction to partial differential equations (6)
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**Remarks:**

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Minor Title: Minor in Mathematics  
Offered to students admitted to Year 1 in 2018

**Objectives:**
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

**Learning Outcomes:**
By the end of this programme, students should be able to:

PLO 1: understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

**Impermissible Combinations:**
- Major in Mathematics
- Major in Mathematics (Intensive)
- Minor in Computational & Financial Mathematics
- Minor in Operations Research & Mathematical Programming

**Required courses (36 credits)**

1. **Introductory level courses (18 credits) (note 4)**  
   **Disciplinary Core Course (6 credits)**  
   MATH1013 University mathematics II (6)

2. **Disciplinary Electives (12 credits)**  
   **Select either List A or List B:**
   - **List A**
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     - MATH2211 Multivariable calculus (6)
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Minor Title: Minor in Mathematics
Offered to students admitted to Year 1 in 2017

Objectives:
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

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By the end of this programme, students should be able to:
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Required courses (36 credits)

1. Introductory level courses (18 credits) (note 4)
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     - MATH1013 University mathematics II (6)
   - **Disciplinary Electives (12 credits)**
     - Select either List A or List B:
       - **List A**
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Required courses (36 credits)

1. Introductory level courses (18 credits) (note 4)
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</tr>
<tr>
<td>MATH7219</td>
<td>Topics in applied functional analysis</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7501</td>
<td>Topics in algebra</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7503</td>
<td>Topics in mathematical programming and optimization</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7504</td>
<td>Geometric topology</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7505</td>
<td>Real analysis</td>
<td>(6)</td>
</tr>
</tbody>
</table>

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. If students would like to take more courses in analysis such as MATH3401 (Analysis I), they are advised to take the introductory course MATH2241 Introduction to mathematical analysis first.

4. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title:** Minor in Mathematics  
**Offered to students:** admitted to Year 1 in 2014

**Objectives:**
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

**Learning Outcomes:**
By the end of this programme, students should be able to:
- **PLO 1:** understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2:** apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3:** communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

**Impermissible Combinations:**
- Major in Mathematics
- Major in Mathematics/Physics
- Minor in Computational & Financial Mathematics
- Minor in Operations Research & Mathematical Programming

**Required courses (36 credits)**

<table>
<thead>
<tr>
<th>Disciplinary Core Courses (18 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013 University mathematics II (6)</td>
</tr>
<tr>
<td>MATH2101 Linear algebra I (6)</td>
</tr>
<tr>
<td>MATH2211 Multivariable calculus (6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disciplinary Electives (18 credits)</th>
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<tbody>
<tr>
<td>MATH3001 Development of mathematical ideas (6)</td>
</tr>
<tr>
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</tr>
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</tr>
<tr>
<td>MATH3303 Matrix theory and its applications (6)</td>
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<tr>
<td>MATH3401 Analysis I (6)</td>
</tr>
<tr>
<td>MATH3403 Functions of a complex variable (6)</td>
</tr>
<tr>
<td>MATH3405 Differential equations (6)</td>
</tr>
<tr>
<td>MATH3408 Computational methods and differential equations with applications (6)</td>
</tr>
<tr>
<td>MATH3541 Introduction to topology (6)</td>
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<td>MATH3600 Discrete mathematics (6)</td>
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<td>MATH3601 Numerical analysis (6)</td>
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<tr>
<td>MATH3603 Probability theory (6)</td>
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<tr>
<td>MATH3901 Operations research I (6)</td>
</tr>
<tr>
<td>MATH3904 Introduction to optimization (6)</td>
</tr>
<tr>
<td>MATH3905 Queueing theory and simulation (6)</td>
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<tr>
<td>MATH3906 Financial calculus (6)</td>
</tr>
<tr>
<td>MATH3911 Game theory and strategy (6)</td>
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<tr>
<td>MATH3943 Network models in operations research (6)</td>
</tr>
<tr>
<td>MATH3999 Directed studies in mathematics (6)</td>
</tr>
<tr>
<td>MATH4302 Algebra II (6)</td>
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<tr>
<td>MATH4402 Analysis II (6)</td>
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<tr>
<td>MATH4404 Functional analysis (6)</td>
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<tr>
<td>MATH4406 Introduction to partial differential equations (6)</td>
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<tr>
<td>MATH4501 Geometry (6)</td>
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<td>MATH4511 Introduction to differentiable manifolds (6)</td>
</tr>
<tr>
<td>MATH4602 Scientific computing (6)</td>
</tr>
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<td>MATH4902 Operations research II (6)</td>
</tr>
<tr>
<td>MATH4907 Numerical methods for financial calculus (6)</td>
</tr>
<tr>
<td>MATH4910 Senior mathematics seminar (6)</td>
</tr>
<tr>
<td>MATH4911 Mathematics capstone project (6)</td>
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<tr>
<td>MATH4966 Mathematics internship (6)</td>
</tr>
<tr>
<td>MATH4999 Mathematics project (12)</td>
</tr>
<tr>
<td>MATH4701 Intermediate complex analysis (6)</td>
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<tr>
<td>MATH4701 Topics in geometry (6)</td>
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<tr>
<td>MATH4702 Complex manifolds (6)</td>
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<tr>
<td>MATH4717 Topics in financial mathematics (6)</td>
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<tr>
<td>MATH4719 Topics in applied functional analysis (6)</td>
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<tr>
<td>Course Code</td>
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<tr>
<td>------------</td>
</tr>
<tr>
<td>MATH7224</td>
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<tr>
<td>MATH7501</td>
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<tr>
<td>MATH7502</td>
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<tr>
<td>MATH7503</td>
</tr>
<tr>
<td>MATH7504</td>
</tr>
<tr>
<td>MATH7505</td>
</tr>
</tbody>
</table>

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. If students would like to take more courses in analysis such as MATH3401 (Analysis I), they are advised to take the introductory course MATH2241 Introduction to mathematical analysis first.

4. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Mathematics

Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
- Major in Mathematics
- Major in Mathematics/Physics
- Minor in Computational & Financial Mathematics
- Minor in Operations Research & Mathematical Programming

Required courses (36 credits)

<table>
<thead>
<tr>
<th>1. Introductory level courses (18 credits) (note 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disciplinary Core Courses (18 credits)</td>
</tr>
<tr>
<td>MATH1013: University mathematics II (6)</td>
</tr>
<tr>
<td>MATH2101: Linear algebra I (6)</td>
</tr>
<tr>
<td>MATH2211: Multivariable calculus (6)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Advanced level courses (18 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disciplinary Electives (18 credits)</td>
</tr>
<tr>
<td>At least 18 credits of advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), subject to pre-requisite requirements. The current course list includes courses in List A:</td>
</tr>
</tbody>
</table>

**List A**

| MATH3001: Development of mathematical ideas (6) |
| MATH3002: Mathematics seminar (6)               |
| MATH3301: Algebra I (6)                         |
| MATH3303: Matrix theory and its applications (6) |
| MATH3304: Introduction to number theory (6)      |
| MATH3401: Analysis I (6)                        |
| MATH3403: Functions of a complex variable (6)    |
| MATH3405: Differential equations (6)             |
| MATH3408: Computational methods and differential equations with applications (6) |
| MATH3541: Introduction to topology (6)           |
| MATH3600: Discrete mathematics (6)               |
| MATH3601: Numerical analysis (6)                 |
| MATH3603: Probability theory (6)                 |
| MATH3901: Operations research I (6)              |
| MATH3904: Introduction to optimization (6)       |
| MATH3905: Queueing theory and simulation (6)     |
| MATH3906: Financial calculus (6)                 |
| MATH3911: Game theory and strategy (6)           |
| MATH3943: Network models in operations research (6) |
| MATH3999: Directed studies in mathematics (6)    |
| MATH4302: Algebra II (6)                        |
| MATH4402: Analysis II (6)                       |
| MATH4404: Functional analysis (6)                |
| MATH4406: Introduction to partial differential equations (6) |
| MATH4501: Geometry (6)                          |
| MATH4511: Introduction to differentiable manifolds (6) |
| MATH4602: Scientific computing (6)               |
| MATH4902: Operations research II (6)             |
| MATH4907: Numerical methods for financial calculus (6) |
| MATH4910: Senior mathematics seminar (6)         |
| MATH4911: Mathematics capstone project (6)       |
| MATH4966: Mathematics internship (6)             |
| MATH4999: Mathematics project (12)               |
| MATH4701: Intermediate complex analysis (6)      |
| MATH4702: Topics in geometry (6)                 |
| MATH4702: Complex manifolds (6)                  |
| MATH4717: Topics in financial mathematics (6)    |
| MATH4729: Topics in applied functional analysis (6) |
MATH7224  Topics in advanced probability theory (6)
MATH7501  Topics in algebra (6)
MATH7502  Topics in applied discrete mathematics (6)
MATH7503  Topics in mathematical programming and optimization (6)
MATH7504  Geometric topology (6)
MATH7505  Real analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. If students would like to take more courses in analysis such as MATH3401 (Analysis I), they are advised to take the introductory course MATH2241 Introduction to mathematical analysis first.

4. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Mathematics
Offered to students admitted to Year 1 in 2012

Objectives:
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics/Physics
Minor in Computational & Financial Mathematics

Required courses (36 credits)

1. Introductory level courses (18 credits) (note 4)
Disciplinary Core Courses (18 credits)
MATH1013 University mathematics II (6)
MATH2101 Linear algebra I (6)
MATH2211 Multivariable calculus (6)

2. Advanced level courses (18 credits)
Disciplinary Electives (18 credits)
At least 18 credits of advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), subject to pre-requisite requirements. The current course list includes courses in List A:

List A
MATH3001 Development of mathematical ideas (6)
MATH3002 Mathematics seminar (6)
MATH3301 Algebra I (6)
MATH3303 Matrix theory and its applications (6)
MATH3304 Introduction to number theory (6)
MATH3401 Analysis I (6)
MATH3403 Functions of a complex variable (6)
MATH3405 Differential equations (6)
MATH3408 Computational methods and differential equations with applications (6)
MATH3541 Introduction to topology (6)
MATH3600 Discrete mathematics (6)
MATH3601 Numerical analysis (6)
MATH3603 Probability theory (6)
MATH3901 Operations research I (6)
MATH3904 Introduction to optimization (6)
MATH3905 Queueing theory and simulation (6)
MATH3906 Financial calculus (6)
MATH3911 Game theory and strategy (6)
MATH3943 Network models in operations research (6)
MATH3999 Directed studies in mathematics (6)
MATH4302 Algebra II (6)
MATH4402 Analysis II (6)
MATH4404 Functional analysis (6)
MATH4406 Introduction to partial differential equations (6)
MATH4501 Geometry (6)
MATH4511 Introduction to differentiable manifolds (6)
MATH4602 Scientific computing (6)
MATH4902 Operations research II (6)
MATH4907 Numerical methods for financial calculus (6)
MATH4910 Senior mathematics seminar (6)
MATH4911 Mathematics capstone project (6)
MATH4966 Mathematics internship (6)
MATH4999 Mathematics project (12)
MATH7101 Intermediate complex analysis (6)
MATH7201 Topics in geometry (6)
MATH7202 Complex manifolds (6)
MATH7217 Topics in financial mathematics (6)
MATH7219 Topics in applied functional analysis (6)
MATH7224 Topics in advanced probability theory (6)
MATH7501  Topics in algebra (6)
MATH7502  Topics in applied discrete mathematics (6)
MATH7503  Topics in mathematical programming and optimization (6)
MATH7504  Geometric topology (6)
MATH7505  Real analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.

3. If students would like to take more courses in analysis such as MATH3401 (Analysis I), they are advised to take the introductory course MATH2241 Introduction to mathematical analysis first.

4. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Molecular Biology & Biotechnology
Offered to students admitted to Year 1 in 2019

Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2**: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)
- **PLO 3**: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
- Major in Molecular Biology & Biotechnology
- Major in Molecular Biology & Biotechnology (Intensive)

### Required courses (36 credits)

**1. Introductory level courses (12 credits)**

- **Disciplinary Electives (12 credits)**
  - At least 12 credits selected from the following courses:
    - BIOL1110 From molecules to cells (6)
    - BIOL1309 Evolutionary diversity (6)
    - BIOC2600 Basic biochemistry (6)
    - BIOL2102 Biostatistics (6)
    - BIOL2103 Biological sciences laboratory course (6)
    - BIOL2220 Principles of biochemistry (6)
    - BIOL2230 Ecology and evolution (6)
    - BIOL2306 Business aspects of biotechnology (6)
    - BIOL2306 Microbial physiology and biotechnology (6)
    - BIOL4401 Medical microbiology and applied immunology (6)
    - BIOL4411 Plant and food biotechnology (6)
    - BIOL4415 Healthcare biotechnology (6)
    - BIOL4416 Stem cells and regenerative biology (6)
    - BIOC2600 'Omics' and systems biology (6)
    - ENV54110 Environmental remediation (6)

**2. Advanced level courses (24 credits)**

- **Disciplinary Core Courses (6 credits)**
  - BIOL3401 Molecular biology (6)

- **Disciplinary Electives (18 credits)**
  - At least 18 credits selected from the following courses:
    - BIOL3402 Cell biology and cell technology (6)
    - BIOL3403 Immunology (6)
    - BIOL3409 Business aspects of biotechnology (6)
    - BIOL3508 Microbial physiology and biotechnology (6)
    - BIOL4401 Medical microbiology and applied immunology (6)
    - BIOL4411 Plant and food biotechnology (6)
    - BIOL4415 Healthcare biotechnology (6)
    - BIOL4416 Stem cells and regenerative biology (6)
    - BIOC2600 'Omics' and systems biology (6)
    - ENV54110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Molecular Biology & Biotechnology

Offered to students admitted to Year 1 in 2018

Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2**: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)
- **PLO 3**: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Molecular Biology & Biotechnology
Major in Molecular Biology & Biotechnology (Intensive)

Required courses (36 credits)

1. Introductory level courses (12 credits)
   **Disciplinary Electives (12 credits)**
   At least 12 credits selected from the following courses:
   - BIOL1110: From molecules to cells (6)
   - BIOL1309: Evolutionary diversity (6)
   - BIOC2600: Basic biochemistry (6)
   - BIOL2102: Biostatistics (6)
   - BIOL2103: Biological sciences laboratory course (6)
   - BIOL2220: Principles of biochemistry (6)
   - BIOL2220: Principles of biochemistry (6)
   - BIOL2306: Ecology and evolution (6)

2. Advanced level courses (24 credits)
   **Disciplinary Core Courses (6 credits)**
   - BIOL3401: Molecular biology (6)
   **Disciplinary Electives (18 credits)**
   At least 18 credits selected from the following courses:
   - BIOL3402: Cell biology and cell technology (6)
   - BIOL3403: Immunology (6)
   - BIOL3409: Business aspects of biotechnology (6)
   - BIOL3508: Microbial physiology and biotechnology (6)
   - BIOL4401: Medical microbiology and applied immunology (6)
   - BIOL4411: Plant and food biotechnology (6)
   - BIOL4415: Healthcare biotechnology (6)
   - BIOL4416: Stem cells and regenerative biology (6)
   - BIOL4417: 'Omics' and systems biology (6)
   - ENVS4110: Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**
Minor in Molecular Biology & Biotechnology

**Offered to students** admitted to Year 1 in 2017

**Objectives:**
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2:** develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)
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**Impermissible Combinations:**
Major in Molecular Biology & Biotechnology
Major in Molecular Biology & Biotechnology (Intensive)

**Required courses (36 credits)**

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   - BIOL2103 Biological sciences laboratory course (6)
   - BIOL2220 Principles of biochemistry (6)
   - BIOL2306 Ecology and evolution (6)

2. **Advanced level courses (24 credits)**
   **Disciplinary Electives (18 credits)**
   At least 18 credits selected from the following courses:
   - BIOL3401 Molecular biology (6)
   - BIOL3402 Cell biology and cell technology (6)
   - BIOL3403 Immunology (6)
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   - ENVS4110 Environmental remediation (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Molecular Biology & Biotechnology
Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)

PLO 3: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Molecular Biology & Biotechnology
Major in Molecular Biology & Biotechnology (Intensive)

Required courses (36 credits)

1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:

- BIOL1110 From molecules to cells (6)
- BIOL1309 Evolutionary diversity (6)
- BIOC2600 Basic biochemistry (6)
- BIOL2102 Biostatistics (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2220 Principles of biochemistry (6)

- BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
Disciplinary Core Courses (6 credits)

- BIOL3401 Molecular biology (6)

Disciplinary Electives (18 credits)
At least 18 credits selected from the following courses:

- BIOL3402 Cell biology and cell technology (6)
- BIOL3403 Immunology (6)
- BIOL3409 Business aspects of biotechnology (6)
- BIOL3508 Microbial physiology and biotechnology (6)
- BIOL4401 Medical microbiology and applied immunology (6)
- BIOL4411 Plant and food biotechnology (6)
- BIOL4415 Healthcare biotechnology (6)
- BIOL4416 Stem cells and regenerative biology (6)
- BIOL4417 'Omics' and systems biology (6)
- ENV4110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Molecular Biology & Biotechnology

Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)

PLO 3: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Molecular Biology & Biotechnology
Major in Molecular Biology & Biotechnology (Intensive)

Required courses (36 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:

BIOL1110 From molecules to cells (6)
BIOL1309 Evolutionary diversity (6)
BIOL2220 Principles of biochemistry (6)

BIOL2102 Biostatistics (6)
BIOL2103 Biological sciences laboratory course (6)
BIOL2220 Principles of biochemistry (6)

BIOL2306 Ecology and evolution (6)

May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.

May take either BIOL2220 or BIOC2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

2. Advanced level courses (24 credits)

Disciplinary Core Courses (6 credits)
BIOL3401 Molecular biology (6)

Disciplinary Electives (18 credits)
At least 18 credits selected from the following courses:

BIOL3402 Cell biology and cell technology (6)
BIOL3403 Immunology (6)
BIOL3409 Business aspects of biotechnology (6)
BIOL3508 Microbial physiology and biotechnology (6)

BIOL4401 Medical microbiology and applied immunology (6)
BIOL4402 Microbial biotechnology (6)

BIOL4411 Plant and food biotechnology (6)
BIOL4415 Healthcare biotechnology (6)
BIOL4416 Stem cells and regenerative biology (6)
BIOL4417 ’Omics’ and systems biology (6)
ENVS4110 Environmental remediation (6)

May take either BIOL3508 or BIOL4402 to fulfill this 18 credits requirement, but not both.

BIOL3508 and BIOL4402 are mutually exclusive.

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor in Molecular Biology & Biotechnology

Offered to students admitted to Year 1 in 2014

### Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2**: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)
- **PLO 3**: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

### Impermissible Combinations:
- Major in Molecular Biology & Biotechnology
- Major in Molecular Biology & Biotechnology (Intensive)

### Required courses (36 credits)

#### 1. Introductory level courses (12 credits)

**Disciplinary Electives (12 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL2102</td>
<td>Biostatistics</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL2103</td>
<td>Biological sciences laboratory course</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution</td>
<td>(6)</td>
</tr>
</tbody>
</table>

#### 2. Advanced level courses (24 credits)

**Disciplinary Core Courses (6 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3401</td>
<td>Molecular biology</td>
<td>(6)</td>
</tr>
</tbody>
</table>

**Disciplinary Electives (18 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology</td>
<td>(6)</td>
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<tr>
<td>BIOL3403</td>
<td>Immunology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3409</td>
<td>Business aspects of biotechnology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
<td>(6)</td>
</tr>
</tbody>
</table>
| BIOL4401    | Medical microbiology and applied immunology| (6) | May take either BIOL3508 or BIOL4402 to fulfill this 18 credits requirement, but not both. BIOL3508 and BIOL4402 are mutually exclusive.
| BIOL4402    | Microbial biotechnology               | (6)     |
| BIOL4411    | Plant and food biotechnology         | (6)     |
| BIOL4415    | Healthcare biotechnology              | (6)     |
| BIOL4416    | Stem cells and regenerative biology   | (6)     |
| BIOL4417    | 'Omics' and systems biology          | (6)     |
| ENVS4110    | Environmental remediation             | (6)     |

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
### Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

### Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2**: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)
- **PLO 3**: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

### Impermissible Combinations:
- Major in Molecular Biology & Biotechnology
- Major in Molecular Biology & Biotechnology (Intensive)

### Required courses (36 credits)

#### 1. Introductory level courses (12 credits)

<table>
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<tr>
<th>Disciplinary Electives (12 credits)</th>
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<tbody>
<tr>
<td>At least 12 credits selected from the following courses:</td>
</tr>
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<td>BIOL1110 From molecules to cells (6)</td>
</tr>
<tr>
<td>BIOL1309 Evolutionary diversity (6)</td>
</tr>
<tr>
<td>BIOC2600 Basic biochemistry (6)</td>
</tr>
<tr>
<td>BIOL2102 Biostatistics (6)</td>
</tr>
<tr>
<td>BIOL2103 Biological sciences laboratory course (6)</td>
</tr>
<tr>
<td>BIOL2220 Principles of biochemistry (6)</td>
</tr>
<tr>
<td>BIOL2306 Ecology and evolution (6)</td>
</tr>
</tbody>
</table>

**May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.**

#### 2. Advanced level courses (24 credits)

<table>
<thead>
<tr>
<th>Disciplinary Core Courses (6 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3401 Molecular biology (6)</td>
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</table>

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<tr>
<th>Disciplinary Electives (18 credits)</th>
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<tbody>
<tr>
<td>At least 18 credits selected from the following courses:</td>
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<td>BIOL3402 Cell biology and cell technology (6)</td>
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<tr>
<td>BIOL3403 Immunology (6)</td>
</tr>
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</tr>
<tr>
<td>ENVS4110 Environmental remediation (6)</td>
</tr>
</tbody>
</table>

**Take either BIOL3508 or BIOL4402 to fulfill this 18 credits requirement, but not both. BIOL3508 and BIOL4402 are mutually exclusive.**

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor in Molecular Biology & Biotechnology

**Offered to students admitted to Year 1 in 2012**

### Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

### Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1**: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)

**PLO 2**: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)

**PLO 3**: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

### Impermissible Combinations:
- Major in Molecular Biology & Biotechnology
- Major in Molecular Biology & Biotechnology (Intensive)

### Required courses (36 credits)

#### 1. Introductory level courses (12 credits)

**Disciplinary Electives (12 credits)**

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#### 2. Advanced level courses (24 credits)

**Disciplinary Core Courses (6 credits)**

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BIOL3401</td>
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**Disciplinary Electives (18 credits)**

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<th>Course Code</th>
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<td>6</td>
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<tr>
<td>ENVS4110</td>
<td>Environmental remediation</td>
<td>6</td>
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**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
- Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled.
- Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Operations Research & Mathematical Programming

Offered to students admitted to Year 1 in 2019

Objectives:
The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithm, mathematical modeling, and decision making. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from decision sciences and logistic industry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and demonstrate understanding of fundamental concepts in operations research & mathematical programming (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics (Intensive)
Minor in Mathematics
Minor in Computational & Financial Mathematics

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Course (6 credits)
   MATH1013 University mathematics II (6)
   Disciplinary Electives (12 credits)
   Select either List A or List B:
   List A
   MATH2101 Linear algebra I (6)
   MATH2211 Multivariable calculus (6)
   List B
   MATH2012 Fundamental concepts of mathematics (6)
   MATH2014 Multivariable calculus and linear algebra (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   MATH3901 Operations research I (6)
   MATH3904 Introduction to optimization (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   MATH3405 Differential equations (6)
   MATH3600 Discrete mathematics (6)
   MATH3905 Queuing theory and simulation (6)
   MATH3906 Financial calculus (6)
   MATH3911 Game theory and strategy (6)
   MATH3943 Network models in operations research (6)
   MATH4902 Operations research II (6)
   MATH4907 Numerical methods for financial calculus (6)
   MATH7502 Topics in applied discrete mathematics (6)
   MATH7503 Topics in mathematical programming and optimization (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this minor. Students who do not fulfill this requirement are required to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Operations Research & Mathematical Programming  
Offered to students admitted to Year 1 in 2018

**Objectives:**
The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithm, mathematical modeling, and decision making. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from decision sciences and logistic industry.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** describe and demonstrate understanding of fundamental concepts in operations research & mathematical programming (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2:** apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3:** communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

**Impermissible Combinations:**
Major in Mathematics  
Major in Mathematics (Intensive)  
Minor in Mathematics  
Minor in Computational & Financial Mathematics

**Required courses (42 credits)**

1. **Introductory level courses (18 credits) (note 3)**
   - **Disciplinary Core Course (6 credits)**
     - MATH1013 University mathematics II (6)
   - **Disciplinary Electives (12 credits)**
     - Select either List A or List B:
       - **List A**
         - MATH2101 Linear algebra I (6)
         - MATH2211 Multivariable calculus (6)
       - **List B**
         - MATH2012 Fundamental concepts of mathematics (6)
         - MATH2014 Multivariable calculus and linear algebra (6)

2. **Advanced level courses (24 credits)**
   - **Disciplinary Core Courses (12 credits)**
     - MATH3901 Operations research I (6)
     - MATH3904 Introduction to optimization (6)
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - MATH3405 Differential equations (6)
       - MATH3600 Discrete mathematics (6)
       - MATH3905 Queueing theory and simulation (6)
       - MATH3906 Financial calculus (6)
       - MATH3911 Game theory and strategy (6)
       - MATH3943 Network models in operations research (6)
       - MATH4902 Operations research II (6)
       - MATH4907 Numerical methods for financial calculus (6)
       - MATH7502 Topics in applied discrete mathematics (6)
       - MATH7503 Topics in mathematical programming and optimization (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this minor. Students who do not fulfill this requirement are required to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
# Minor in Operations Research & Mathematical Programming

**Offered to students admitted to Year 1 in 2017**

**Objectives:**
The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithm, mathematical modeling, and decision making. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from decision sciences and logistic industry.

**Learning Outcomes:**
By the end of this programme, students should be able to:
- **PLO 1**: describe and demonstrate understanding of fundamental concepts in operations research & mathematical programming (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2**: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3**: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

**Impermissible Combinations:**
- Major in Mathematics
- Major in Mathematics (Intensive)
- Major in Mathematics/Physics
- Minor in Mathematics
- Minor in Computational & Financial Mathematics

### Required courses (42 credits)

1. **Introductory level courses (18 credits) (note 3)**
   - **Disciplinary Core Course (6 credits)**
     - MATH1013 University mathematics II (6)
   
2. **Disciplinary Electives (12 credits)**
   - Select either List A or List B:
     - **List A**
       - MATH2101 Linear algebra I (6)
       - MATH2211 Multivariable calculus (6)
     - **List B**
       - MATH2012 Fundamental concepts of mathematics (6)
       - MATH2014 Multivariable calculus and linear algebra (6)

2. **Advanced level courses (24 credits)**
   - **Disciplinary Core Courses (12 credits)**
     - MATH3901 Operations research I (6)
     - MATH3904 Introduction to optimization (6)
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - MATH3405 Differential equations (6)
       - MATH3600 Discrete mathematics (6)
       - MATH3905 Queueing theory and simulation (6)
       - MATH3906 Financial calculus (6)
       - MATH3911 Game theory and strategy (6)
       - MATH3943 Network models in operations research (6)
       - MATH4902 Operations research II (6)
       - MATH4907 Numerical methods for financial calculus (6)
       - MATH7502 Topics in applied discrete mathematics (6)
       - MATH7503 Topics in mathematical programming and optimization (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this minor. Students who do not fulfill this requirement are required to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at [https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements](https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements).

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor in Operations Research & Mathematical Programming

Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithm, mathematical modeling, and decision making. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from decision sciences and logistic industry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and demonstrate understanding of fundamental concepts in operations research & mathematical programming (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics (Intensive)
Major in Mathematics/Physics
Minor in Mathematics
Minor in Computational & Financial Mathematics

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
Disciplinary Core Course (6 credits)
MATH1013 University mathematics II (6)

Disciplinary Electives (12 credits)
Select either List A or List B:
List A
MATH2101 Linear algebra I (6)
MATH2211 Multivariable calculus (6)

List B
MATH2012 Fundamental concepts of mathematics (6)
MATH2014 Multivariable calculus and linear algebra (6)

2. Advanced level courses (24 credits)
Disciplinary Core Courses (12 credits)
MATH3901 Operations research I (6)
MATH3904 Introduction to optimization (6)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
MATH3405 Differential equations (6)
MATH3600 Discrete mathematics (6)
MATH3905 Queueing theory and simulation (6)
MATH3906 Financial calculus (6)
MATH3911 Game theory and strategy (6)
MATH3943 Network models in operations research (6)
MATH4902 Operations research II (6)
MATH4907 Numerical methods for financial calculus (6)
MATH7502 Topics in applied discrete mathematics (6)
MATH7503 Topics in mathematical programming and optimization (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this minor. Students who do not fulfill this requirement are required to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Operations Research & Mathematical Programming  
Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithm, mathematical modeling, and decision making. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from decision sciences and logistic industry.

Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1:** describe and demonstrate understanding of fundamental concepts in operations research & mathematical programming (by means of coursework, tutorial classes and project-based learning in the curriculum)

**PLO 2:** apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

**PLO 3:** communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics/Physics
Minor in Mathematics
Minor in Computational & Financial Mathematics

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   - **Disciplinary Core Course (6 credits)**
     - MATH1013 University mathematics II (6)
   - **Disciplinary Electives (12 credits)**
     - Select either List A or List B:
       - **List A**
         - MATH2101 Linear algebra I (6)
         - MATH2211 Multivariable calculus (6)
       - **List B**
         - MATH2012 Fundamental concepts of mathematics (6)
         - MATH2014 Multivariable calculus and linear algebra (6)

2. Advanced level courses (24 credits)
   - **Disciplinary Core Courses (12 credits)**
     - MATH3901 Operations research I (6)
     - MATH3904 Introduction to optimization (6)
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - MATH3405 Differential equations (6)
       - MATH3600 Discrete mathematics (6)
       - MATH3905 Queueing theory and simulation (6)
       - MATH3906 Financial calculus (6)
       - MATH3911 Game theory and strategy (6)
       - MATH3943 Network models in operations research (6)
       - MATH4902 Operations research II (6)
       - MATH4907 Numerical methods for financial calculus (6)
       - MATH7502 Topics in applied discrete mathematics (6)
       - MATH7503 Topics in mathematical programming and optimization (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this minor. Students who do not fulfill this requirement are required to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
# Minor in Operations Research & Mathematical Programming

**Offered to students admitted to Year 1 in 2014**

## Objectives:

The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithm, mathematical modeling, and decision making. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from decision sciences and logistic industry.

## Learning Outcomes:

By the end of this programme, students should be able to:

**PLO 1**: describe and demonstrate understanding of fundamental concepts in operations research & mathematical programming (by means of coursework, tutorial classes and project-based learning in the curriculum)

**PLO 2**: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

**PLO 3**: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

## Impermissible Combinations:

- Major in Mathematics
- Major in Mathematics/Physics
- Minor in Mathematics
- Minor in Computational & Financial Mathematics

## Required courses (42 credits)

### 1. Introductory level courses (18 credits) (note 3)

**Disciplinary Core Courses (18 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
<td></td>
</tr>
<tr>
<td>MATH2101</td>
<td>Linear algebra I (6)</td>
<td></td>
</tr>
<tr>
<td>MATH2211</td>
<td>Multivariable calculus (6)</td>
<td></td>
</tr>
</tbody>
</table>

### 2. Advanced level courses (24 credits)

**Disciplinary Core Courses (12 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3901</td>
<td>Operations research I (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization (6)</td>
<td></td>
</tr>
</tbody>
</table>

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3405</td>
<td>Differential equations (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3600</td>
<td>Discrete mathematics (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3905</td>
<td>Queueing theory and simulation (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3906</td>
<td>Financial calculus (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3911</td>
<td>Game theory and strategy (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3943</td>
<td>Network models in operations research (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4902</td>
<td>Operations research II (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus (6)</td>
<td></td>
</tr>
<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics (6)</td>
<td></td>
</tr>
<tr>
<td>MATH7503</td>
<td>Topics in mathematical programming and optimization (6)</td>
<td></td>
</tr>
</tbody>
</table>

## Notes:

1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this minor. Students who do not fulfill this requirement are required to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at [https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements](https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements).

## Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Operations Research & Mathematical Programming

Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithm, mathematical modeling, and decision making. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from decision sciences and logistic industry.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: describe and demonstrate understanding of fundamental concepts in operations research & mathematical programming (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Major in Mathematics/Physics
Minor in Mathematics
Minor in Computational & Financial Mathematics

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Courses (18 credits)
   - MATH1013 University mathematics II (6)
   - MATH2101 Linear algebra I (6)
   - MATH2211 Multivariable calculus (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - MATH3901 Operations research I (6)
   - MATH3904 Introduction to optimization (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - MATH3405 Differential equations (6)
   - MATH3600 Discrete mathematics (6)
   - MATH3905 Queueing theory and simulation (6)
   - MATH3906 Financial calculus (6)
   - MATH3911 Game theory and strategy (6)
   - MATH3943 Network models in operations research (6)
   - MATH4902 Operations research II (6)
   - MATH4907 Numerical methods for financial calculus (6)
   - MATH7502 Topics in applied discrete mathematics (6)
   - MATH7503 Topics in mathematical programming and optimization (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this minor. Students who do not fulfill this requirement are required to take MATH1011 University mathematics I.

3. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at https://www.scifac.hku.hk/current/ug/academic/overlapping-course-requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title | Minor in Physics  
Offered to students admitted to Year 1 in | 2019  
**Objectives:**  
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.  
**Learning Outcomes:**  
By the end of this programme, students should be able to:  
PLO 1: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)  
PLO 2: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)  
PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)  
**Impermissible Combinations:**  
Major in Physics  
Major in Physics (Intensive)  
**Required courses (42 credits)**  
1. Introductory level courses (24 credits)  
   Disciplinary Core Courses (6 credits)  
   PHYS1250 Fundamental physics (6)  
   Disciplinary Electives (18 credits)  
   At least 18 credits selected from the following courses:  
   - PHYS1150 Problem solving in physics (6)  
   - PHYS2055 Introductory relativity (6)  
   - PHYS2150 Methods in physics I (6)  
   - PHYS2155 Methods in physics II (6)  
   - PHYS2160 Introductory computational physics (6)  
   - PHYS2250 Introductory mechanics (6)  
   - PHYS2255 Introductory electricity and magnetism (6)  
   - PHYS2261 Introductory heat and thermodynamics (6)  
   - PHYS2265 Introductory quantum physics (6)  
2. Advanced level courses (18 credits)  
   Disciplinary Electives (18 credits)  
   At least 18 credits selected from the following courses:  
   List A  
   - PHYS3150 Theoretical physics (6)  
   - PHYS3151 Machine learning in physics (6)  
   - PHYS3350 Classical mechanics (6)  
   - PHYS3351 Quantum mechanics (6)  
   - PHYS3450 Electromagnetism (6)  
   - PHYS3550 Statistical mechanics & thermodynamics (6)  
   - PHYS3650 Observational astronomy (6)  
   - PHYS3653 Astrophysics (6)  
   - PHYS3660 Astronomy laboratory (6)  
   - PHYS3750 Laser and spectroscopy (6)  
   - PHYS3760 Physics laboratory (6)  
   - PHYS3850 Waves and optics (6)  
   - PHYS3851 Atomic and nuclear physics (6)  
   - PHYS4150 Computational physics (6)  
   - PHYS4151 Data analysis and modeling in physics (6)  
   - PHYS4351 Advanced quantum mechanics (6)  
   - PHYS4450 Advanced electromagnetism (6)  
   - PHYS4551 Solid state physics (6)  
   - PHYS4652 Planetary science (6)  
   - PHYS4653 Cosmology (6)  
   - PHYS4654 General relativity (6)  
   - PHYS4655 Interstellar medium (6)  
   - PHYS4656 Advanced astrophysics (6)  
   - PHYS4850 Particle physics (6)  
   - PHYS7350 Graduate classical mechanics (6)  
   - PHYS7351 Graduate quantum mechanics (6)  
   - PHYS7450 Graduate electromagnetism (6)  
   - PHYS7550 Graduate statistical mechanics (6)  
   - PHYS7750 Nanophysics (6)  

**Notes:**  
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc
2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor Title

**Minor in Physics**

**Offered to students admitted to Year 1 in**

2018

### Objectives:

The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

### Learning Outcomes:

By the end of this programme, students should be able to:

1. **PLO 1**: Identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)
2. **PLO 2**: Analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)
3. **PLO 3**: Communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

### Impermissible Combinations:

- Major in Physics
- Major in Physics (Intensive)

### Required courses (42 credits)

1. **Introductory level courses (24 credits)**
   - Disciplinary Core Courses (6 credits)
     - PHYS1250 Fundamental physics (6)
   - Disciplinary Electives (18 credits)
     - At least 18 credits selected from the following courses:
       - PHYS1150 Problem solving in physics (6)
       - PHYS2055 Introductory relativity (6) [previous title: Introduction to relativity (6)]
       - PHYS2150 Methods in physics I (6)
       - PHYS2155 Methods in physics II (6)
       - PHYS2250 Introductory mechanics (6)
       - PHYS2255 Introductory electricity and magnetism (6)
       - PHYS2261 Introductory heat and thermodynamics (6)
       - PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]

2. **Advanced level courses (18 credits)**
   - Disciplinary Electives (18 credits)
     - At least 18 credits selected from the following courses:
       - List A
         - PHYS3150 Theoretical physics (6)
         - PHYS3151 Machine learning in physics (6)
         - PHYS3350 Classical mechanics (6)
         - PHYS3351 Quantum mechanics (6)
         - PHYS3450 Electromagnetism (6)
         - PHYS3550 Statistical mechanics & thermodynamics (6)
         - PHYS3650 Observational astronomy (6)
         - PHYS3653 Astrophysics (6)
         - PHYS3660 Astronomy laboratory (6)
         - PHYS3750 Laser and spectroscopy (6)
         - PHYS3760 Physics laboratory (6)
         - PHYS3850 Waves and optics (6)
         - PHYS3851 Atomic and nuclear physics (6)
         - PHYS4150 Computational physics (6)
         - PHYS4151 Data analysis and modeling in physics (6)
         - PHYS4351 Advanced quantum mechanics (6)
         - PHYS4450 Advanced electromagnetism (6)
         - PHYS4551 Solid state physics (6)
         - PHYS4652 Planetary science (6)
         - PHYS4653 Cosmology (6)
         - PHYS4654 General relativity (6)
         - PHYS4655 Interstellar medium (6)
         - PHYS4856 Advanced astrophysics (6)
         - PHYS4850 Particle physics (6)
         - PHYS7350 Graduate classical mechanics (6)
         - PHYS7351 Graduate quantum mechanics (6)
         - PHYS7450 Graduate electromagnetism (6)
         - PHYS7550 Graduate statistical mechanics (6)
         - PHYS7750 Nanophysics (6)

### Notes:

1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.
2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Physics
Offered to students admitted to Year 1 in 2017

Objectives:
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics/Physics
Major in Physics
Major in Physics (Intensive)

Required courses (42 credits)

1. Introductory level courses (18 credits)

Disciplinary Core Courses (18 credits)

PHYS1250 Fundamental physics (6)
PHYS2250 Introductory mechanics (6)
PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]

2. Advanced level courses (24 credits)

Disciplinary Electives (24 credits)

At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

List A

PHYS3150 Theoretical physics (6)
PHYS3350 Classical mechanics (6)
PHYS3351 Quantum mechanics (6)
PHYS3450 Electromagnetism (6)
PHYS3550 Statistical mechanics & thermodynamics (6)
PHYS3551 Introductory solid state physics (6)
PHYS3650 Observational astronomy (6)
PHYS3651 The physical universe (6)
PHYS3652 Principles of astronomy (6)
PHYS3750 Laser and spectroscopy (6)
PHYS3751 Physics of nanomaterials (6)
PHYS3850 Waves and optics (6)
PHYS3851 Atomic and nuclear physics (6)
PHYS3999 Directed studies in physics (6)
PHYS4150 Computational physics (6)
PHYS4151 Data analysis and modeling in physics (6)
PHYS4350 Advanced classical mechanics (6)
PHYS4351 Advanced quantum mechanics (6)
PHYS4450 Advanced electromagnetism (6)
PHYS4550 Advanced statistical mechanics (6)
PHYS4551 Solid state physics (6)
PHYS4650 Stellar physics (6)
PHYS4651 Selected topics in astrophysics (6)
PHYS4652 Planetary science (6)
PHYS4653 Cosmology (6)
PHYS4654 General relativity (6)
PHYS4655 Interstellar medium (6)
PHYS4750 Experimental physics (6)
PHYS4850 Particle physics (6)
PHYS4966 Physics internship (6)
PHYS4999 Physics project (12)
PHYS7350 Graduate classical mechanics (6)
PHYS7351 Graduate quantum mechanics (6)
PHYS7450 Graduate electromagnetism (6)
PHYS7550 Graduate statistical mechanics (6)
PHYS7551 Graduate solid state physics (6)
PHYS7650 Stellar atmospheres (6)
PHYS7750 Nanophysics (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course
("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Physics

Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)
PLO 2: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)
PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics/Physics
Major in Physics
Major in Physics (Intensive)

Required courses (42 credits)

1. Introductory level courses (18 credits)

Disciplinary Core Courses (18 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS1250</td>
<td>Fundamental physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2250</td>
<td>Introductory mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2265</td>
<td>Introductory quantum physics</td>
<td>6</td>
</tr>
</tbody>
</table>

[previous title: Modern physics (6)]

2. Advanced level courses (24 credits)

Disciplinary Electives (24 credits)
At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

List A

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3150</td>
<td>Theoretical physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3350</td>
<td>Classical mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3351</td>
<td>Quantum mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3450</td>
<td>Electromagnetism</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3550</td>
<td>Statistical mechanics &amp; thermodynamics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3551</td>
<td>Introductory solid state physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3650</td>
<td>Observational astronomy</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3651</td>
<td>The physical universe</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3652</td>
<td>Principles of astronomy</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3750</td>
<td>Laser and spectroscopy</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3751</td>
<td>Physics of nanomaterials</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3850</td>
<td>Waves and optics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3851</td>
<td>Atomic and nuclear physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3999</td>
<td>Directed studies in physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4150</td>
<td>Computational physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4151</td>
<td>Data analysis and modeling in physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4350</td>
<td>Advanced classical mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4351</td>
<td>Advanced quantum mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4450</td>
<td>Advanced electromagnetism</td>
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<td>PHYS4650</td>
<td>Stellar physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4651</td>
<td>Selected topics in astrophysics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4652</td>
<td>Planetary science</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4653</td>
<td>Cosmology</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4654</td>
<td>General relativity</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4655</td>
<td>Interstellar medium</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4750</td>
<td>Experimental physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4850</td>
<td>Particle physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4966</td>
<td>Physics internship</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4999</td>
<td>Physics project</td>
<td>12</td>
</tr>
<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS7351</td>
<td>Graduate quantum mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS7450</td>
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<td>Graduate statistical mechanics</td>
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<tr>
<td>PHYS7551</td>
<td>Graduate solid state physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS7650</td>
<td>Stellar atmospheres</td>
<td>6</td>
</tr>
<tr>
<td>PHYS7750</td>
<td>Nanophysics</td>
<td>6</td>
</tr>
</tbody>
</table>

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course
("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**  | **Minor in Physics**  
--- | ---  
**Offered to students**  | **2015**  
**admitted to Year 1 in**  |  

**Objectives:**  
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

**Impermissible Combinations:**  
Major in Mathematics/Physics  
Major in Physics

<table>
<thead>
<tr>
<th>Required courses (42 credits)</th>
<th></th>
</tr>
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<tbody>
<tr>
<td><strong>1. Introductory level courses (18 credits)</strong></td>
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<td>Disciplinary Core Courses (18 credits)</td>
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</tr>
</tbody>
</table>
| PHYS1250 | Fundamental physics (6)  
PHYS2250 | Introductory mechanics (6)  
PHYS2265 | Introductory quantum physics (6)  
| \[previous title: Modern physics (6)\]  |
| **2. Advanced level courses (24 credits)** |  |
| Disciplinary Electives (24 credits) |  |
| At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A: |  |
| List A |  |
| PHYS3150 | Theoretical physics (6)  
PHYS3350 | Classical mechanics (6)  
PHYS3351 | Quantum mechanics (6)  
PHYS3450 | Electromagnetism (6)  
PHYS3550 | Statistical mechanics & thermodynamics (6)  
PHYS3551 | Introductory solid state physics (6)  
PHYS3650 | Observational astronomy (6)  
PHYS3651 | The physical universe (6)  
PHYS3652 | Principles of astronomy (6)  
PHYS3750 | Laser and spectroscopy (6)  
PHYS3751 | Physics of nanomaterials (6)  
PHYS3850 | Waves and optics (6)  
PHYS3851 | Atomic and nuclear physics (6)  
PHYS3999 | Directed studies in physics (6)  
PHYS4150 | Computational physics (6)  
PHYS4151 | Data analysis and modeling in physics (6)  
PHYS4350 | Advanced classical mechanics (6)  
PHYS4351 | Advanced quantum mechanics (6)  
PHYS4450 | Advanced electromagnetism (6)  
PHYS4550 | Advanced statistical mechanics (6)  
PHYS4551 | Solid state physics (6)  
PHYS4650 | Stellar physics (6)  
PHYS4651 | Selected topics in astrophysics (6)  
PHYS4652 | Planetary science (6)  
PHYS4653 | Cosmology (6)  
PHYS4654 | General relativity (6)  
PHYS4655 | Interstellar medium (6)  
PHYS4750 | Experimental physics (6)  
PHYS4850 | Particle physics (6)  
PHYS4966 | Physics internship (6)  
PHYS4999 | Physics project (12)  
PHYS7350 | Graduate classical mechanics (6)  
PHYS7351 | Graduate quantum mechanics (6)  
PHYS7450 | Graduate electromagnetism (6)  
PHYS7550 | Graduate statistical mechanics (6)  
PHYS7650 | Graduate solid state physics (6)  
PHYS7750 | Stellar atmospheres (6)  
PHYS7765 | Nanophysics (6)  |

**Notes:**  
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For
details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Physics
Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)
- **PLO 3**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics/Physics
Major in Physics

Required courses (42 credits)

1. Introductory level courses (18 credits)
   - **Disciplinary Core Courses (18 credits)**
     - PHYS1250 Fundamental physics (6)
     - PHYS2250 Introductory mechanics (6)
     - PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]

2. Advanced level courses (24 credits)
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

   **List A**
   - PHYS3150 Theoretical physics (6)
   - PHYS3350 Classical mechanics (6)
   - PHYS3351 Quantum mechanics (6)
   - PHYS3450 Electromagnetism (6)
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   - PHYS3652 Principles of astronomy (6)
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   - PHYS7750 Nanophysics (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For
details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics/Physics
Major in Physics

Required courses (42 credits)
1. Introductory level courses (18 credits)
   Disciplinary Core Courses (18 credits)
   PHYS1250 Fundamental physics (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]

2. Advanced level courses (24 credits)
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   At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A:
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Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For
details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title
Minor in Physics

Offered to students admitted to Year 1 in 2012

Objectives:
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics/Physics
Major in Physics

Required courses (42 credits)

1. Introductory level courses (18 credits)
   Disciplinary Core Courses (18 credits)
   PHYS1250 Fundamental physics (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A:
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   PHYS7750 Nanophysics (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For
details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this minor. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Objectives:**
The Minor in Plant Science is offered to students who are fascinated by the diversity and beauty of plants and the molecular mechanisms underlying their growth and development. Knowledge in plant science is essential for tackling daily-life issues such as the production of high-quality food, utilization of plant products as biofuels and extraction of beneficial phytochemicals. Recent advances in plant genetic engineering have also allowed scientists to manipulate plant growth and development for nutritional and environmental benefits. This minor aims to provide broad training in the biology of plants from the molecular to the organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)
- **PLO 2:** understand and describe the fundamental concepts of plant evolution, anatomy, biochemistry, physiology and biotechnology (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)
- **PLO 3:** acquire necessary academic and practical skills for careers in government agencies, secondary school teaching and postgraduate research in different disciplines of plant science (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

**Impermissible Combinations:**
NIL

**Required courses (36 credits)**

1. **Introductory level courses (12 credits)**
   
   **Disciplinary Electives (12 credits)**
   
   At least 12 credits selected from the following courses:
   - BIOL1110 From molecules to cells (6)
   - BIOL1309 Evolutionary diversity (6)
   - BIOL2103 Biological sciences laboratory course (6)
   - BIOL2220 Principles of biochemistry (6)

2. **Advanced level courses (24 credits)**
   
   **Disciplinary Electives (24 credits)**
   
   At least 24 credits selected from the following courses:
   - BIOL3107 Plant physiology (6)
   - BIOL3210 Grain production and utilization (6)
   - BIOL3314 Plant structure and evolution (6)
   - BIOL3408 Genetics (6)
   - BIOL4209 Functional foods (6)
   - BIOL4411 Plant and food biotechnology (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Plant Science  
Offered to students admitted to Year 1 in 2018

Objectives:
The Minor in Plant Science is offered to students who are fascinated by the diversity and beauty of plants and the molecular mechanisms underlying their growth and development. Knowledge in plant science is essential for tackling daily-life issues such as the production of high-quality food, utilization of plant products as biofuels and extraction of beneficial phytochemicals. Recent advances in plant genetic engineering have also allowed scientists to manipulate plant growth and development for nutritional and environmental benefits. This minor aims to provide broad training in the biology of plants from the molecular to the organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 2: understand and describe the fundamental concepts of plant evolution, anatomy, biochemistry, physiology and biotechnology (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 3: acquire necessary academic and practical skills for careers in government agencies, secondary school teaching and postgraduate research in different disciplines of plant science (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- BIOL1110 From molecules to cells (6)
- BIOL1309 Evolutionary diversity (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2220 Principles of biochemistry (6)

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
- BIOL3107 Plant physiology (6)
- BIOL3210 Grain production and utilization (6)
- BIOL3314 Plant structure and evolution (6)
- BIOL3408 Genetics (6)
- BIOL4209 Functional foods (6)
- BIOL4411 Plant and food biotechnology (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 2: understand and describe the fundamental concepts of plant evolution, anatomy, biochemistry, physiology and biotechnology (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 3: acquire necessary academic and practical skills for careers in government agencies, secondary school teaching and postgraduate research in different disciplines of plant science (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2103</td>
<td>Biological sciences laboratory course</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

2. Advanced level courses (24 credits)

Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3107</td>
<td>Plant physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3210</td>
<td>Grain production and utilization</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3408</td>
<td>Genetics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4209</td>
<td>Functional foods</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology</td>
<td>6</td>
</tr>
</tbody>
</table>

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Plant Science
Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Plant Science is offered to students who are fascinated by the diversity and beauty of plants and the molecular mechanisms underlying their growth and development. Knowledge in plant science is essential for tackling daily-life issues such as the production of high-quality food, utilization of plant products as biofuels and extraction of beneficial phytochemicals. Recent advances in plant genetic engineering have also allowed scientists to manipulate plant growth and development for nutritional and environmental benefits. This minor aims to provide broad training in the biology of plants from the molecular to the organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 2: understand and describe the fundamental concepts of plant evolution, anatomy, biochemistry, physiology and biotechnology (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 3: acquire necessary academic and practical skills for careers in government agencies, secondary school teaching and postgraduate research in different disciplines of plant science (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:
- BIOL1110 From molecules to cells (6)
- BIOL1309 Evolutionary diversity (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2220 Principles of biochemistry (6)

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)

At least 24 credits selected from the following courses:
- BIOL3107 Plant physiology (6)
- BIOL3210 Grain production and utilization (6)
- BIOL3314 Plant structure and evolution (6)
- BIOL3408 Genetics (6)
- BIOL4209 Functional foods (6)
- BIOL4411 Plant and food biotechnology (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Plant Science
Offered to students: 2015

Objectives:
The Minor in Plant Science is offered to students who are fascinated by the diversity and beauty of plants and the molecular mechanisms underlying their growth and development. Knowledge in plant science is essential for tackling daily-life issues such as the production of high-quality food, utilization of plant products as biofuels and extraction of beneficial phytochemicals. Recent advances in plant genetic engineering have also allowed scientists to manipulate plant growth and development for nutritional and environmental benefits. This minor aims to provide broad training in the biology of plants from the molecular to the organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)
- **PLO 2**: understand and describe the fundamental concepts of plant evolution, anatomy, biochemistry, physiology and biotechnology (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)
- **PLO 3**: acquire necessary academic and practical skills for careers in government agencies, secondary school teaching and postgraduate research in different disciplines of plant science (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (12 credits)
   - Disciplinary Electives (12 credits)
     At least 12 credits selected from the following courses:
     - BIOL1110 From molecules to cells (6)
     - BIOL1309 Evolutionary diversity (6)
     - BIOL2103 Biological sciences laboratory course (6)
     - BIOL2220 Principles of biochemistry (6)

2. Advanced level courses (24 credits)
   - Disciplinary Electives (24 credits)
     At least 24 credits selected from the following courses:
     - BIOL3107 Plant physiology (6)
     - BIOL3210 Grain production and utilization (6)
     - BIOL3314 Plant structure and evolution (6)
     - BIOL3408 Genetics (6)
     - BIOL4209 Functional foods (6)
     - BIOL4411 Plant and food biotechnology (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
## Minor Title
Minor in Plant Science

## Offered to students
admitted to Year 1 in

### Objectives:
The Minor in Plant Science is offered to students who are fascinated by the diversity and beauty of plants and the molecular mechanisms underlying their growth and development. Knowledge in plant science is essential for tackling daily-life issues such as the production of high-quality food, utilization of plant products as biofuels and extraction of beneficial phytochemicals. Recent advances in plant genetic engineering have also allowed scientists to manipulate plant growth and development for nutritional and environmental benefits. This minor aims to provide broad training in the biology of plants from the molecular to the organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

### Learning Outcomes:
By the end of this programme, students should be able to:

**PLO 1:** appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

**PLO 2:** understand and describe the fundamental concepts of plant evolution, anatomy, biochemistry, physiology and biotechnology (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

**PLO 3:** acquire necessary academic and practical skills for careers in government agencies, secondary school teaching and postgraduate research in different disciplines of plant science (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

### Impermissible Combinations:
NIL

### Required courses (36 credits)

#### 1. Introductory level courses (12 credits)

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses:

- BIOL1110 From molecules to cells (6)
- BIOL1309 Evolutionary diversity (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2220 Principles of biochemistry (6)

#### 2. Advanced level courses (24 credits)

**Disciplinary Electives (24 credits)**

At least 24 credits selected from the following courses:

- BIOL3107 Plant physiology (6)
- BIOL3210 Grain production and utilization (6)
- BIOL3314 Plant structure and evolution (6)
- BIOL3408 Genetics (6)
- BIOL4209 Functional foods (6)
- BIOL4411 Plant and food biotechnology (6)

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title**  
Minor in Plant Science

**Offered to students**  
admitted to Year 1 in 2013

**Objectives:**
The Minor in Plant Science is offered to students who are fascinated by the diversity and beauty of plants and the molecular mechanisms underlying their growth and development. Knowledge in plant science is essential for tackling daily-life issues such as the production of high-quality food, utilization of plant products as biofuels and extraction of beneficial phytochemicals. Recent advances in plant genetic engineering have also allowed scientists to manipulate plant growth and development for nutritional and environmental benefits. This minor aims to provide broad training in the biology of plants from the molecular to the organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)
- **PLO 2:** understand and describe the fundamental concepts of plant evolution, anatomy, biochemistry, physiology and biotechnology (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)
- **PLO 3:** acquire necessary academic and practical skills for careers in government agencies, secondary school teaching and postgraduate research in different disciplines of plant science (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

**Impermissible Combinations:**
NIL

**Required courses (36 credits)**

1. **Introductory level courses (12 credits)**
   - Disciplinary Electives (12 credits)
     - At least 12 credits selected from the following courses:
       - BIOL1110 From molecules to cells (6)
       - BIOL1309 Evolutionary diversity (6)
       - BIOL2103 Biological sciences laboratory course (6)
       - BIOL2220 Principles of biochemistry (6)

2. **Advanced level courses (24 credits)**
   - Disciplinary Electives (24 credits)
     - At least 24 credits selected from the following courses:
       - BIOL3107 Plant physiology (6)
       - BIOL3210 Grain production and utilization (6)
       - BIOL3314 Plant structure and evolution (6)
       - BIOL3408 Genetics (6)
       - BIOL4209 Functional foods (6)
       - BIOL4411 Plant and food biotechnology (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title  |  Minor in Plant Science  
Offered to students  |  admitted to Year 1 in  
|  2012  

**Objectives:**
The Minor in Plant Science is offered to students who are fascinated by the diversity and beauty of plants and the molecular mechanisms underlying their growth and development. Knowledge in plant science is essential for tackling daily-life issues such as the production of high-quality food, utilization of plant products as biofuels and extraction of beneficial phytochemicals. Recent advances in plant genetic engineering have also allowed scientists to manipulate plant growth and development for nutritional and environmental benefits. This minor aims to provide broad training in the biology of plants from the molecular to the organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

**Learning Outcomes:**
By the end of this programme, students should be able to:

PLO 1:  
- appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment  
(by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 2:  
- understand and describe the fundamental concepts of plant evolution, anatomy, biochemistry, physiology and biotechnology  
(by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 3:  
- acquire necessary academic and practical skills for careers in government agencies, secondary school teaching and postgraduate research in different disciplines of plant science  
(by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

**Impermissible Combinations:**
NIL

**Required courses (36 credits)**
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   - At least 12 credits selected from the following courses:
     BIOL1110  From molecules to cells (6)
     BIOL1309  Evolutionary diversity (6)
     BIOL2103  Biological sciences laboratory course (6)
     BIOL2220  Principles of biochemistry (6)

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   - At least 24 credits selected from the following courses:
     BIOL3107  Plant physiology (6)
     BIOL3210  Grain production and utilization (6)
     BIOL3314  Plant structure and evolution (6)
     BIOL3408  Genetics (6)
     BIOL4209  Functional foods (6)
     BIOL4411  Plant and food biotechnology (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Risk Management

Offered to students admitted to Year 1 in 2019

Objectives:
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Risk Management
Major in Statistics
Minor in Statistics

Required courses (42 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:

<table>
<thead>
<tr>
<th>List A</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT1601</td>
<td>Elementary statistical methods</td>
<td>6</td>
</tr>
<tr>
<td>STAT1602</td>
<td>Business statistics</td>
<td>6</td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics</td>
<td>6</td>
</tr>
<tr>
<td>STAT2601</td>
<td>Probability and statistics I</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>List B</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT2602</td>
<td>Probability and statistics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT2603</td>
<td>Data management with SAS</td>
<td>6</td>
</tr>
<tr>
<td>STAT2604</td>
<td>Introduction to R programming and elementary data analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

2. Advanced level courses (30 credits)

Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3609</td>
<td>The statistics of investment risk</td>
<td>6</td>
</tr>
<tr>
<td>STAT3610</td>
<td>Risk management and insurance</td>
<td>6</td>
</tr>
<tr>
<td>STAT3611</td>
<td>Computer-aided data analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT3612</td>
<td>Statistical machine learning</td>
<td>6</td>
</tr>
<tr>
<td>STAT3614</td>
<td>Business forecasting</td>
<td>6</td>
</tr>
<tr>
<td>STAT3615</td>
<td>Practical mathematics for investment</td>
<td>6</td>
</tr>
<tr>
<td>STAT3618</td>
<td>Derivatives and risk management</td>
<td>6</td>
</tr>
<tr>
<td>STAT4601</td>
<td>Time-series analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT4603</td>
<td>Current topics in risk management</td>
<td>6</td>
</tr>
<tr>
<td>STAT4606</td>
<td>Risk management and Basel Accords in banking and finance</td>
<td>6</td>
</tr>
<tr>
<td>STAT4607</td>
<td>Credit risk analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT4608</td>
<td>Market risk analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Risk Management
Offered to students admitted to Year 1 in 2018

Objectives:
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Risk Management
Major in Statistics
Minor in Statistics

Required courses (42 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits from List A and List B, with at least 6 credits from List B:
   
   List A
   STAT1601 Elementary statistical methods (6)
   STAT1602 Business statistics (6)
   STAT1603 Introductory statistics (6)
   STAT2601 Probability and statistics I (6)
   
   List B
   STAT2602 Probability and statistics II (6)
   STAT2603 Data management with SAS (6)
   STAT2604 Introduction to R programming and elementary data analysis (6)

2. Advanced level courses (30 credits)
   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   STAT3609 The statistics of investment risk (6)
   STAT3610 Risk management and insurance (6)
   STAT3611 Computer-aided data analysis (6)
   STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
   STAT3614 Business forecasting (6)
   STAT3615 Practical mathematics for investment (6)
   STAT3618 Derivatives and risk management (6)
   STAT4601 Time-series analysis (6)
   STAT4603 Current topics in risk management (6)
   STAT4606 Risk management and Basel Accords in banking and finance (6)
   STAT4607 Credit risk analysis (6)
   STAT4608 Market risk analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Risk Management
Offered to students admitted to Year 1 in 2017

Objectives:
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2**: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3**: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
- Major in Computing and Data Analytics
- Major in Risk Management
- Major in Statistics
- Minor in Statistics

### Required courses (42 credits)

1. **Introductory level courses (12 credits)**
   - Disciplinary Electives (12 credits)
     - At least 12 credits from List A and List B, with at least 6 credits from List B:
       - **List A**
         - STAT1601: Elementary statistical methods (6)
         - STAT1602: Business statistics (6)
         - STAT1603: Introductory statistics (6)
         - STAT2601: Probability and statistics I (6)
       - **List B**
         - STAT2602: Probability and statistics II (6)
         - STAT2603: Data management with SAS (6)
         - STAT2604: Introduction to R programming and elementary data analysis (6)

2. **Advanced level courses (30 credits)**
   - Disciplinary Electives (30 credits)
     - At least 30 credits selected from the following courses:
       - STAT3609: The statistics of investment risk (6)
       - STAT3610: Risk management and insurance (6)
       - STAT3611: Computer-aided data analysis (6)
       - STAT3612: Statistical machine learning (6) [previous title: Data mining (6)]
       - STAT3614: Business forecasting (6)
       - STAT3615: Practical mathematics for investment (6)
       - STAT3618: Derivatives and risk management (6)
       - STAT4601: Time-series analysis (6)
       - STAT4603: Current topics in risk management (6)
       - STAT4606: Risk management and Basel Accords in banking and finance (6)
       - STAT4607: Credit risk analysis (6)
       - STAT4608: Market risk analysis (6)

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Risk Management

Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Risk Management
Major in Statistics
Minor in Statistics

Required courses (42 credits)

1. Introductory level courses (12 credits)
2. Advanced level courses (30 credits)

Disciplinary Electives (12 credits)

At least 12 credits from List A and List B, with at least 6 credits from List B:

List A
- STAT1601 Elementary statistical methods (6)
- STAT1602 Business statistics (6)
- STAT1603 Introductory statistics (6)
- STAT2601 Probability and statistics I (6)

List B
- STAT2602 Probability and statistics II (6)
- STAT2603 Data management with SAS (6)
- STAT2604 Introduction to R programming and elementary data analysis (6)

Disciplinary Electives (30 credits)

At least 30 credits selected from the following courses:

- STAT3609 The statistics of investment risk (6)
- STAT3610 Risk management and insurance (6)
- STAT3611 Computer-aided data analysis (6)
- STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
- STAT3614 Business forecasting (6)
- STAT3615 Practical mathematics for investment (6)
- STAT3618 Derivatives and risk management (6)
- STAT4601 Time-series analysis (6)
- STAT4603 Current topics in risk management (6)
- STAT4606 Risk management and Basel Accords in banking and finance (6)
- STAT4607 Credit risk analysis (6)
- STAT4608 Market risk analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled.
Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Risk Management  
Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics  
Major in Risk Management  
Major in Statistics  
Minor in Statistics

Required courses (42 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:

<table>
<thead>
<tr>
<th>List A</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT1601</td>
<td>Elementary statistical methods</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>STAT1602</td>
<td>Business statistics</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>STAT2601</td>
<td>Probability and statistics I</td>
<td>(6)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>List B</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT2602</td>
<td>Probability and statistics II</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>STAT2603</td>
<td>Data management with SAS</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>STAT2604</td>
<td>Introduction to R programming and elementary data analysis</td>
<td>(6)</td>
<td></td>
</tr>
</tbody>
</table>

2. Advanced level courses (30 credits)

Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3609</td>
<td>The statistics of investment risk</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3610</td>
<td>Risk management and insurance</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3611</td>
<td>Computer-aided data analysis</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3612</td>
<td>Statistical machine learning</td>
<td>(6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3614</td>
<td>Business forecasting</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3615</td>
<td>Practical mathematics for investment</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3618</td>
<td>Derivatives and risk management</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4601</td>
<td>Time-series analysis</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4603</td>
<td>Current topics in risk management</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4606</td>
<td>Risk management and Basel Accords in banking and finance</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4607</td>
<td>Credit risk analysis</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4608</td>
<td>Market risk analysis</td>
<td>(6)</td>
</tr>
</tbody>
</table>

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Risk Management

Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Risk Management
Major in Statistics
Minor in Statistics

Required courses (42 credits)

1. Introductory level courses (12 credits)

Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:

List A
- STAT1601 Elementary statistical methods (6)
- STAT1602 Business statistics (6)
- STAT1603 Introductory statistics (6)
- STAT2601 Probability and statistics I (6)

List B
- STAT2602 Probability and statistics II (6)
- STAT2603 Data management with SAS (6)
- STAT2604 Introduction to R programming and elementary data analysis (6)

2. Advanced level courses (30 credits)

Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:

- STAT3609 The statistics of investment risk (6)
- STAT3610 Risk management and insurance (6)
- STAT3611 Computer-aided data analysis (6)
- STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
- STAT3614 Business forecasting (6)
- STAT3615 Practical mathematics for investment (6)
- STAT3618 Derivatives and risk management (6)
- STAT4601 Time-series analysis (6)
- STAT4603 Current topics in risk management (6)
- STAT4606 Risk management and Basel Accords in banking and finance (6)
- STAT4607 Credit risk analysis (6)
- STAT4608 Market risk analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
<table>
<thead>
<tr>
<th>Minor Title</th>
<th>Minor in Risk Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offered to students admitted to</td>
<td>2013</td>
</tr>
<tr>
<td>Year 1 in</td>
<td></td>
</tr>
</tbody>
</table>

**Objectives:**
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1:** acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2:** apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3:** acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

**Impermissible Combinations:**
- Major in Risk Management
- Major in Statistics
- Minor in Statistics

**Required courses (42 credits)**

1. **Introductory level courses (12 credits)**
   - Disciplinary Electives (12 credits)
     - At least 12 credits from List A and List B, with at least 6 credits from List B:
       - **List A**
         - STAT1601 Elementary statistical methods (6)
         - STAT1602 Business statistics (6)
         - STAT1603 Introductory statistics (6)
         - STAT2601 Probability and statistics I (6)
       - **List B**
         - STAT2602 Probability and statistics II (6)
         - STAT2603 Data management with SAS (6)
         - STAT2604 Introduction to R programming and elementary data analysis (6)

2. **Advanced level courses (30 credits)**
   - Disciplinary Electives (30 credits)
     - At least 30 credits selected from the following courses:
       - STAT3609 The statistics of investment risk (6)
       - STAT3610 Risk management and insurance (6)
       - STAT3611 Computer-aided data analysis (6)
       - STAT3612 Statistical machine learning (6)
       - STAT3614 Business forecasting (6)
       - STAT3615 Practical mathematics for investment (6)
       - STAT3618 Derivatives and risk management (6)
       - STAT4601 Time-series analysis (6)
       - STAT4603 Current topics in risk management (6)
       - STAT4606 Risk management and Basel Accords in banking and finance (6)
       - STAT4607 Credit risk analysis (6)
       - STAT4608 Market risk analysis (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
<table>
<thead>
<tr>
<th>Minor Title</th>
<th>Minor in Risk Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offered to students</td>
<td>2012</td>
</tr>
<tr>
<td>admitted to Year 1 in</td>
<td></td>
</tr>
</tbody>
</table>

**Objectives:**
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

**Learning Outcomes:**
By the end of this programme, students should be able to:

- **PLO 1**: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2**: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3**: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

**Impermissible Combinations:**
- Major in Risk Management
- Major in Statistics
- Minor in Statistics

**Required courses (42 credits)**

1. **Introductory level courses (12 credits)**
2. **Disciplinary Electives (12 credits)**
   - At least 12 credits from List A and List B, with at least 6 credits from List B:
   - **List A**
     - STAT1601 Elementary statistical methods (6)
     - STAT1602 Business statistics (6)
     - STAT1603 Introductory statistics (6)
     - STAT2601 Probability and statistics I (6)
   - **List B**
     - STAT2602 Probability and statistics II (6)
     - STAT2603 Data management with SAS (6)
     - STAT2604 Introduction to R programming and elementary data analysis (6)

3. **Advanced level courses (30 credits)**
4. **Disciplinary Electives (30 credits)**
   - At least 30 credits selected from the following courses:
   - STAT3609 The statistics of investment risk (6)
   - STAT3610 Risk management and insurance (6)
   - STAT3611 Computer-aided data analysis (6)
   - STAT3612 Statistical machine learning (6)
   - STAT3614 Business forecasting (6)
   - STAT3615 Practical mathematics for investment (6)
   - STAT3618 Derivatives and risk management (6)
   - STAT4601 Time-series analysis (6)
   - STAT4603 Current topics in risk management (6)
   - STAT4606 Risk management and Basel Accords in banking and finance (6)
   - STAT4607 Credit risk analysis (6)
   - STAT4608 Market risk analysis (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Science Entrepreneurship

Objectives:
This Minor aims at broadening the horizon of our undergraduate students with respect to entrepreneurship, so as to arouse their interest in this aspect and better equip them. It is also important for our students to visualize how their training in science (a) is relevant to the real world and (b) can bring about huge insights via critical analysis of the operation of existing enterprises. With the vivid commercial environment and a growing atmosphere for start-ups both locally and globally, this Minor also serves to offer more competitive edge to our students via connecting their academic knowledge with the real world, even though they may not initiate their own start-ups in the short run.

Learning Outcomes:
By the end of this programme, students should be able to:

- **PLO 1**: apprehend the entrepreneurial process and the principles/models relevant to its different key stages (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: gain insights into how a broad range of disciplines contribute to the success of the entrepreneurial process (by means of coursework and tutorial classes in the curriculum)
- **PLO 3**: evaluate how scientific knowledge can cause impact to the society via entrepreneurship (by means of coursework and tutorial classes in the curriculum)
- **PLO 4**: develop appropriate action plans for transforming ideas into start-up companies (by means of coursework, tutorial classes and training in his/her internship in the curriculum)
- **PLO 5**: effectively collaborate with team members with different expertise and communicate their ideas to a range of audiences during the entrepreneurial process (by means of coursework, tutorial classes and training in his/her internship in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (12 credits)
   **Disciplinary Core Courses (12 credits) (Resource, Management and Basic Entrepreneurship)**
   - ENTR2001: Professional and leadership development (6)
   - IMT1611: Principles of Technology Entrepreneurship (6)

2. Advanced level courses (24 credits)
   **Disciplinary Core Courses (24 credits) (Creativity and Innovation)**
   - ENTR3001: Science-based innovation development (6)
   - ENTR3002: Customer analysis and strategic marketing (6)
   **(Practical Experience)**
   - ENTR4966: Entrepreneurship internship (6)
   - ENTR4999: Entrepreneurship project (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students may consider taking the following courses if they wish to pursue a more focused study in topics related to entrepreneurship: BUSI38011 Business Law, BUSI3803 Company Law, STRA3706 China Business Environment.

3. Courses with the prefix ENTR are subjected to minor changes.

4. Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Science Entrepreneurship

Offered to students admitted to Year 1 in 2018

Objectives:
This Minor aims at broadening the horizon of our undergraduate students with respect to entrepreneurship, so as to arouse their interest in this aspect and better equip them. It is also important for our students to visualize how their training in science (a) is relevant to the real world and (b) can bring about huge insights via critical analysis of the operation of existing enterprises. With the vivid commercial environment and a growing atmosphere for start-ups both locally and globally, this Minor also serves to offer more competitive edge to our students via connecting their academic knowledge with the real world, even though they may not initiate their own start-ups in the short run.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: apprehend the entrepreneurial process and the principles/models relevant to its different key stages (by means of coursework and tutorial classes in the curriculum)

PLO 2: gain insights into how a broad range of disciplines contribute to the success of the entrepreneurial process (by means of coursework and tutorial classes in the curriculum)

PLO 3: evaluate how scientific knowledge can cause impact to the society via entrepreneurship (by means of coursework and tutorial classes in the curriculum)

PLO 4: develop appropriate action plans for transforming ideas into start-up companies (by means of coursework, tutorial classes and training in his/her internship in the curriculum)

PLO 5: effectively collaborate with team members with different expertise and communicate their ideas to a range of audiences during the entrepreneurial process (by means of coursework, tutorial classes and training in his/her internship in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (12 credits)

Disciplinary Core Courses (12 credits)

(Resource, Management and Basic Entrepreneurship)

ENTR2001 Professional and leadership development (6)
IMT1611 Principles of Technology Entrepreneurship (6)

2. Advanced level courses (24 credits)

Disciplinary Core Courses (24 credits)

(Creativity and Innovation)

ENTR3001 Science-based innovation development (6)
ENTR3002 Customer analysis and strategic marketing (6)

(Practical Experience)

ENTR4966 Entrepreneurship internship (6)
ENTR4999 Entrepreneurship project (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students may consider taking the following courses if they wish to pursue a more focused study in topics related to entrepreneurship: BUSI38011 Business Law, BUSI3803 Company Law, STRA3706 China Business Environment.

3. Courses with the prefix ENTR are subjected to minor changes.

4. Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
This Minor aims at broadening the horizon of our undergraduate students with respect to entrepreneurship, so as to arouse their interest in this aspect and better equip them. It is also important for our students to visualize how their training in science (a) is relevant to the real world and (b) can bring about huge insights via critical analysis of the operation of existing enterprises. With the vivid commercial environment and a growing atmosphere for start-ups both locally and globally, this Minor also serves to offer more competitive edge to our students via connecting their academic knowledge with the real world, even though they may not initiate their own start-ups in the short run.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: apprehend the entrepreneurial process and the principles/models relevant to its different key stages (by means of coursework and tutorial classes in the curriculum)

PLO 2: gain insights into how a broad range of disciplines contribute to the success of the entrepreneurial process (by means of coursework and tutorial classes in the curriculum)

PLO 3: evaluate how scientific knowledge can cause impact to the society via entrepreneurship (by means of coursework and tutorial classes in the curriculum)

PLO 4: develop appropriate action plans for transforming ideas into start-up companies (by means of coursework, tutorial classes and training in his/her internship in the curriculum)

PLO 5: effectively collaborate with team members with different expertise and communicate their ideas to a range of audiences during the entrepreneurial process (by means of coursework, tutorial classes and training in his/her internship in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (12 credits)
Disciplinary Core Courses (12 credits)

(Resource, Management and Basic Entrepreneurship)

ENTR2001 Professional and leadership development (6)

IIMT1611 Principles of Technology Entrepreneurship (6)

2. Advanced level courses (24 credits)
Disciplinary Core Courses (24 credits)

(Creativity and Innovation)

ENTR3001 Science-based innovation development (6)

ENTR3002 Customer analysis and strategic marketing (6)

(Practical Experience)

ENTR4966 Entrepreneurship internship (6)

ENTR4999 Entrepreneurship project (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students may consider taking the following courses if they wish to pursue a more focused study in topics related to entrepreneurship: BUSI38011 Business Law, BUSI3803 Company Law, STRA3706 China Business Environment.

3. Courses with the prefix ENTR are subjected to minor changes.

4. Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Statistics

Offered to students admitted to Year 1 in 2019

Objectives:
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Risk Management
Major in Statistics
Minor in Risk Management

Required courses (42 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:
List A
STAT1601 Elementary statistical methods (6)
STAT1602 Business statistics (6)
STAT1603 Introductory statistics (6)
STAT2601 Probability and statistics I (6)
List B
STAT2602 Probability and statistics II (6)
STAT2603 Data management with SAS (6)
STAT2604 Introduction to R programming and elementary data analysis (6)
STAT2605 Demographic and socio-economic statistics (6)

2. Advanced level courses (30 credits)
Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:
STAT3600 Linear statistical analysis (6)
STAT3602 Statistical inference (6)
STAT3603 Stochastic processes (6)
STAT3604 Design and analysis of experiments (6)
STAT3605 Quality control and management (6)
STAT3606 Business logistics (6)
STAT3607 Statistics in clinical medicine and bio-medical research (6)
STAT3608 Statistical genetics (6)
STAT3611 Computer-aided data analysis (6)
STAT3612 Statistical machine learning (6)
STAT3613 Marketing analytics (6)
STAT3614 Business forecasting (6)
STAT3617 Sample survey methods (6)
STAT3620 Modern nonparametric statistics (6)
STAT3621 Statistical data analysis (6)
STAT3955 Survival analysis (6)
STAT4601 Time-series analysis (6)
STAT4602 Multivariate data analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Statistics  
Offered to students admitted to Year 1 in 2018

**Objectives:**  
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

**Impermissible Combinations:**  
Major in Computing and Data Analytics  
Major in Decision Analytics  
Major in Risk Management  
Major in Statistics  
Minor in Risk Management

**Required courses (42 credits)**

1. Introductory level courses (12 credits)

   **Disciplinary Electives (12 credits)**
   At least 12 credits from List A and List B, with at least 6 credits from List B:

   **List A**
   - STAT1601: Elementary statistical methods (6)
   - STAT1602: Business statistics (6)
   - STAT1603: Introductory statistics (6)
   - STAT2601: Probability and statistics I (6)

   **List B**
   - STAT2602: Probability and statistics II (6)
   - STAT2603: Data management with SAS (6)
   - STAT2604: Introduction to R programming and elementary data analysis (6)
   - STAT2605: Demographic and socio-economic statistics (6)

2. Advanced level courses (30 credits)

   **Disciplinary Electives (30 credits)**
   At least 30 credits selected from the following courses:

   - STAT3600: Linear statistical analysis (6)
   - STAT3602: Statistical inference (6)
   - STAT3603: Stochastic processes (6)
   - STAT3604: Design and analysis of experiments (6)
   - STAT3605: Quality control and management (6)
   - STAT3606: Business logistics (6)
   - STAT3607: Statistics in clinical medicine and bio-medical research (6)
   - STAT3608: Statistical genetics (6)
   - STAT3611: Computer-aided data analysis (6)
   - STAT3612: Statistical machine learning (6)
   - STAT3613: Marketing analytics (6)
   - STAT3614: Business forecasting (6)
   - STAT3617: Sample survey methods (6)
   - STAT3620: Modern nonparametric statistics (6)
   - STAT3621: Statistical data analysis (6)
   - STAT3955: Survival analysis (6)
   - STAT4601: Time-series analysis (6)
   - STAT4602: Multivariate data analysis (6)

**Notes:**  
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**  
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Statistics
Offered to students admitted to Year 1 in 2017

Objectives:
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Risk Management
Major in Statistics
Minor in Risk Management

Required courses (42 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits from List A and List B, with at least 6 credits from List B:
   List A
   - STAT1601 Elementary statistical methods (6)
   - STAT1602 Business statistics (6)
   - STAT1603 Introductory statistics (6)
   - STAT2601 Probability and statistics I (6)
   List B
   - STAT2602 Probability and statistics II (6)
   - STAT2603 Data management with SAS (6)
   - STAT2604 Introduction to R programming and elementary data analysis (6)
   - STAT2605 Demographic and socio-economic statistics (6)

2. Advanced level courses (30 credits)
   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   - STAT3600 Linear statistical analysis (6)
   - STAT3602 Statistical inference (6)
   - STAT3603 Stochastic processes (6)
   - STAT3604 Design and analysis of experiments (6)
   - STAT3605 Quality control and management (6)
   - STAT3606 Business logistics (6)
   - STAT3607 Statistics in clinical medicine and bio-medical research (6)
   - STAT3608 Statistical genetics (6)
   - STAT3611 Computer-aided data analysis (6)
   - STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
   - STAT3613 Marketing analytics (6) [previous title: Marketing engineering (6)]
   - STAT3614 Business forecasting (6)
   - STAT3616 Advanced SAS programming (6)
   - STAT3617 Sample survey methods (6)
   - STAT3620 Modern nonparametric statistics (6)
   - STAT3621 Statistical data analysis (6)
   - STAT3655 Survival analysis (6)
   - STAT4601 Time-series analysis (6)
   - STAT4602 Multivariate data analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Minor Title:** Minor in Statistics  
**Offered to students admitted to Year 1 in:** 2016

**Objectives:**  
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

**Learning Outcomes:**  
By the end of this programme, students should be able to:

- **PLO 1:** acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2:** equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)
- **PLO 3:** participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

**Impermissible Combinations:**  
- Major in Computing and Data Analytics  
- Major in Decision Analytics  
- Major in Risk Management  
- Major in Statistics  
- Minor in Risk Management

**Required courses (42 credits)**

1. **Introductory level courses (12 credits)**  
   **Disciplinary Electives (12 credits)**  
   At least 12 credits from List A and List B, with at least 6 credits from List B:
   
<table>
<thead>
<tr>
<th>List A</th>
<th>List B</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT1601 Elementary statistical methods (6)</td>
<td>STAT2602 Probability and statistics II (6)</td>
</tr>
<tr>
<td>STAT1602 Business statistics (6)</td>
<td>STAT2603 Data management with SAS (6)</td>
</tr>
<tr>
<td>STAT1603 Introductory statistics (6)</td>
<td>STAT2604 Introduction to R programming and elementary data analysis (6)</td>
</tr>
<tr>
<td>STAT2601 Probability and statistics I (6)</td>
<td>STAT2605 Demographic and socio-economic statistics (6)</td>
</tr>
</tbody>
</table>

2. **Advanced level courses (30 credits)**  
   **Disciplinary Electives (30 credits)**  
   At least 30 credits selected from the following courses:
   
   | STAT3600 Linear statistical analysis (6) |
   | STAT3602 Statistical inference (6)       |
   | STAT3603 Stochastic processes (6)         |
   | STAT3604 Design and analysis of experiments (6) |
   | STAT3605 Quality control and management (6) |
   | STAT3606 Business logistics (6)           |
   | STAT3607 Statistics in clinical medicine and bio-medical research (6) |
   | STAT3608 Statistical genetics (6)         |
   | STAT3611 Computer-aided data analysis (6)  |
   | STAT3612 Statistical machine learning (6)  | [previous title: Data mining (6)] |
   | STAT3613 Marketing analytics (6)          | [previous title: Marketing engineering (6)] |
   | STAT3614 Business forecasting (6)         |
   | STAT3616 Advanced SAS programming (6)     |
   | STAT3617 Sample survey methods (6)        |
   | STAT3620 Modern nonparametric statistics (6) |
   | STAT3621 Statistical data analysis (6)     |
   | STAT3955 Survival analysis (6)            |
   | STAT4601 Time-series analysis (6)         |
   | STAT4602 Multivariate data analysis (6)    |

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum).

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum).

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum).

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Risk Management
Major in Statistics
Minor in Risk Management

Required courses (42 credits)

1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits from List A and List B, with at least 6 credits from List B:
   
   List A
   STAT1601 Elementary statistical methods (6)
   STAT1602 Business statistics (6)
   STAT1603 Introductory statistics (6)
   STAT2601 Probability and statistics I (6)
   
   List B
   STAT2602 Probability and statistics II (6)
   STAT2603 Data management with SAS (6)
   STAT2604 Introduction to R programming and elementary data analysis (6)
   STAT2605 Demographic and socio-economic statistics (6)

2. Advanced level courses (30 credits)
   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   
   STAT3600 Linear statistical analysis (6)
   STAT3602 Statistical inference (6)
   STAT3603 Stochastic processes (6)
   STAT3604 Design and analysis of experiments (6)
   STAT3605 Quality control and management (6)
   STAT3606 Business logistics (6)
   STAT3607 Statistics in clinical medicine and bi-medical research (6)
   STAT3608 Statistical genetics (6)
   STAT3611 Computer-aided data analysis (6)
   STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
   STAT3613 Marketing analytics (6) [previous title: Marketing engineering (6)]
   STAT3614 Business forecasting (6)
   STAT3616 Advanced SAS programming (6)
   STAT3617 Sample survey methods (6)
   STAT3620 Modern nonparametric statistics (6)
   STAT3621 Statistical data analysis (6)
   STAT3655 Survival analysis (6)
   STAT4601 Time-series analysis (6)
   STAT4602 Multivariate data analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Statistics  
Offered to students admitted to Year 1 in 2014

Objectives:
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics  
Major in Decision Analytics  
Major in Risk Management  
Major in Statistics  
Minor in Risk Management

Required courses (42 credits)

1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:

List A
- STAT1601 Elementary statistical methods (6)
- STAT1602 Business statistics (6)
- STAT1603 Introductory statistics (6)
- STAT2601 Probability and statistics I (6)

List B
- STAT2602 Probability and statistics II (6)
- STAT2603 Data management with SAS (6)
- STAT2604 Introduction to R programming and elementary data analysis (6)
- STAT2605 Demographic and socio-economic statistics (6)

2. Advanced level courses (30 credits)
Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:

- STAT3600 Linear statistical analysis (6)
- STAT3602 Statistical inference (6)
- STAT3603 Stochastic processes (6)
- STAT3604 Design and analysis of experiments (6)
- STAT3605 Quality control and management (6)
- STAT3606 Business logistics (6)
- STAT3607 Statistics in clinical medicine and bio-medical research (6)
- STAT3608 Statistical genetics (6)
- STAT3611 Computer-aided data analysis (6)
- STAT3612 Statistical machine learning (6)  
- STAT3613 Marketing analytics (6)  
- STAT3614 Business forecasting (6)
- STAT3616 Advanced SAS programming (6)
- STAT3617 Sample survey methods (6)
- STAT3620 Modern nonparametric statistics (6)
- STAT3621 Statistical data analysis (6)
- STAT3955 Survival analysis (6)
- STAT4601 Time-series analysis (6)
- STAT4602 Multivariate data analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title Minor in Statistics
Offered to students admitted to Year 1 in 2013

Objectives:
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Decision Analytics
Major in Risk Management
Major in Statistics
Minor in Risk Management

Required courses (42 credits)

1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:

List A
- STAT1601 Elementary statistical methods (6)
- STAT1602 Business statistics (6)
- STAT1603 Introductory statistics (6)
- STAT2601 Probability and statistics I (6)

List B
- STAT2602 Probability and statistics II (6)
- STAT2603 Data management with SAS (6)
- STAT2604 Introduction to R programming and elementary data analysis (6)
- STAT2605 Demographic and socio-economic statistics (6)

2. Advanced level courses (30 credits)
Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:

- STAT3600 Linear statistical analysis (6)
- STAT3602 Statistical inference (6)
- STAT3603 Stochastic processes (6)
- STAT3604 Design and analysis of experiments (6)
- STAT3605 Quality control and management (6)
- STAT3606 Business logistics (6)
- STAT3607 Statistics in clinical medicine and bio-medical research (6)
- STAT3608 Statistical genetics (6)
- STAT3609 Computer-aided data analysis (6)
- STAT3611 Statistical machine learning (6)  
  [previous title: Data mining (6)]
- STAT3613 Marketing analytics (6)
- STAT3614 Business forecasting (6)
- STAT3616 Advanced SAS programming (6)
- STAT3617 Sample survey methods (6)
- STAT3620 Modern nonparametric statistics (6)
- STAT3621 Statistical data analysis (6)
- STAT3955 Survival analysis (6)
- STAT4601 Time-series analysis (6)
- STAT4602 Multivariate data analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Statistics
Offered to students admitted to Year 1 in 2012

Objectives:
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

Learning Outcomes:
By the end of this programme, students should be able to:

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Decision Analytics
Major in Risk Management
Major in Statistics
Minor in Risk Management

**Required courses (42 credits)**

1. **Introductory level courses (12 credits)**
   Disciplinary Electives (12 credits)
   At least 12 credits from List A and List B, with at least 6 credits from List B:
   **List A**
   - STAT1601 Elementary statistical methods (6)
   - STAT1602 Business statistics (6)
   - STAT1603 Introductory statistics (6)
   - STAT2601 Probability and statistics I (6)
   **List B**
   - STAT2602 Probability and statistics II (6)
   - STAT2603 Data management with SAS (6)
   - STAT2604 Introduction to R programming and elementary data analysis (6)
   - STAT2605 Demographic and socio-economic statistics (6)

2. **Advanced level courses (30 credits)**
   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   - STAT3600 Linear statistical analysis (6)
   - STAT3602 Statistical inference (6)
   - STAT3603 Stochastic processes (6)
   - STAT3604 Design and analysis of experiments (6)
   - STAT3605 Quality control and management (6)
   - STAT3606 Business logistics (6)
   - STAT3607 Statistics in clinical medicine and bio-medical research (6)
   - STAT3608 Statistical genetics (6)
   - STAT3611 Computer-aided data analysis (6)
   - STAT3612 Statistical machine learning (6) [previous title: Data mining (6)]
   - STAT3613 Marketing analytics (6) [previous title: Marketing engineering (6)]
   - STAT3614 Business forecasting (6)
   - STAT3616 Advanced SAS programming (6)
   - STAT3617 Sample survey methods (6)
   - STAT3620 Modern nonparametric statistics (6)
   - STAT3621 Statistical data analysis (6)
   - STAT3955 Survival analysis (6)
   - STAT4601 Time-series analysis (6)
   - STAT4602 Multivariate data analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Students taking double Majors, Major-Minor or double Minors with overlapping course requirements
1. Double-counting of courses up to a maximum of 24 credits is permissible with double majors. The double-counted courses in both Science majors must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. The following list shows the major-major combinations that have more than 24 credits of the same ‘disciplinary core’ courses that appear in both majors and is subject to the rule of double counting:

<table>
<thead>
<tr>
<th>Major-Major combination</th>
<th>Admission Year (Year 1)</th>
<th>No. of common 'disciplinary core' courses (credits) appear in both majors including SCNC1111 and SCNC1112</th>
<th>No. of replacement courses (credits) to be taken in the 2nd major ('Major 2')</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major in Astronomy</td>
<td>2014</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Mathematics/Physics</td>
<td>2014</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Astronomy</td>
<td>2014</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Chemistry</td>
<td>2015, 2016, 2017, 2018, 2019</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Biochemistry</td>
<td>2014</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Molecular Biology &amp; Biotechnology</td>
<td>All years</td>
<td>7 (42 credits)</td>
<td>3 (18 credits)</td>
</tr>
<tr>
<td>Major in Biological Sciences Major in Ecology &amp; Biodiversity</td>
<td>All years</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Biological Sciences Major in Food &amp; Nutritional Science</td>
<td>2014, 2017, 2018, 2019</td>
<td>7 (42 credits)</td>
<td>3 (18 credits)</td>
</tr>
<tr>
<td>Major in Biological Sciences Major in Molecular Biology &amp; Biotechnology</td>
<td>2014</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Molecular Biology &amp; Biotechnology Major in Earth System Science Major in Geology</td>
<td>2014, 2015, 2016</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Ecology &amp; Biodiversity Major in Food &amp; Nutritional Science</td>
<td>2017, 2018, 2019</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Ecology &amp; Biodiversity Major in Molecular Biology &amp; Biotechnology</td>
<td>2014, 2015, 2016</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Food &amp; Nutritional Science Major in Molecular Biology &amp; Biotechnology</td>
<td>All years</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
</tbody>
</table>

If more than 24 credits (including SCNC1111 & SCNC1112) are listed as ‘disciplinary core’ courses required in both the first (‘Major 1’) and second (‘Major 2’) majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) in the second major (‘Major 2’). The replacement course(s) must be the disciplinary elective course in the second major (‘Major 2’) and have the same prefix and at the same or higher level as the double-counted course(s). The double counted credits should count the following courses in this order: (1) SCNC1111 and SCNC1112, (2) introductory level (levels 1 and 2) courses, and (3) advanced level (level 3 or above) courses. For example, if a student takes a first major in Ecology & Biodiversity (‘Major 1’) and the 2nd major in Molecular Biology & Biotechnology (‘Major 2’), SCNC1111, SCNC1112, BIOL1110, BIOL2102 and BIOL2103 are the common ‘disciplinary core’ courses that appear in both majors. The first 3 courses SCNC1111, SCNC1112, and BIOL1110 would first be counted plus either BIOL2102 or BIOL2103 for the major in Molecular Biology & Biotechnology. The student has to take a replacement ‘disciplinary elective’ course (with a prefix of BIOL at level 2 or above) in the 2nd major in Molecular Biology & Biotechnology to make up for BIOL2102 or BIOL2103.
3. Double counting of credits is not permissible for major–minor or double-minors combinations. When a course is required (‘disciplinary core’) both by the major and minor or by both minors, the student must take a replacement course for the minor. The replacement course must be the disciplinary elective in the minor and have the same prefix and at the same or higher level as the course to be replaced.

4. For students taking the Mathematics related majors/minors should note the following exemption and replacement arrangement:

Students who fall into the following exemption situation for the introductory level Disciplinary Core Mathematics courses in Science Majors/Minors are required to take the specified replacement course(s) as prescribed in the table:

<table>
<thead>
<tr>
<th>Exempted Course</th>
<th>Exemption granted under the following circumstances</th>
<th>Specified Replacement Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013 University mathematics II</td>
<td>For students taking Minor with an overlap of Disciplinary Core Course: MATH1013</td>
<td>Select 6 credits from the following to replace MATH1013:</td>
</tr>
<tr>
<td></td>
<td>For students taking Programme / Major / Minor with Disciplinary Core Courses: MATH1851 and MATH1853 (which are together deemed equivalent to MATH1013)</td>
<td>· Any 6-credit level 2 or above Mathematics Disciplinary Elective chosen from the Programme/Major/Minor structure in which MATH1013 is the disciplinary core course</td>
</tr>
<tr>
<td></td>
<td>For students taking Professional Core in Bachelor of Science in Actuarial Science with Disciplinary Core Course: MATH1821 (which is equivalent to MATH1013)</td>
<td>· MATH2012 Fundamental concepts of mathematics (6) (if not the disciplinary core course in the structure)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>· MATH2241 Introduction to mathematical analysis (6) (if not the disciplinary core course in the structure)</td>
</tr>
<tr>
<td>MATH2014 Multivariable calculus and linear algebra</td>
<td>For students taking Programme/Major with Disciplinary Core Course: MATH2101 and MATH2211 (which are together deemed equivalent to MATH2014)</td>
<td>Select 6 credits from the following to replace MATH2014:</td>
</tr>
<tr>
<td></td>
<td>For students taking Professional Core in Bachelor of Science in Actuarial Science with Disciplinary Core Course: MATH2822 (which is equivalent to MATH2014)</td>
<td>· Any 6-credit level 2 or above Mathematics Disciplinary Elective chosen from the Programme/Major/Minor structure in which MATH2014 is the disciplinary core course</td>
</tr>
<tr>
<td></td>
<td></td>
<td>· MATH2012 Fundamental concepts of mathematics (6) (if not the disciplinary core course in the structure)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>· MATH2241 Introduction to mathematical analysis (6) (if not the disciplinary core course in the structure)</td>
</tr>
</tbody>
</table>

5. For the situations of 2, 3 and 4 above, students have to complete the application form, seek the written endorsement from the Course Selection Adviser of the second major (‘Major 2’) / minor and then return it to the Faculty Office by the closing dates of course selection or add/drop periods.
Course Descriptions

SCIENCE
### BIOC1600
**Perspectives in biochemistry (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biomedical Sciences</th>
<th>Quota</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr. J Tanner, Biomedical Sciences (<a href="mailto:jatanner@hku.hk">jatanner@hku.hk</a>)</td>
<td>---</td>
<td>2019</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr A C Koon, Biomedical Sciences) (Dr B C W Wong, Biomedical Sciences) (Dr J Tanner, Biomedical Sciences) (Dr. J W Y Ho, Biomedical Sciences) (Dr. M S Y Huen, Biomedical Sciences) (Dr. Y S Chan, Department of Paediatrics and Adolescent Medicine)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Course Objectives**
- Teach students a biochemical perspective on each of the Basic Sciences focusing on concepts fundamental to the learning of Biochemistry.
- Promote deep learning of course material through an integrated programme of practical and collaborative tasks.
- Inspire students with a view of the great discoveries and future challenges for Biochemistry.
- Help students make the transition from school to university by developing their teamwork, independent study skills and confidence to communicate within a Biochemistry learning environment.

**Course Contents & Topics**
A Biochemical Perspective on the Basic Sciences

A. Chemistry for Biochemistry
The elements and bonding (from carbon to Coenzyme A); Resonance and orbital theory (a focus on the electron); Structure and conformation (thinking in 3 dimensions); Isomerism (from mirrors to thalidomide); Water (the universal biochemical solvent) & buffer; Quantitation in chemistry (who was Avogadro anyway?).

B. Biology for Biochemistry
The basic building blocks of life (proteins, DNA, lipids, carbohydrate); The Central Dogma of Molecular Biology; Evolution (considering molecular evolution); Origins of life (the chicken-egg paradox of proteins and DNA).

C. Physics and Mathematics for Biochemistry
Thermodynamics from a Biological Perspective; Introduction to molecular recognition and binding (DNA melting); Statistics for biochemistry (applied statistics for what you really need to know); Thinking numbers (exponentials, logs and the limits of life).

D. Inspiring Biochemistry
The protein; The gene; Vitamins and disease; Synthetic biology; The challenges of modern-day genetics Drugs-

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1 describe the basics of biomolecular structure from a chemical perspective, thereby integrating the basic sciences of biology, chemistry and physics into a biochemical perspective
- CLO 2 apply knowledge of biomolecular structure to review major discoveries and contemporary issues in molecular biology
- CLO 3 interpret scientific data and discuss major issues in biochemistry using the scientific literature
- CLO 4 demonstrate skills in working and collaborating together with colleagues in practicals and in presentation of scientific ideas
- CLO 5 relate how biochemistry intersects with the three basic sciences of biology, chemistry and physics, and recognize the transition from school to university level study

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Level 3 or above in HKDSE Biology, Chemistry, or Combined Science with Biology or Chemistry component, or equivalent

**Offer in 2019 - 2020**
Y 1st sem Offer in 2020 - 2021 : Y |

**Course Type**
Lecture-based course

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures or workshops</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Group work</td>
<td>Practical classess</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>Tasks and preparation</td>
<td>30</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr J Tanner</td>
<td></td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td>Assignments</td>
<td>including practical writeups</td>
<td>20</td>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>CLO 1.2.3</td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td>group communication project</td>
<td>30</td>
<td>CLO 2.3,4,5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
TBC

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### BIOC2600
**Basic biochemistry (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biomedical Sciences</th>
<th>Quota</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr. M Kotaka, Biomedical Sciences (<a href="mailto:masayo@hku.hk">masayo@hku.hk</a>)</td>
<td>300</td>
<td>2019</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr A S L Wong, Biomedical Sciences) (Dr C M Qian, Biomedical Sciences) (Dr C W Lee, Biomedical Sciences)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Course Objectives
This course is designed to present an overview of biochemistry of fundamental importance to the life process. We aim to develop appreciation of the basics in biochemistry as a common ground for science and non-science students to progress into their areas of specialization. Students intending to pursue further studies in Biochemistry and Molecular Biology will find this course particularly helpful.

Course Contents & Topics
Structure and functions of carbohydrates, lipids, nucleic acids, amino acids and proteins; enzymes and co-enzymes; basic bioenergetics; key metabolic processes in a living cell; signaling across cell membranes; flow of genetic information.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: Relate structures to functions of biomolecules.
- CLO 2: Explain the functions of key metabolic processes.
- CLO 3: Explain the significance of signaling across cell membranes.
- CLO 4: Explain the flow of genetic information.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC1600 or BIOL1110 or ENG1207; and Not for students who have passed in BIOL2220 or MEDE2301 or BMED2301, or have already enrolled in these courses.

Offer in 2019 - 2020
Y 1st sem Y 2020 - 2021 : Y Examination Dec

Grade Descriptors (A+ to F)

- A: Demonstrates thorough and complete mastery of the entire range of knowledge and analytical skills as required for maximal attainment in all the course learning outcomes; excellence in critical thinking towards application of the knowledge in a range of contexts.
- B: Demonstrates substantial command of a broad range of knowledge and analytical skills as required for attainment of the majority of course learning outcomes; good evidence of critical thinking towards application of the knowledge in a range of contexts.
- C: Demonstrates general but incomplete command of knowledge and analytical skills as required for attainment of adequate course learning outcomes; some evidence critical thinking towards application of the knowledge in a range of contexts.
- D: Demonstrates partial but limited command of knowledge and analytical skills as required for attainment of some of the course learning outcomes; limited evidence of critical thinking towards application of the knowledge in a range of contexts.
- Fail: Demonstrates little or no evidence of command of knowledge and analytical skills as required for attainment of the course learning outcomes; lacking in critical thinking towards application of the knowledge in a range of contexts.

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Additional Course Information
Also offered as BMED2301 "Life Sciences I (Biochemistry)" to students of the Faculty of Engineering. Students who have passed BMED2301 (previously known as MEDE2301) is considered to have passed BIOC2600.

BIOC3601

Offering Department
Biomedical Sciences

Course Co-ordinator
Dr. N. S. Wong, Biomedical Sciences (nswang@hku.hk)

Teachers Involved
- Dr. L. V. L. Cheng, Biomedical Sciences
- Dr. N. S. Wong, Biomedical Sciences
- Dr. L. W. Lim, Biomedical Sciences
- Dr. S. Sanyal, Biomedical Sciences

Course Objectives
This course focuses on the central metabolic pathways involved in the provision of energy needed by living organisms. Major metabolic pathways covered in this course include those that are involved in the synthesis and breakdown of glucose, glycogen, triacylglycerol, and amino acids. The metabolism of purines and pyrimidines will also be considered. Emphasis is on the understanding of the metabolic reactions involved and how they are regulated in relation to environmental cues. Metabolic derangements as a basis of diseases will also be discussed.

Course Contents & Topics
This course focuses on the central metabolic pathways involved in the provision of energy needed by living organisms. Major metabolic pathways covered in this course include those that are involved in the synthesis and breakdown of glucose, glycogen, triacylglycerol, and amino acids. The metabolism of purines and pyrimidines will also be considered. Emphasis is on the understanding of the metabolic reactions involved and how they are regulated in relation to environmental cues. Metabolic derangements as a basis of diseases will also be discussed.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: Explain the significance of individual steps in a metabolic pathway.
- CLO 2: Recognize the importance and the need for regulation of metabolic pathways.
- CLO 3: Discuss the roles of enzymes in the regulation of metabolic pathways.
- CLO 4: Describe how metabolic process are integrated under different physiological and pathological conditions.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC3601 or BIOL2220 or MEDE2301

Offer in 2019 - 2020
Y 1st sem Y 2020 - 2021 : Y Examination Dec

Grade Descriptors (A+ to F)

- A: Demonstrates thorough and extensive knowledge and skills required for attaining all the course learning outcomes. Displays a strong analytical ability and logical thinking and is able to apply knowledge to a wide range of complex situations. Consistently able to communicate sophisticated ideas clearly and concisely.
- B: Demonstrates substantial knowledge and skills required for attaining most of the course learning outcomes. Shows evidence of analytical ability and logical thinking and is sometimes able to apply knowledge to complex situations. Often communicates complex ideas clearly.
- C: Demonstrates general but incomplete knowledge and skills required for attaining most of the course learning outcomes. Shows evidence of some analytical ability and logical thinking and is sometimes able to apply knowledge to familiar or uncomplicated situations. Sometimes communicates ideas clearly.
- D: Demonstrates limited knowledge and skills required for attaining some of the course learning outcomes. Shows poor analytical...
School of Biomedical Sciences

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>glycolysis; gluconeogenesis; pentose phosphate pathway; glycogen metabolis; lipid metabolis; purine and pyrimidine metabolism; regulation and integration of metabolic pathways</td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td>working on problems relating to the lecture topics</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>3 hrs examination</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


BIOSC3604

Offering Department
Biomedical Sciences

Course Co-ordinator
Dr K M Yao, Biomedical Sciences (kmyao@hku.hk)

Course Objectives
To give students a general overview of different experimental approaches and model systems, and to provide students with hands-on experience in basic biochemical and molecular techniques.

Course Contents & Topics
Basic concepts in experimental science; writing of lab notebooks; experimental approaches - genetic, biochemical, molecular, genomic and others; methods for isolation and analysis of carbohydrates, proteins, lipids and nucleic acids; subcellular fractionation; enzyme assays and spectrophotometry; basic nucleic acid manipulation - PCR, site-directed mutagenesis, blotting and hybridization, cloning strategies, restriction mapping.

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1: explain the basic principles of various biochemical and molecular techniques
- CLO 2: describe different experimental approaches for achieving defined experimental aims
- CLO 3: apply different techniques to biochemical and molecular analyses
- CLO 4: appreciate the importance of maintaining a scientific laboratory notebook satisfactorily

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC2600 or BIOL2220 or MEDE2301

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrates thorough and extensive knowledge and skills required for attaining all the course learning outcomes. Shows strong analytical ability and logical thinking, with evidence of original thought. Competently conducts laboratory skills and techniques with confidence and can critically appraise data to draw appropriate and insightful conclusions.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrates substantial knowledge and skills required for attaining most of the course learning outcomes. Shows evidence of critical thinking and analytical skills. Conducts laboratory skills and techniques with confidence and can appraise data to draw appropriate conclusions.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrates general but incomplete knowledge and skills required for attaining most of the course learning outcomes. Shows some evidence of critical thinking and analytical skills. Conducts laboratory skills and techniques to a satisfactory level of competence and can sometimes correctly appraise data and draw appropriate conclusions.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrates partial but limited knowledge and skills required for attaining some of the course learning outcomes. Shows limited critical thinking and analytical skills. Displays poor laboratory skills and techniques and is rarely able to use data to draw appropriate conclusions.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrates little or no evidence of knowledge and skills required for attaining the course learning outcomes. Lacks analytical ability and logical thinking. Displays ineffective lab skills and techniques and is unable to use data to draw appropriate conclusions.</td>
</tr>
</tbody>
</table>

Course Type
Lecture with laboratory component course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

BIOSC3605

Offering Department
Biomedical Sciences

Course Co-ordinator
Dr B C W Wong, Biomedical Sciences (bcwong@hku.hk)
### Course Objectives
This course will examine existing bioinformatics tools for DNA and protein sequence analysis. The underlying principles of these analysis programs and services will be presented. Students will learn how to retrieve, analyze, and compare protein and DNA sequences using bioinformatics tools available on the World Wide Web.

### Course Contents & Topics
This course will introduce and discuss the following topics:
- DNA and protein sequence database, protein family databases; information searching and retrieval - Entrez and SRS; Simple sequence analysis; sequence alignment: pair-wise alignment, multiple sequence alignment, substitution matrices; sequence database searching: algorithm and parameters; sequence patterns and motifs, and profiles; phylogenetic analysis; gene prediction.

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 search and retrieve sequence information from biological databases
- CLO 2 describe the algorithms for pairwise and multiple alignments, BLAST, and phylogenetic tree construction
- CLO 3 perform sequence analysis using EMBOSS package and other web-based analysis tools
- CLO 4 interpret results from sequence alignments and BLAST database searches
- CLO 5 use results from various sequence analysis tools to annotate a biological sequence

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC2600 or BIOL2220 or BBMS2003 or BBMS2007 or MEDE2301

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrates thorough and complete mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes; strong critical thinking; excellent ability to apply bioinformatics skills in a range of context.</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes; evidence of critical thinking; good ability to apply bioinformatics skills in a range of context.</td>
<td>CLO 2, 3, 4, 5</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrates general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes; some critical thinking; adequate ability to apply bioinformatics skills in a range of context.</td>
<td>CLO 3, 4, 5</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrates partial but limited command of knowledge and skills required for attaining some of the course learning outcomes; limited critical thinking; limited ability to apply bioinformatics skills in a range of context.</td>
<td>CLO 4, 5</td>
</tr>
<tr>
<td>F</td>
<td>Demonstrates little or no evidence of command of knowledge and skills required for attaining the course learning outcomes; lack of critical thinking; little or no ability to apply bioinformatics skills in a range of context.</td>
<td>Fail</td>
</tr>
</tbody>
</table>

### Course Type
Lecture-based course

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Methods and Weighing</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td></td>
<td>30</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td>70</td>
<td>CLO 2, 4</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>BIOL3606</th>
<th>Molecular medicine (6 credits)</th>
<th>Academic Year</th>
<th>2019</th>
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</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Biomedical Sciences</td>
<td>Quota</td>
<td>50</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof D Y Jin, Biomedical Sciences (<a href="mailto:dyjin@hku.hk">dyjin@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr B Gao,Biomedical Sciences)</td>
<td>(Dr. T Y Lam,Publich Health)</td>
<td>(Dr. YQ Song,Biomedical Sciences)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To provide up-to-date knowledge of the molecular and cellular basis of selected human diseases including cancer and infection with HIV and influenza viruses, thereby preparing the students for a career in biomedical, biotechnological, pharmaceutical and genomic research.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>This course covers cell signaling in relation to human diseases, molecular basis of cancer and viral diseases, and molecular therapeutics. Specific topics may include cell signaling, mouse model of human diseases, oncogenes and tumour suppressor genes, genome instability, HIV science, genetics and pathogenesis of influenza viruses, molecular approaches to vaccine development, immune checkpoint therapy, stem cells and stem cell therapy, gene therapy, and nucleic acid therapeutics. Basic knowledge of biochemistry and molecular cell biology is assumed for students taking this course.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to: CLO 1 explain the molecular mechanisms underlying selected human diseases including cancer CLO 2 illustrate the application of molecular biology in medicine with examples CLO 3 integrate and translate knowledge in molecular biology to new approaches in disease prevention and intervention</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Pass in BIOC2600 or BIOL2220 or MEDE2301</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 2nd sem Exam in 2020 - 2021 : Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Displays a comprehensive grasp of the key concepts underlying the molecular basis of human diseases, with few omissions or errors. Able to articulate clearly with examples how knowledge in molecular biology can lead to new strategies in disease prevention and intervention. Evidence of strong analytical and critical thinking when dealing with complex scientific data. Some evidence for additional information beyond what is given in the lectures.</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>B</td>
<td>Displays a substantial and near-complete grasp of the key concepts underlying the molecular basis of human diseases, but without depth in some areas and with some omissions and factual errors. An understanding of the topic though is clear. Able to</td>
<td>CLO 2, 3, 4, 5</td>
</tr>
</tbody>
</table>
Directed studies in biochemistry (6 credits)

Course Type: Lecture-based course

Course Teaching & Learning Activities
- Activities: Details
  - Lectures: 36
  - Tutorials: 12
  - Reading / Self study: 100

Assessment Methods and Weighting
- Methods: Details
  - Examination: 80%
  - Test: 20%

CLO 1, CLO 2, CLO 3

Required/recommended reading and online materials
- Cassimeris et al: Lewin's Cells, 2nd ed., 2011

BIOC3999
Directed studies in biochemistry (6 credits)

Offering Department: Biomedical Sciences
Quota: 36

Course Co-ordinator: Prof J D Huang, Biomedical Sciences
(jdhuan@g.hku.hk)

Teachers Involved:
- (All academic staff in Biochemistry Major, Biomedical Sciences)
- (Prof J D Huang, Biomedical Sciences)

Course Objectives
- To enhance students knowledge of a particular topic and the students self-directed learning and critical thinking skills.

Course Contents & Topics
- The student undertakes a self-managed study on a topic in biochemistry under the supervision of a staff member. The topic is preferably one not sufficiently covered in the regular curriculum. The directed study can be a critical review or a synthesis of published work on the subject. A laboratory or field study may also be involved that would enhance the student's understanding of the subject.

Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1: critically appraise research literature in a specific area of biochemistry and molecular biology
  - CLO 2: examine the theoretical or experimental basis for existing concepts
  - CLO 3: identify questions and evaluate issues for further research development

Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Biochemistry Major including BIOC2600 and BIOC4301.
- This capstone course is for Biochemistry Major students only.
- The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020: Y
1st sem 2nd sem Summer
Offer in 2020 - 2021: Y
Examination No Exam

Grade Descriptors (A+ to F)
- A: Produces a sophisticated and detailed appraisal of the biochemical literature, displaying a comprehensive and deep understanding of the selected topic. Able to contextualize all the ideas within a personal framework of knowledge and evaluate relevant issues emerging from the study. Works proactively with a supervisor to enhance understanding and scientific writing skills. Communicates the findings to a broader audience in an effective way and responds knowledgeably to questions. Excellent time-management skills and able to reflect honestly on one's own learning.
- B: Produces a coherent appraisal of the biochemical literature, displaying a sound understanding of the selected topic. Able to contextualize many of the ideas within a personal framework of knowledge and identify some relevant issues emerging from the study. Works constructively with a supervisor to enhance understanding and scientific writing skills. Clearly communicates the findings to a broader audience. Able to contextualize a few of the ideas within a personal framework of knowledge and makes some attempt to identify some relevant issues emerging from the study. Works constructively with a supervisor to enhance understanding and scientific writing skills. Communicates the findings to a broader audience with reasonable clarity and responds to most questions. Acceptable time-management and self-reflection skills.
- C: Produces a reasonable appraisal of the biochemical literature, displaying an adequate understanding of the selected topic. Able to contextualize a few of the ideas within a personal framework of knowledge and makes some attempt to identify some relevant issues emerging from the study. Works constructively with a supervisor to enhance understanding and scientific writing skills. Communicates the findings to a broader audience with reasonable clarity and responds to most questions. Acceptable time-management and self-reflection skills.
- D: Produces a superficial appraisal of the biochemical literature, displaying a limited understanding of the selected topic. Able to contextualize a few of the ideas within a personal framework of knowledge but unable to identify any relevant issues emerging from the study. Works reluctantly with a supervisor and other co-workers to develop understanding and scientific writing skills. Displays weak communication skills when presenting the findings to a broader audience. Poor time-management and self-reflection skills.
- Fail: Fails to appraise the biochemical literature and thus unable to display any understanding of the selected topic. Unable to contextualize the ideas within a personal framework of knowledge or identify any relevant issues emerging from the study. Works in isolation, thus failing to make progress in understanding and scientific writing skills. Unable to communicate effectively when presenting the findings to a broader audience. No time-management skills or ability to self-reflect.

Course Type: Project-based course

Course Teaching & Learning Activities
- Activities: Details
  - Reading / Self study: at least 120 hours on the project

Assessment Methods and Weighting
- Methods: Details
  - Dissertation: including mind map (10%)
  - Oral presentation: 25
  - Research report: Supervisor comments

Weighting in final course grade (%)
- CLO 1.2.3

Required/recommended reading and online materials
- as suggested by project supervisors

BIOC4610
Advanced biochemistry (6 credits)

Offering Department: Biomedical Sciences
Quota: 50
Advanced biochemistry II (6 credits)  

### Course Co-ordinator
Dr K M Yao, Biomedical Sciences  

### Teachers Involved
(Dr K M Yao,Biomedical Sciences)  
(Prof D Chan,Biomedical Sciences)  
(Prof D K Y Shum,Biomedical Sciences)  
(Prof J D Huang,Biomedical Sciences)

### Course Objectives
This course aims at providing students with an in-depth understanding of molecular and cellular signaling in multicellular organisms. This course is particularly useful for students interested in research or intending to develop a career in biomedical sciences.

### Course Contents & Topics
- **A. Inter and intracellular signal transduction mechanisms**
  - Cell-surface receptors and signal transduction proteins; G-Protein-coupled receptors; structure and mechanism; signaling pathways that control gene expression; receptors that activate protein tyrosine kinases, the Ras/MAP kinase pathway, phosphoinositide signaling pathways and receptor serine kinases that activate Smads.
- **B. Cytoskeleton as target of signal transduction**
  - The microtubule cytoskeleton; kinesin and dynein motor; the actin cytoskeleton; myosin; the intermediate filament; cytoskeleton and cell behavior; cytoskeleton and intracellular transport in neuron.
- **C. Protein trafficking and sorting pathways**
  - Translocation of secretory proteins - insertion into the ER; major protein sorting pathways; protein modification, folding and quality control in the ER; molecular mechanism of vesicular traffic; protein sorting and processing.
- **D. Cell-cell and cell-matrix adhesion**
  - Cell-cell and cell-extracellular matrix (ECM) junctions and their adhesion molecules; cadherins and integrins; collagens and proteoglycans; when cell meets the matrix; regulation of signaling molecules by ECM.

### Course Learning Outcomes
- **On successful completion of this course, students should be able to:**
  - **CLO 1** describe the molecular and cellular signal transduction mechanisms that mediate cellular communication to achieve a plethora of cellular responses.
  - **CLO 2** illustrate the controls of the metabolic and cellular regulation based on their understanding of cytoskeleton as target of signal transduction, protein trafficking and sorting pathways, and cell-cell and cell-matrix adhesion.
  - **CLO 3** develop critical thinking and analytical skills.

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC3601 or BIOL3401 or BIOL3402 or BIOL3404.

### Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y

### Grade Descriptors
- **A**
  - Demonstrate thorough and complete mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong critical thinking and analytical skills, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations.

- **B**
  - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of critical thinking and analytical skills, and ability to apply knowledge to familiar and some unfamiliar situations.

- **C**
  - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some critical thinking and analytical skills, and ability to apply knowledge to most familiar situations.

- **D**
  - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some critical thinking, but with limited analytical skills. Show limited ability to apply knowledge to solve problems.

- **Fail**
  - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of critical thinking and analytical skills. Show very little or no ability to apply knowledge to solve problems.

### Course Type
Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
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<tbody>
<tr>
<td>Lectures</td>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
<td>CLO 1.2,3</td>
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<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1.2,3</td>
</tr>
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</table>

### Required/recommended reading and online materials
**Pre-requisites (and Co-requisites and Impermissible combinations)**

Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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<th>Examination</th>
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<tbody>
<tr>
<td>N</td>
<td>Examination</td>
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Pass in BIOC3601; and BIOL3404 or CHEM2441; and Pass in BIOC4610, or already enrolled in this course

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
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<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<tr>
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<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
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**Assessment Methods and Weighting**

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</thead>
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<td>Examination</td>
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<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**BIOC4612 Molecular biology of the gene (6 credits)**

**Offering Department**

Biomedical Sciences

**Course Co-ordinator**

Prof K S E Cheah, Biomedical Sciences (hrmbdck@hku.hk)

**Teachers Involved**

(Dr K M Yao,Biomedical Sciences)

(Dr R K Ng,Biomedical Sciences)

(Prof K S E Cheah,Biomedical Sciences)

(Prof. ZJ Zhou,Biomedical Sciences)

**Course Objectives**

To provide an up-to-date knowledge of molecular biology, especially with respect to the regulation of eukaryotic gene expression.

**Course Contents & Topics**

This is a comprehensive course covering many detailed molecular aspects of gene regulation and gene function. Through this course an understanding of how gene expression can be regulated at levels of transcription and post transcription will be gained.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 describe the mechanisms for regulation of transcription, RNA processing and translation in eukaryotes
- CLO 2 explain how cellular homeostasis can be maintained by a combination of controls of gene expression at multiple levels
- CLO 3 illustrate the hierarchy of gene expression regulation in stem cells and developmental processes
- CLO 4 interpret experimental results in gene regulation studies

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Y</th>
<th>2nd sem Offer in 2020 - 2021 : Y</th>
<th>Examination</th>
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<tbody>
<tr>
<td>Y</td>
<td>Examination</td>
<td>May</td>
</tr>
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</table>

Pass in BIOC3601 or BIOL3401 or BIOL3402 or BIOL3404 or BBMS2007

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<tbody>
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<td>Lectures</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
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**Assessment Methods and Weighting**

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<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
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<td>Examination</td>
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<td>80</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Course Objectives
This is an advanced experimental-based course for students majoring in Biochemistry and related disciplines. The aim is to provide the necessary training for students to pursue postgraduate research education and potential employment in a scientific laboratory/industry environment.

Course Contents & Topics
Hands-on experiments using advanced techniques in biochemistry, molecular and cell biology, and bioinformatics. Students will also have the opportunity to familiarize themselves with modern instruments used in life sciences.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 explain the basic principles of current advanced techniques commonly used in biochemistry and molecular biology
- CLO 2 apply and perform these techniques in other novel experimental settings
- CLO 3 critically evaluate experimental data
- CLO 4 design alternative approaches to test or validate hypotheses
- CLO 5 write a concise experimental report using correct terminologies and nomenclatures

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC3604

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y Examination Dec

Grade Descriptors (A+ to F)
A Comprehensive and in-depth understanding of the principles and applications of advance techniques in biochemistry; clear and effective ability to identify problems and generate solutions relating to applications in a laboratory setting; clear evidence of ability to evaluate experimental data; cohesive and systematic planning and organization of experimental design and presentation of experimental data.
B Comprehensive understanding of the principles and applications of advance techniques in biochemistry; clear ability to identify problems and generate solutions relating to applications in a laboratory setting; evidence of ability to evaluate experimental data; systematic planning and organization of experimental design and presentation of experimental data.
C Sound understanding of the principles and applications of advance techniques in biochemistry; sound ability to identify problems and generate solutions relating to applications in a laboratory setting; some evidence of ability to evaluate experimental data; satisfactory planning and organization of experimental design and presentation of experimental data.
D Superficial understanding of the principles and applications of advance techniques in biochemistry; limited ability to identify problems and generate solutions relating to applications in a laboratory setting; some awareness of ability to evaluate experimental data; some evidence of planning and organization of experimental design and presentation of experimental data.
Fail Lack of understanding of the principles and applications of advance techniques in biochemistry; lack of ability to identify problems and generate solutions relating to applications in a laboratory setting; lack of evidence of ability to evaluate experimental data; insufficient evidence of planning and organization of experimental design and presentation of experimental data.

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
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<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4</td>
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</table>

Examining the test scores, depth understanding of the principles and applications of advance techniques in biochemistry: clear and comprehensive ability to identify problems and generate solutions relating to applications in a laboratory setting; clear evidence of ability to evaluate experimental data; cohesive and systematic planning and organization of experimental design and presentation of experimental data.

Further information can be found in the following books:
BIOC4999  
Biochemistry project (12 credits)  
Academic Year: 2019  
Quota: 25

Course Co-ordinator: Dr N S Wong, Biomedical Sciences (ns Wong@hku.hk)

Offering Department: Biomedical Sciences

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Biochemistry Major including BIOL3401, BIOC3601, BIOC3604, BIOC3610 and BIOC4613. This capstone course is for Biochemistry Major students only.

Grade Descriptors (A+ to F):  
A Plans and executes a sophisticated and creative experimental investigation, framing the research question within existing knowledge. Displays tenacity and commitment, generating a meaningful body of data that is analysed with insight and comprehensively evaluated in the context of the original research question. Works proactively with a supervisor and other co-workers to enhance practical and scientific writing skills. Communicates the findings to a broader audience in an effective and scholarly way and responds knowledgeably to questions. Excellent time-management skills.

B Plans and executes a detailed experimental investigation, framing the research question within existing knowledge. Works with commitment, generating a sufficient body of data that is analysed and evaluated in the context of the original research question with skill and understanding. Works constructively with a supervisor and other co-workers to enhance practical and scientific writing skills. Clearly communicates the findings to a broader audience and responds knowledgeably to most questions. Able to time-manage effectively.

C Plans and executes an experimental investigation, attempting to contextualize the research question. Works with adequate commitment in order to generate sufficient data for a reasonable analysis and evaluation in the context of the original research question. Works with a supervisor and other co-workers to improve practical and scientific writing skills. Communications the findings to a broader audience with reasonable clarity and responds to most questions. Ascendently does the job.

D Plans and executes a rudimentary experimental investigation, showing a limited ability to contextualize the research question. Displays minimal commitment when collecting data and is only able to undertake a superficial analysis and evaluation. Works reluctantly with a supervisor and other co-workers to develop practical and scientific writing skills. Displays weak communication skills when presenting the findings to a broader audience. Poor time-management skills.

Fail Plans and executes an experimental investigation that is flawed, ineffective or overly simplistic, that is lacking a valid scientific context. Shows no commitment when collecting data and produces an incoherent analysis and evaluation. Works in isolation, thus failing to improve practical and scientific writing skills. Displays weak communication skills when presenting the findings to a broader audience. No time-management skills.

Course Type: Project-based course

Course Teaching & Learning Activities: 
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
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<td>Reading / Self study</td>
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Assessment Methods and Weighting: 
<table>
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<th>Methods</th>
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Additional Course Information: Satisfactory completion of this course can be counted towards the Capstone requirement. Details of internship will be recorded on the student's transcript. This course will be assessed on "Pass/Fail" basis. Students who are interested to enrol in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.
<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
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<tbody>
<tr>
<td>None prescribed</td>
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<tbody>
<tr>
<td>Dissertation</td>
<td>60 CLO 1,2,3,4,5</td>
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<tr>
<td>Oral presentation including continuous assessment (15%)</td>
<td>40 CLO 5</td>
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<tr>
<td>BIOL1110</td>
<td>From molecules to cells (6 credits)</td>
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<tr>
<td>Offering Department</td>
<td>Biological Sciences</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr C S C Lo, Biological Sciences) (Dr J W Zhang, Biological Sciences) (Dr K W Y Yuen, Biological Sciences) (Prof B K C Chow, Biological Sciences)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course aims to provide basic conceptual understanding of the biology of molecules and cells to underpin later studies in applied biology, genetics, biochemistry, nutrition, biotechnology, microbiology, plant and animal physiology and developmental biology.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>An issue-based approach will be adopted to enable students to integrate basic concepts in molecules and cells and to inspire further investigation through the exploration of contemporary biological issues. The course is divided into 4 parts and the following is a list of some of the questions to be asked and discussed:</td>
</tr>
<tr>
<td></td>
<td>Genes and inheritance: How do children resemble their parents? What is the central dogma of biology? What are the rules of genetic inheritance? What determines gender and sexuality? Why is that children resemble, but not identical to, their parents? What happen if some genes are non-functional or mutated?</td>
</tr>
<tr>
<td></td>
<td>Metabolism and Health: How are diets related to good health? Do all humans have the same dietary requirements? Why can't we live without plants? Cells and cell division: What are the common features in a cell? How do cells communicate and assemble themselves to form tissues and organs? What is a cell cycle and how it is regulated? What happens if cell-cycle control system goes wrong? How newly formed cells commit themselves for differentiation? Genetic engineering and modern biology: To what extent can genes be modified? Is gene therapy the future of medicines? Is genetically modified food safe for consumption? What are the Genome Projects and why have they been important?</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td></td>
<td>CLO 1 understand the relationships between genes in a genome and the inherited phenotypes expressed in a living organism</td>
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<tr>
<td></td>
<td>CLO 2 learn the underlying principle on how mutation of a gene can lead to the development of a genetic disease</td>
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<td></td>
<td>CLO 3 understand the importance of dietary intake of biomolecules in relationship to good health</td>
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<td></td>
<td>CLO 4 describe various stages in a cell division and that disturbance of this process may result in cancer development</td>
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<tr>
<td></td>
<td>CLO 5 describe concepts used in genetic engineering</td>
</tr>
<tr>
<td></td>
<td>CLO 6 know some applications of genetic engineering in gene therapy and production of genetically modified food</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Students who wish to take this course are expected to have taken HKDSE Biology and/or Chemistry or equivalent. For students without HKDSE Chemistry, they are encouraged to take CHEM1041 concurrently or before. Not for students having taken any level 2 (or above) Biomedical Sciences (BBMS) or Biochemistry (BIOC) course.</td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 1st sem 2nd sem</td>
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<tr>
<td>Grade Descriptors (A+ to F)</td>
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<td>B</td>
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<td>D</td>
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<td>Fail</td>
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<td>Course Type</td>
<td>Lecture-based course</td>
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<tr>
<td>Course Teaching &amp; Learning Activities</td>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
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<tr>
<td></td>
<td>Examination</td>
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<td>Course Website</td>
<td><a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
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<td>Additional Course Information</td>
<td>Quota in 1st Semester: 210 Quota in 2nd Semester: 210</td>
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BIOL1111

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<th>Introductory microbiology (6 credits)</th>
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<td>Offering Department</td>
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<td>Quota</td>
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<td>Teachers Involved</td>
<td>(---, Biological Sciences)</td>
<td></td>
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<tr>
<td>Course Objectives</td>
<td>To introduce students to the diversity and function of microorganisms; and relate this to their importance in the natural environment, disease and public health, food production and spoilage and the biotechnology industry.</td>
<td></td>
<td></td>
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<tr>
<td>Course Contents &amp; Topics</td>
<td>Evolutionary diversity of bacteria, archaea, eukarya and viruses; Metabolic strategies, cell biology and genetics; Microbial ecology, marine microbiology, terrestrial microbiology; Microbial interactions with animals and plants; The human microbiome; Medical microbiology and immunology; Biotechnology applications; Food spoilage and food fermentations.</td>
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<tr>
<td>Course Learning</td>
<td>On successful completion of this course, students should be able to:</td>
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</table>
### Course Objectives
To enable student to appreciate the multidisciplinary nature of the study of Food and Nutrition. From the farmer's field to the dinner table, a basic understanding of the general properties of macro and micronutrients food production, processing and storage will be covered. Food safety, food selection behaviour as well as balanced nutrition as part of lifestyle instrumental to good health will be discussed. This is an independent course which can be taken by students from various disciplines. It also prepares students for further studies in Food and Nutritional Science.

### Course Contents & Topics
Topics will include food composition and functional properties of major nutrients; food additives; food hygiene, safety and regulation; determinants of food choice; examples of complex processed foods; healthy eating-concepts and practice; essential nutrients; diet and disease relationship.

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand the key components of food and be able to discuss their functional properties
- CLO 2 understand the significance of food safety and be able to identify sources of contamination
- CLO 3 understand the concept of a balanced diet
- CLO 4 critically assess health problems associated with malnutrition

### Pre-requisites (and Co-requisites and Impermissible combinations)
NIL

### Offer in 2019 - 2020
Y Offer in 2020 - 2021 : Y

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>70</td>
<td>CLO 1, 2, 3</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>30</td>
<td>CLO 3</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

### Course Website
http://moodle.hku.hk/
School of Biological Sciences

BIOL1309

Evolutionary diversity (6 credits)

Academic Year 2019

Offering Department
Biological Sciences

Quota 250

Course Co-ordinator
Prof R M K Saunders, Biological Sciences (saunders@hku.hk)

Course Website
http://moodle.hku.hk

Course Contents & Topics
Introduction to the methodology for reconstructing the sequence of past evolutionary events (cladistics); algae (Rhodophyta, Phaeophyta and Chlorophyta); non-vascular plants (Hepatophyta, Anthocerophyta and Bryophyta); seedless vascular plants (Lycophyta, Psilophyta, Sphenophyta and Pterophyta); seed plants (Cycadophyta, Ginkgophyta, Coniferophyta, Gnetophyta and Anthophyta); invertebrates (Cnidaria, Platyhelminthes, Annelida, Mollusca, Nematomata, Arthropoda and Echinodermata); fish (Chondrichthyes and Actinopterygii); amphibians (Batracchoroma); reptiles (Anapsida, Lepidosauromorpha and Archosauromorpha); and mammals (Monotremata, Metatheria and Eutheria).

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 interpret phylogenies in order to understand the relatedness of taxonomic groups and the pattern of evolutionary changes in structures, processes and behaviours
- CLO 2 describe the characteristics of different evolutionary lineages of plants and animals and recall the names of the main taxonomic groups
- CLO 3 explain the possible selective advantages of the highlighted structures, processes and behaviours

Pre-requisites
NIL

Offer in 2019 - 2020
Y 2nd sem 2020 - 2021 : Y

Grade Descriptors (A to F)

A
Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining most or all of the course learning outcomes, with extensive use of named examples. Show evidence of significant critical abilities and logical thinking. Apply highly effective presentation skills.

B
Demonstrate substantial command of knowledge required for attaining most of the course learning outcomes, with some use of named examples. Show evidence of critical abilities and logical thinking. Apply effective presentation skills.

C
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes, with only limited use of named examples. Show evidence of some critical abilities and logical thinking. Apply moderately effective presentation skills.

D
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes, with insufficient use of named examples. Show evidence of limited critical abilities and logical thinking. Apply limited presentation skills.

Fail
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes, without use of named examples. Show little or no evidence of critical abilities and logical thinking. Presentation skills are minimally effective or ineffective.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 24
Laboratory 36
Reading / Self study 100

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 70 CLO 1,2,3
Laboratory reports 30 CLO 1,2,3

Required/recommended reading and online materials
TBC

Course Website
http://moodle@hku.hk

BIOL1501

Bioethics (6 credits)

Academic Year 2019

Offering Department
Biological Sciences

Quota 40

Course Co-ordinator
---, Biological Sciences

Course Objectives
The aim is to explore the ethical implications of the latest major advances in biology and medicine.

Course Contents & Topics
The course will discuss research ethic between student and mentor, and ethical implications in recent major advancements in biological and medical sciences. Major areas to be discussed include but are not limited to: genetics, reproduction, disease diagnosis and therapy, development, transplantation, aging, dying, environment, and the use of animals in research. Ethical and moral principles and implications for social framework and public policy raised by these advances will be discussed.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 familiarize with the current ethical theories, discussions, and arguments taking place in the field of bioethics specifically related to the advancement of modern molecular biology and genomics
- CLO 2 reflect upon and formulate in a professional manner their own opinions on these matters as well as to understand and enter into a respectful dialogue with those who possess another point of view

Pre-requisites
TBC

Course Website
http://moodle@hku.hk
Pre-requisites (and Co-requisites and Impermissible combinations) NIL

Offer in 2019 - 2020 N Offer in 2020 - 2021 : N Examination ---

Grade Descriptors (A+ to F)

A Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use communication skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective individual as well as collaborative-based organizational and presentational skills.

B Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use communication skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective individual as well as collaborative-based organizational and presentational skills.

C Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use communication skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately individual as well as collaborative-based organizational and presentational skills.

D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use communication skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate individual as well as collaborative-based organizational and presentational skills of limited effectiveness.

Fail Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use communication skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness individual as well as collaborative-based organizational and presentational skills.

Course Type Lecture-based course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>continuous assessment of essays, presentation and debate exercises</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>continuous assessment of essays, presentation and debate exercises</td>
<td>40</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials NIL

Library & web-based reading materials

Additional Course Information This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL1502 The gene (6 credits) Academic Year 2019

Offering Department Biological Sciences Quota 50

Course Co-ordinator ---, Biological Sciences (/)

Teachers Involved ---, Biological Sciences (/)

Course Objectives

The objective is to expose students to the impacts of genes to the society. Recent completion of the human genome and many agricultural crops and animals genomes, it brings not only promises of a better quality of life as well as lots of technical and ethical issues/challenges that general public need to deal with. The goal of this course is to open up students from all backgrounds to this basic unit of inheritance called the gene and its impact on various scientific and social disciplines.

Course Contents & Topics

Content/topics include:
- Introduction and review of basic cell biology
- Basic genetic - The gene
- Basic Molecular Biology and Biotechnology - Recombinant DNA and cloning
- Bacterial Genes - Gene and Environment
- Human Genes/Human genome - history and its Impacts!
- Human Genome - The Amazing discovery!
- Genes and Biotechnology
- Genes and Disease
- Genes and Cancer
- Animal and Plant Cloning
- Genes and Agricultural/Food Biotechnology
- Genes and Human Behavior

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 demonstrate understanding and to explain the principle of inheritance, recombinant DNA and cloning

CLO 2 gain deep understanding about the advancement of biotechnology

CLO 3 determine and explain the benefits and shortcomings of the application of biotechnology knowledge

Pre-requisites (and Co-requisites and Impermissible combinations) NIL

Not for students with level 3 or above in HKDSE Biology or Combined Science with Biology component or equivalent.

Offer in 2019 - 2020 N Offer in 2020 - 2021 : N Examination ---

Grade Descriptors (A+ to F)

A Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use communication skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective individual as well as collaborative-based organizational and presentational skills.

B Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use communication skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective individual as well as collaborative-based organizational and presentational skills.

C Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use communication skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately individual as well as collaborative-based organizational and presentational skills.

Grade Descriptors (A+ to F)

A Demonstrat...
Course Type: Lecture-based course

Course Teaching & Learning Activities:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>including 45 hours on 15 essay/report writing, 30 presentation (include preparation)</td>
<td>93</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>discussion forum</td>
<td>35</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Essay</td>
<td>essays &amp; written reports</td>
<td>25</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Presentation</td>
<td>poster &amp; oral presentation</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td>in-class participation &amp; quizzes</td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:

Library & web-based reading materials

Additional Course Information:

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL2101 Principles of food chemistry (6 credits) Academic Year 2019

Offering Department: Biological Sciences

Course Co-ordinator: Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)

Course Objective:

To provide a basic understanding of chemistry in food systems, and to provide practical training in chemistry related to food science and nutrition.

Course Contents & Topics:

The course will cover the components of food, including water, proteins, carbohydrates and lipids, and minor components such as enzymes, vitamins, minerals, colorants, flavorants and additives. The physical and chemical properties of these important constituents of foods are covered in detail, and form the basis for understanding the reactions which occur during the production, processing, storage and handling of foods, and in understanding the methods used in analyzing foods.

Course Learning Outcomes:

On successful completion of this course, students should be able to:

- CLO 1 understand the functions and properties of major and minor food components
- CLO 2 understand the basic chemistry behind food processing
- CLO 3 understand how major chemical and biochemical reactions influence food quality
- CLO 4 have integrated their knowledge of biological and chemical principles into a food science and nutrition context

Pre-requisites (and Co-requisites and Impermissible combinations):

Pass in BIOL1201; and NOT for students who have passed in BIOL3201.

The course is only for students admitted in 2017-2018 or thereafter.

Grade Descriptors (A to F):

**A** Demonstrate thorough grasp of the subject matter covered. Show extensive knowledge and understanding of the topics covered and can readily apply this knowledge. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions.

**B** Demonstrate substantial grasp of the subject matter covered. Show thorough knowledge and understanding of the content and a high level of competence in the topics covered and be able to apply this knowledge and skills to most situations. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions.

**C** Demonstrate general but incomplete grasp of the subject matter covered. The student has a sound knowledge and understanding of the main areas of content and has achieved an adequate level of competence in the topics covered. Use lab skills and techniques and analysis of data and results to draw moderately appropriate conclusions.

**D** Demonstrate partial but limited grasp, with retention of some relevant information of the subject matter covered. Show a basic knowledge and understanding of the content and has achieved a limited level of competence in the topics covered. Use lab skills and techniques and analysis of data and results to draw appropriate conclusions occasionally.

**Fail** Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show elementary knowledge and understanding in few areas of the content and has achieved very limited competence in some of the topics covered. Use lab skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions.

Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Laboratory reports</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:

Fennema OR, Food Chemistry (Marcel Dekker 4th Ed, 2008)
Belitz HD, Grosch W, Schieberle, P, Food Chemistry (Springer 4th Ed, 2009)

Course Website: http://moodle.hku.hk

Additional Course Information:

The course will be offered subject to a minimum enrollment number and availability of teachers.
## BIOL2102
### Biostatistics (6 credits)
#### Offering Department
Biological Sciences
#### Course Co-ordinator
Prof. K M Y Leung, Biological Sciences (kmyleung@hku.hk)
#### Teachers Involved
(Prof. K M Y Leung,Biological Sciences)
#### Course Objectives
This course aims to familiarise students with biostatistics. The course will give students the skills to understand, interpret, and critically evaluate the statistics used in biological and biomedical studies. The course will also introduce the students to fundamental principles of various statistical tests, basic computational tools for analysing data, choose the correct statistical test and avoid common statistical pitfalls.
#### Course Contents & Topics
Introduction to Statistics and Probability; Different Probability Distributions including Normal Distribution; Describing, Exploring and Comparing Data; Hypothesis Testing and Inferential Statistics (Both Parametric and Non-Parametric Tests such as Chi square test, Student t tests, Mana-Whitney test, Wilcoxon test, Analysis of Variance, and Kruskal-Wallis test); Correlation and Regression; Power Analysis; Experimental design.
#### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1: formulate biological questions into statistical questions
- CLO 2: design experiments effectively
- CLO 3: appreciate and interpret statistics in scientific paper
- CLO 4: use Excel and R to carry out common statistical computations
- CLO 5: understand the assumptions of commonly used statistical methods
- CLO 6: critically evaluate the scientific literature
- CLO 7: create novel hypothesis for testing

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in BIOC1600 or BIOL1110 or BIOL2306 or ENVS1301 or ENVS2002

**Offer in 2019 - 2020**
Y 2nd sem Offer in 2020 - 2021: Y

**Grade Descriptors (A+ to F)**
- **A**: Demonstrate thorough grasp of the subject and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective computational skills and techniques for basic statistical analyses. Be able to critically use data and statistical results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
- **B**: Demonstrate substantial grasp of the subject and skills required for attaining at least most of the course learning outcomes. Present evidence of analytical and critical abilities and logical thinking. Apply effective computational skills and techniques for basic statistical analyses. Be able to correctly use data and statistical results to draw appropriate conclusions. Apply effective organizational and presentional skills.
- **C**: Demonstrate general but incomplete grasp of the subject and skills required for attaining some of the course learning outcomes. Present evidence of some analytical and critical abilities and logical thinking. Apply moderately effective computational skills and techniques for basic statistical analyses. Demonstrate mostly correct but some erroneous use of data and statistical results to draw appropriate conclusions. Apply moderately effective organizational and presentional skills.
- **D**: Demonstrate partial and limited grasp of the subject and skills required for attaining some of the course learning outcomes. Present evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply limited or barely effective computational skills and techniques for basic statistical analyses. Demonstrate limited ability to use data and statistical results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.
- **F**: Demonstrate evidence of little or no grasp of the subject and skills required for attaining any of the course learning outcomes. Present evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Apply minimally effective or ineffective computational skills and techniques for basic statistical analyses. Demonstrate minimal ability to use data and statistical results and/or unable to draw appropriate conclusions. Apply minimally effective or ineffective organizational and presentational skills.

**Assessment Methods and Weighting**
- **Methods**: Assignments, Examination
- **Details**: Weighting in final course grade (%), Assessment Methods to CLO Mapping
- **Weighting in final course grade (%)**
- **Assessment Methods to CLO Mapping**

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3,4,5,6,7</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>30</td>
<td>CLO 1,3,5</td>
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</table>

**Required/recommended reading and online materials**

**Secondary Assessment Information**

**Course Website**
http://moodle.hku.hk/

## BIOL2103
### Biological sciences laboratory course (6 credits)
#### Offering Department
Biological Sciences
#### Course Co-ordinator
Dr W Y Lui, Biological Sciences (wyliu@hku.hk)
#### Teachers Involved
(Prof. K M Y Leung,Biological Sciences)
#### Course Objectives
The objective is to provide students a comprehensive training in basic laboratory techniques used in modern biological studies. The course will cover a number of techniques used by molecular biologists and microbiologists to conduct scientific research.
#### Course Contents & Topics
This course will be divided into three modules and each module will have 3 laboratory sessions.
- **Module one**: Nucleic acid analysis
- **Module two**: Protein analysis
- **Module three**: Centrifugation, chromatography and SDS-PAGE electrophoresis.
Module three: Microbiology
Microscopy, observation of microorganisms and staining of bacteria, isolation of pure cultures by streaking and serial dilution, enumeration of microbial cells by Petroff-Hauser counting chamber, and turbidity. Identification and classification of microbes from natural source and statistical analysis.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge in proper use of simple research equipment
- CLO 2 demonstrate knowledge and understanding of how and why certain techniques are used in a research setting
- CLO 3 master some basic laboratory techniques for carrying out experiments
- CLO 4 understand the different ways that microorganisms were categorized according to their size, shape, colour and response to dye etc. and how they were counted

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL1110.
Not for students having taken any level 3 (or above) Biochemistry (BIOC) course or BBMS2001.

Offer in 2019 - 2020
Y 1st sem 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Evidence of analytical and critical abilities and logical thinking. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

Course Type
Laboratory and workshop course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td>11 laboratory sessions (4 hours each)</td>
</tr>
<tr>
<td>Tutorials</td>
<td>lecture/tutorials</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
</tr>
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</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>40</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>Final examination</td>
<td>60</td>
<td>CLO 1,2</td>
</tr>
</tbody>
</table>

Course Website
http://moodle.hku.hk/

Additional Course Information
Quota 105 - 1st Semester
Lab A on Wed. with 35 students and Lab. B on Thurs. with 70 students
Quota 105 - 2nd Semester
Lab A on Wed. with 35 students; Lab. D on Fri. with 70 students

BIOL2220
Principles of biochemistry (6 credits) Academic Year 2019

Offering Department
Biological Sciences Quota 100

Course Co-ordinator
Dr C S C Lo, Biological Sciences (clivelo@hku.hk)

Teachers Involved
(Prof C S Lo, Biological Sciences)

Course Objectives
This course is designed to provide undergraduate (non-biochemistry major) an overview of fundamental concepts in biochemistry as well as hands-on experience in biochemical techniques.

Course Content
An introduction to various biomolecules in terms of their structures, functions, syntheses and metabolisms, with emphasis on amino acids, proteins, enzymes, carbohydrates, lipids and nucleic acids. The correlations between their biochemical properties and their roles in various life processes will be illustrated.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 describe the key structural features of carbohydrates, proteins, lipids and nucleotides
- CLO 2 understand the basic enzyme kinetic properties
- CLO 3 explain how the common sugars, fatty acids and amino acids are metabolized and synthesized in living cells

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL1110; and
Not for students who have passed in BIOC2600, or have already enrolled in this course.

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Integration of the full range of appropriate theories, principles, evidence and techniques</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. General integration of theories, principles, evidence and techniques</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Some partial integration of theories, principles, evidence and techniques</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited integration of theories, principles, evidence and techniques</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems.</td>
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</table>

Test Final examination 60 CLO 1,2
Assignments 40 CLO 1,2,3,4
Tutorials lecture/tutorials 1
Laboratory 11 laboratory sessions (4 hours each) 44
## Course Details

**Course Type**
Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>3 laboratory sessions</td>
<td>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td>Reading / Self study</td>
<td>12</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>10</td>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>30</td>
<td>CLO 1.2.3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**Course Website**
http://moodle.hku.hk/

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**BIOL2306**

**Ecology and evolution (6 credits)**

**Offering Department**
Biological Sciences

**Academic Year**
2019

**Course Co-ordinator**
Prof D Dudgeon, Biological Sciences (ddudgeon@hku.hk)

**Course Teachers Involved**
(Prof D Dudgeon, Biological Sciences)
(Prof G. A Williams (Field course component only), Biological Sciences)

**Course Objectives**

- The interaction between organisms and their environment is addressed using an issue-based approach in order to explain how the ecology of plants and animals has been shaped by evolution through interactions with their living and non-living environment.
- The course also demonstrates how we can understand and explain the significance of what we see in nature using scientific methods.
- A field course component provides the opportunity to investigate how the environment influences community composition, biodiversity, and adaptive radiation in a variety of habitats.

**Course Contents & Topics**

- The environment influences organisms profoundly. It affects their present-day ecology (determining where they live and how many can survive there) and, through natural selection acting over past generations, influences their form and adaptations. Present day human-induced changes to the environment are also responsible for endangering species and degrading their habitats.
- This introductory course introduces some basic scientific principles of ecology and evolution, showing how they are linked to the environment by physiological tolerances and evolutionary adaptation which, in turn, lead to specialization and generate biodiversity.
- Individuals and their interactions will be a major focus of the course together with discussion of population dynamics, community structuring, life histories, and niche dynamics.
- The principles of ecology and evolution resulting from interaction with the environment will also be demonstrated by describing the origins of modern humans, including our fossil record and relationship to other primates, and the main ecological transformations caused by humans and their environmental impacts.
- The course will conclude with an account of the importance of biodiversity, and the factors that threaten it globally.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 understand how scientific methods (hypotheses, experiments, comparisons) are used to investigate ecological and evolutionary processes
- CLO 2 understand the basic mechanism of natural selection, and how interactions with the environment lead to adaptation and generate biodiversity
- CLO 3 understand that ecology and behaviour can be interpreted in the light of selective pressures from the environment upon individual organisms
- CLO 4 understand the ecological factors influencing evolution, using the human evolutionary tree as an example
- CLO 5 understand the community ecology and biodiversity of selected Hong Kong habitats, and typical adaptations of organisms found there

**Pre-requisites (and Co-requisites and Impermissible combinations)**

- Pass in BIOL1110 or BIOL1309 or ENVS1301 or ENVS1401

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>A: Evidence of complete or near-complete understanding and a thorough grasp of the subject as demonstrated by attainment of all learning outcomes, and excellent use of named (organism) examples, including local species and habitats. Show excellent organizational, presentational and/or analytical skills and fieldwork techniques. Excellent or outstanding (for A+) work relative to what is required at degree level.</td>
</tr>
<tr>
<td></td>
<td>B: Evidence of substantial understanding and a good grasp of the subject as demonstrated by attainment of the majority of learning outcomes, and use of named (organism) examples, including local species and habitats. Show good organizational, presentational and/or analytical skills and fieldwork techniques. Work more than sufficient for what is required at degree level.</td>
</tr>
<tr>
<td></td>
<td>C: Evidence of general understanding with an adequate (but incomplete) grasp of the subject, as demonstrated by general but incomplete attainment of most of the learning outcomes, with limited use of named (organism) examples. Show fair organizational, analytical, presentational and/or analytical skills and fieldwork techniques. Work sufficient for what is required for degree level.</td>
</tr>
<tr>
<td></td>
<td>D: Evidence of retention of a minimum of relevant information and incomplete understanding of the subject (i.e. knowledge is very incomplete), as demonstrated by partial but limited attainment of learning outcomes. Insufficient familiarity with fieldwork techniques, habitats or organisms. Work merely (for D+) or barely (D) adequate for what is required at degree level.</td>
</tr>
<tr>
<td></td>
<td>Fail: Evidence of poor or inadequate knowledge and understanding of the subject such that the majority of learning outcomes cannot be attained. Little or no evidence of familiarity with fieldwork techniques, habitats or organisms. Work fails to reach degree level.</td>
</tr>
</tbody>
</table>

**Course Type**
Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>24 hours lectures, plus 10 hours of lectures during residential field course</td>
<td>34</td>
</tr>
<tr>
<td>Laboratory</td>
<td>at least 36 hours field and laboratory work, as groups and individuals</td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>during the semester in the form of internet tutorials, assigned reading and a laboratory workshop</td>
<td>80</td>
</tr>
</tbody>
</table>
BIOL2408
Green earth-plants and mankind (6 credits)

Offering Department
Biological Sciences

Course Co-ordinator
Prof. M L Chye, Biological Sciences (mlchye@hku.hk)

Academic Year
2019

Course Website
http://moodle.hku.hk

Course Objectives
This course is intended for students interested in the fundamentals of plant biology. The course will emphasize on the essential attributes of plants to humans. At the end of the course, students are expected to know the distinct features of plants and appreciate the importance of plants in our daily lives. Specific topics such as genetic engineering and the use of plants for food and medicine, will be addressed.

Course Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 Realize how plant structure enables functions
- CLO 2 Comprehend the essentials of plant growth and development
- CLO 3 Understand the abilities of plants to detect, process, and interpret information from their surrounding environment
- CLO 4 Recognize the interactions of plant with the living and non-living environment
- CLO 5 Appreciate the contribution of plants to humans

Required/recommended reading and online materials
- An up-to-date list of references to the primary scientific literature, background reading and/or internet resources relevant to each lecture will be provided on the course website.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL1110

Offer in 2019 - 2020
N Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F)

A
Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presenational skills.

B
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Demonstrate substantial grasp of the subject. Show evidence of analytical and critical abilities and logical thinking. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presenational skills.

D
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presenational skills.

Fail
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presenational skills are minimally effective or ineffective.

Assessment Methods and Weighting
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
<td>CLO 5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Assessment to CLO Mapping
| CLO 1             | Recognize the interactions of plant with the living and non-living environment |
| CLO 2             | Comprehend the essentials of plant growth and development                        |
| CLO 3             | Understand the abilities of plants to detect, process, and interpret information from their surrounding environment |
| CLO 4             | Appreciate the contribution of plants to humans                                 |
| CLO 5             | Realize how plant structure enables functions                                    |

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Course Grade (%)

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Grade Descriptors</th>
<th>40</th>
</tr>
</thead>
</table>

Assignment

Examination

Course Website
http://moodle.hku.hk

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.
Animal behaviour (6 credits)

Offering Department: Biological Sciences

Course Co-ordinator: Dr W B L Lim, Biological Sciences (bllim@hku.hk)

Teachers Involved: Dr W B Lim, School of Biological Sciences

Course Objectives: The purpose of this course is to introduce students with the diversity in animal behaviour and the means of understanding animal behaviour. The course will teach students the underlying mechanism and function of behaviour, and how did a particular behaviour develop and evolve.

Course Contents & Topics: Why do animal behaviours vary among individuals and species? How do environment and ecological interactions influence behaviours? What are the underlying genetic mechanism of a particular behaviour? In this course, students will learn to think within the ecological and evolutionary perspectives on animal behaviour. Topics include behavioral ecology; behavioral genetics; reproductive behaviour; mating system; parental care; communication; foraging; learning; migration and biological rhythms; evolutionary stable strategies; sexual selection; altruism; and sociality in vertebrates and invertebrates. We will discuss several classical studies that form the foundation of this field, as well as more recent research that have led to current understanding of animal behaviour. This course will

Course Learning Outcomes: On successful completion of this course, students should be able to:

1. Understand and demonstrate how discoveries and inventions are commercialized.
2. Understand and demonstrate how discoveries and inventions are commercialized.
3. Navigate the various steps in the development of a biotechnology derived product: from bench, to scale-up, to market.
4. Gain technical and business knowledge of the biotechnology and bioprocessing industries.
5. Participate and contribute to the business side of scientific enterprises.

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in 1110.

Grade Descriptors: A+ to F

Offer in 2019 - 2020: Y

Grade Descriptors: A+ to F

Offer in 2020 - 2021: Y

Examination: No Exam

Course Type: Lecture-based course

Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Presentation</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:

- Company annual reports
- Online materials

Course Website: http://moodle.hku.hk/
give students a unique perspective on the natural world and our own species.

Course Outcomes
On successful completion of this course, students should be able to:

CLO 1 learn and appreciate the mechanism, function, development, and evolution of animal behaviour
CLO 2 understand the complexity of interactions between natural and sexual selection and animal behaviour
CLO 3 appreciate current theories that form basis for modern understanding of animal behaviour
CLO 4 learn the scientific reasoning and methodology in the field of Animal Behaviour
CLO 5 think analytically, based upon ecological and evolutionary principles, to explain the behaviours observed in the natural world and our own species

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL2306

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y Examination Dec

Grade Descriptors (A+ to F)
A Evidence of a thorough grasp of the subject in a broader comparative perspective as demonstrated by background reading and excellent use of named examples and case studies. Evidence of independent critical thought with excellent use of a broad range of fundamental concepts to draw insightful and logical conclusions. Show eagerness to learn, great abilities of independent work, effective presentation skills with excellent analytical argumentation. Excellent or outstanding work relative to what is required at degree level.

B Evidence of a good grasp of the subject as demonstrated by some background reading and appropriate use of named examples and some case studies. Evidence of good critical thought, although not necessarily original. Good and very good (but not outstanding) abilities of independent work, effective presentation skills with good analytical and logical argumentation. Good general command of acquired knowledge to draw meaningful and logical conclusions. Work more than sufficient for what is required at degree level.

C Demonstrate an adequate, but not coherent and incomplete grasp of the subject, with limited background reading and limited use of named examples and case studies. Some abilities of logical critical thinking, but not insightful and/or independent; only partial abilities to use acquired knowledge and work independently to draw meaningful conclusions. Fair presentation skills, with mostly correct argumentation, but limited (or no) abilities to integrate broader concepts. Work sufficient for what is required for degree level.

D Demonstrate some grasp of the subject, but partial and limited to the most basic concepts, examples, and limited (or none) case studies. Insufficient evidence of background reading, limited abilities of critical independent thinking, and not particularly effective presentation skills with generally weak logical argumentation and restricted ability of drawing appropriate conclusions. Work barely meets what is required at degree level.

Fail No evidence of basic minimum knowledge and understanding of the subject. No evidence of background reading and no familiarity with any relevant examples and case studies. Inadequate evidence of coherent logical thought; ineffective presentation skills with poor argumentation and no abilities to draw meaningful conclusions. Work fails to reach degree level.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 24
Laboratory Lab work, field trips, or debates/presentations 24
Tutorials 6
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 50 CLO 1,2,3,4,5
Examination 50 CLO 1,2,3,4,5

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk

Additional Course Information
This course will be offered to a minimum enrolment number and availability of teachers.

BIOL3105 Animal physiology and environmental adaptation (6 credits) Academic Year 2019
Offering Department Biological Sciences
Course Co-ordinator Prof A O L Wong, Biological Sciences (olworm@hku.hk)
Teachers Involved (Dr W Y Lui,Biological Sciences)
(Prof A O L Wong,Biological Sciences)
(Prof A S T Wong,Biological Sciences)

Course Objectives
The course covers the major aspects of animal physiology for environmental adaptation in terrestrial & aquatic habitats. Stress will be given to the functional interactions between animals and the environment, especially on the mechanisms by which animals obtain resources for survival from the environment, detect environmental changes via sensory structures, and respond to adversities in the environment by altering their body forms & functions.

Course Contents & Topics
Basic concepts of animal adaptation to environmental changes/extreme environment; Modification of energy metabolism according to oxygen availability; Different models of gaseous exchange for aquatic, inter-tidal, and terrestrial habitats; Cross-adaptation to different environment: air-breathing fish vs diving adaptations in mammals; Visual signals & differential levels of photoreception from protozoa to mammals; Background adaptation: functions & mechanisms for color presentation; Sound wave as environmental signals: functions & mechanisms of detection in aquatic & terrestrial habitats; Echo sounding in bats for navigation without visual signals; Behavioral, morphological & physiological adaptations in hostile environment: extreme hot vs freezing cold; salinity changes in aquatic habitats & water availability in terrestrial habitats on osmoregulation, water balance & nitrogenous metabolism.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 have a broad understanding on functional interactions between animals and their environment
CLO 2 appreciate the role of the environment in shaping the evolution of animal structures & functions
CLO 3 comprehend a wide range of physiological adaptations (both structurally & functionally) in coping with environmental stress and environmental changes

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL2103 or BIOL2220 or BIOL2600 or MEDE2301

Offer in 2019 - 2020 N Offer in 2020 - 2021 : Y Examination ---

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply
knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills. Writings consistently demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.

C
Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational skills. Writings mostly demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.

D
Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills. Writings indicate some intellectual engagement with concepts or theories but mostly at a superficial level.

Fail
Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems.

Organizational skills are minimally effective or ineffective. Writings reveal an absence of intellectual engagement with concepts or theories. Writings are irrelevant or superficial.

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>30</td>
<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>&amp; continual assessment</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website
http://moodle.hku.hk/

Additional Course Information
Refer to the Website of School of Biological Sciences.

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3107 Plant physiology (6 credits)

Offering Department Biological Sciences

Quota 30

Course Co-ordinator TBC, Biological Sciences

Course Objectives
To give an understanding of plant processes such as plant growth and development and their regulatory mechanisms.

Course Contents & Topics
Discovery, assay, chemical nature, mechanism, structure-activity relationships, physiological effects, and signal transduction of plant hormones. Hormonal transport. Selected topics on plant growth and development including photo-morphogenesis, seed germination, dormancy, apical dominance, fruit ripening, leaf abscission, and plant defense.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand the study of plant biology using mutants in model plant Arabidopsis
CLO 2 understand biotechnological opportunities by manipulating plant gene expression
CLO 3 understand the regulation of plant growth and development by various plant hormones

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL2103

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
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<td>24</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
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Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>75</td>
<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>25</td>
<td>CLO 3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website
http://moodle.hku.hk/

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.
BIOL3108  Microbial physiology (6 credits)  Academic Year: 2019

Offering Department: Biological Sciences  Quota: 50
Course Co-ordinator: Dr A Yan, Biological Sciences (ayan8@hku.hk)

Teachers Involved: (Dr A Yan,Biological Sciences)

Course Objectives:
Microbes are amazing and important entities on earth. Knowledge of microbes is widely applied in food, pharmacueticals, biotechnologies, diseases control, and biogeochemical processes. Microbial Physiology provides molecular basis for understanding of these important processes and applications, and to serve as essential foundations for sub-disciplines of Microbiology, such as environmental, industrial, and medicinal Microbiology. Upon completion, students will acquire fundamental knowledge and methodologies for microbial studies and be able to relate knowledge to various microbial applications.

Course Contents & Topics:
Serving as a fundamental course for the understanding of the world of microorganisms, Microbial Physiology is organized and presented in three themes: 'Microbial Rules', 'Microbial Breath', and 'Microbial Adaption'. Under these three themes, a broad range of highly educational and interesting topics are presented including: 'Microorganisms and their position in the living world', 'Fundamental methodologies for the study of microbes', 'Microbial structures and functions', 'Microbial growth and control', 'Energy Generations', 'Central metabolism', and 'Regulation and control of metabolic Activities'. Topics are taught in a coherent manner with a highly interactive tutorial session following each of the topics such that students will achieve a high quality, stimulating, and problem-learning experiences.

Course Learning Outcomes:
On successful completion of this course, students should be able to:
CLO 1 appreciate the diversity of microbial metabolisms and the strategies for their adaptive responses
CLO 2 comprehend the principles underlying the dynamic nature of microbial physiology
CLO 3 relate knowledge to practical application of microbes in industry and medicine
CLO 4 develop abilities to read and assess scientific literature in microbiology area

Pre-requisites (and Co-requisites and Impermissible combinations):
Pass in BIOC2600 or BIOL2103 or BIOL3604

Offer in 2019 - 2020: N  Offer in 2020 - 2021: N

Grade Descriptors (A to F):
A Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills.
B Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational skills.
C Demonstrate general but limited command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills.
D Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills.
Fail Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organizational skills are minimally effective or ineffective.

Course Type: Lecture-based course

Course Teaching & Learning Activities:
Activities  Details  No. of Hours
Lectures  36
Tutorials  12
Project work  2
Reading / Self study  100

Assessment Methods and Weighting:
Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
Assignments  20  CLO 1,2,3,4
Test  50  CLO 1,2,3
mid-term  30  CLO 1,2,3

Required/recommended reading and online materials:
Primary Text Book:
Supplementary Reading:
On-line textbook of Bacteriology: Kenneth Tobar, U. of Wisconsin-Madison, Department of Bacteriology. URL (http://www.textbookofbacteriology.net/)

Course Website: http://moodle.hku.hk/

Additional Course Information:
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3109  Environmental microbiology (6 credits)  Academic Year: 2019

Offering Department: Biological Sciences  Quota: 40
Course Co-ordinator: Dr J D Gu, Biological Sciences (jdgui@hku.hk)

Course Objectives:
To familiarize students with the role of various microorganisms in natural process which affect our environment, such as cycling of chemical elements, interactions with plants and animals, and the way in which they carry out biodegradation of environmentally important pollutants. Selective groups of microorganisms will be examined in detail for their biochemical processes. Key concepts are illustrated with known examples and cases

Course Contents & Topics:
1. Advanced aspects of microbial diversity, ecology and growth
2. Contribution of microbial metabolism to biogeochemical processes important in cycling of nutrients
3. Microbial interactions with plants and animals
4. Microbial metabolism of organic compounds, metals and man-made polymers
5. Training in laboratory and field microbiological research technique

Course Learning Outcomes:
On successful completion of this course, students should be able to:
CLO 1 understand a range of microorganisms in the environment in terms of their roles and function as well as biochemical capability and host range
<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td><strong>Activities</strong></td>
</tr>
<tr>
<td>Activities</td>
<td>Lectures</td>
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<tr>
<td></td>
<td>Laboratory</td>
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<td>Field work</td>
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<td>Project work</td>
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<td></td>
<td>Tutorials</td>
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<td></td>
<td>Reading / Self study</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td><strong>Methods</strong></td>
</tr>
<tr>
<td>Assignments</td>
<td>10</td>
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<tr>
<td>Examination</td>
<td>50</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>25</td>
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<td>Presentation including report</td>
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<td>Test</td>
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<td>Course Website</td>
<td><a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
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<td>Additional Course Information</td>
<td>This course will be offered subject to a minimum enrolment number and availability of teachers.</td>
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**BIOL3110**

**Environmental toxicology** (6 credits) **Academic Year** 2019 **Quota** 60

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr J D Gu, Biological Sciences (jdgui@hku.hk)

**Teachers Involved** (Dr J D Gu,Biological Sciences)

**Course Objectives** To introduce students to the basic principles of environmental and ecological toxicology by analysis of the fate of pollutants in lithosphere, hydrosphere, atmosphere and biosphere. Mechanisms of toxicity as dose-response will be analyzed through adsorption, metabolism, toxicity and elimination. Major metabolic processes and enzymes involved will be highlighted. Specific cases of toxicity will be presented and discussed.

**Course Contents & Topics**

1. Environmental chemistry of pollutants and their toxicity and factors governing toxic effects, bioaccumulation and biomagnification
2. Partitioning and transformation of environmental pollutants
3. Quantitative toxicology using dose-response approaches
4. Emerging endocrine-disrupting chemicals and carcinogens at molecular levels
5. Elimination of pollutants from the environments
6. Laboratory testing of toxicity and review various adsorption isotherm models

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 understand fate and distribution of chemicals in various compartments of the ecosystem
- CLO 2 understand toxicity through adsorption, metabolism, elimination and target site and quantitative analysis
- CLO 3 understand mechanism of toxicity from specific pollutants of choice
- CLO 4 understand specific biochemical processes and enzymes involved in pollutants transformation and mitigation
- CLO 5 understand appropriate techniques in environmental cleaning up

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL2103 or CHEM3141 or ENVIS3042

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Examination</th>
<th>May</th>
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<tbody>
<tr>
<td>A</td>
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</table>

Thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes.
Food chemistry (6 credits)

Offering Department  Biological Sciences
Course Co-ordinator  Dr J C Y Lee, Biological Sciences (jittylee@hku.hk)
Teachers Involved  (Dr J C Y Lee, School of Biological Sciences) (TBC, School of Biological Sciences)
Course Objectives  To provide a basic understanding of chemistry in food systems, and to provide practical training in chemistry related to food science and nutrition.

Course Content & Topics  The course will cover the components of food, including water, proteins, carbohydrates and lipids, and minor components such as enzymes, vitamins, minerals, colorants, flavorants and additives. The physical and chemical properties of these important constituents of foods are covered in detail, and form the basis for understanding the reactions which occur during the production, processing, storage and handling of foods, and in understanding the methods used in analyzing foods.

Course Learning Outcomes  On successful completion of this course, students should be able to:

- CLO 1 understand the functions and properties of major and minor food components
- CLO 2 understand the basic chemistry behind food processing
- CLO 3 have integrated their knowledge of biological and chemical principles into a food science and nutrition context

Pre-requisites (and Co-requisites and Impermissible combinations)  Passes in BIOL2600 or BIOL2103 or BIOL2220 or MEDE2301; and NOT for students who have passed in BIOL2101. This course is only offered for students admitted in 2016-2017 or before.

Examination Grade  

<table>
<thead>
<tr>
<th>Grade</th>
<th>Descriptors</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough grasp of the subject matter covered. Show extensive knowledge and understanding of the topics covered and can readily apply this knowledge. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions.</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial grasp of the subject matter covered. Show thorough knowledge and understanding of the content and a high level of competence in the topics covered and able to apply this knowledge and skills to most situations. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions.</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete grasp of the subject matter covered. The student has a sound knowledge and understanding of the main areas of content and has achieved an adequate level of competence in the topics covered. Use lab skills and techniques and analysis of data and results to draw moderately appropriate conclusions.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited grasp, with retention of some relevant information of the subject matter covered. Show a basic knowledge and understanding of the content and has achieved a limited level of competence in the topics covered. Use lab skills and techniques and analysis of data and results to draw limited conclusions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show elementary knowledge and understanding in few areas of the content and has achieved very limited competence in some of the topics covered. Use lab skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions.</td>
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</tbody>
</table>

Course Type  Lecture with laboratory component course
Course Teaching & Learning Activities  

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
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<tr>
<td>Lectures</td>
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<tr>
<td>Laboratory</td>
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<tr>
<td>Tutorials</td>
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Additional Course Information  This course will be offered subject to a minimum enrollment number and availability of teachers.
### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td></td>
<td>30</td>
<td>CLO 1,2,3</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>Test</td>
<td></td>
<td></td>
<td>20</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

- Fennema OR, Food Chemistry (Marcel Dekker 4th Ed, 2008)
- Belitz HD, Grosch W, Schieberle, P, Food Chemistry (Springer 4th Ed, 2009)

### Course Website

http://moodle.hku.hk/

### Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers

### BIOL3202

#### Nutritional biochemistry (6 credits)

**Offering Department**: Biological Sciences  
**Academic Year**: 2019

**Course Co-ordinator**: Dr H S El-Nezami, Biological Sciences (elnezami@hku.hk)

**Teachers Involved**: Dr C B Chan, Biological Sciences

**Course Objectives**: To introduce the fundamental concepts of nutrition through an integrated approach in discussing the interactions between diet and intermediary metabolism.

**Course Contents & Topics**: Essential nutrients and their requirement; Metabolic control of macronutrient utilization; Metabolism of micronutrients; Nutritional impacts of hexoses, long chain polyunsaturated fatty acid, cholesterol, amino acids, vitamins and minerals.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- CLO 1: explain how different organs coordinate to achieve metabolic control of glucose
- CLO 2: understand the metabolic pathways of cholesterol and polyunsaturated fatty acids
- CLO 3: understand the theoretical constructs of nitrogen requirement and the importance of the urea cycle
- CLO 4: understand the biochemical roles of micronutrient in human health
- CLO 5: explain the biochemical outcomes of nutrient deficiency/excess

**Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in BIOC2600 or BIOL2220 or MED2301

**Offer in 2019 - 2020**: Y  
**Grade Descriptors** (A+ to F):  
- A: Demonstrate thorough grasp of the subject matter covered. Show exceptional ability on knowledge integration, problem identification and solving. Show outstanding ability to critically analyze and interpret scientific data and draw appropriate conclusions. Demonstrate highly effective organization / writing skills.
- B: Demonstrate substantial grasp of the subject matter covered. Show full ability on knowledge integration, problem identification and solving. Show reasonable ability to critically analyze and interpret scientific data and draw appropriate conclusions. Demonstrate effective organization / writing skills.
- C: Demonstrate general but incomplete grasp of the subject matter covered. Might show misunderstanding of the materials. Show some ability on knowledge integration, problem identification and solving. Show some ability to analyze and interpret scientific data and draw proper conclusions. Demonstrate adequate organization / writing skills.
- D: Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Misunderstanding of the materials is not uncommon. Show limited ability on knowledge integration, problem identification and solving. Use elementary approaches to analyze and interpret scientific data and draw sometimes erroneous conclusions. Demonstrate basic organization / writing skills.
- Fail: Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in problem solving. Fail to integrate information and identify problems. Seriously deficient in ability to analyze and interpret scientific data and draw conclusions. Demonstrate poor organization / writing skills.

**Course Type**: Lecture-based course

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
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<td>100</td>
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**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
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</tbody>
</table>

**Required/recommended reading and online materials**:  

**Course Website**: http://moodle.hku.hk/

**Additional Course Information**: This course will be offered subject to a minimum enrollment number and availability of teachers

### BIOL3203

#### Food microbiology (6 credits)

**Offering Department**: Biological Sciences  
**Academic Year**: 2019

**Course Co-ordinator**: Dr H S El-Nezami, Biological Sciences (elnezami@hku.hk)

**Teachers Involved**: Dr H S El-Nezami, Biological Sciences

**Course Objectives**: This course provides the key concepts and principles of food microbiology with special emphasis on the interaction between microorganisms and food, microbial food spoilage and foodborne diseases will be discussed in detail.

**Course Contents & Topics**: Detection and enumeration of microbes in foods, Factors that influence microbes in foods, Spores and their significance, Physical methods of food preservation, Chemical preservation and natural antimicrobials, Foodborne pathogens

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- CLO 1: describe methods for evaluating microorganisms and their products in foods

**Course Website**: http://moodle.hku.hk/
CLO 2 demonstrate an understanding of the causes of food spoilage, and predict response of a microorganism that can spoil a given food.

CLO 3 develop and implement appropriate measures to control the spoilage and pathogenic microorganisms in a food.

CLO 4 demonstrate the ability to work in a team to investigate and solve problems in food microbiology.

Pre-requisites
Pass in BIOL2600 or BIOL2220 or MEDE2301

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021: Y

Course Website
http://moodle.hku.hk/

Course Objectives
Nutritional needs vary throughout different stages of the life cycle. This course aims to cover the functional roles of development, and a socio-economic factors that influence nutrient requirements at different stages of the human life cycle. Socio-economic factors that influence dietary habit and nutritional status will also be covered.

Course Contents & Topics
Teaching and learning will take place through an evidence-based approach and will be organized around key issues: needs of macro- and micronutrients, as well as the physiological and psychological determinants that influence nutrient requirements at different stages of the human life cycle.

Course Learning Outcomes
On successful completion of this course, students should be able to:

1. Demonstrate thorough grasp of the subject matter covered. Show exceptional ability on knowledge integration, problem identification and solving. Demonstrate highly effective team-based organization and presentation skills.

2. Demonstrate substantial grasp of the subject matter covered. Show full ability on knowledge integration, problem identification and solving. Show reasonable ability to analyze and interpret scientific data and draw appropriate conclusions. Demonstrate effective team-based organization and presentation skills.

3. Demonstrate general but incomplete grasp of the subject matter covered. Might show misunderstanding of the materials. Show some ability on knowledge integration, problem identification and solving. Use elementary approaches to analyze and interpret scientific data and draw sometimes erroneous conclusions. Demonstrate moderately effective team-based organization and presentation skills.

4. Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw occasionally appropriate but often erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organization and presentation skills.

5. Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organization and presentation skills.

6. Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate moderate effective team-based organization and presentation skills.

7. Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw incorrectly, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffective team-based organization and presentation skills.

Assessment Methods & Weighting

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>seminars &amp; continuous assessment</td>
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<td>Laboratory reports</td>
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<td>Laboratory &amp; research reports</td>
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<td>CLO 1.3</td>
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</table>

Course Type
Lecture with laboratory component course

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3204 Nutrition and the life cycle (6 credits)

Offering Department
Biological Sciences

Academic Year
2019

Course Co-ordinator
Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)

Quota
70

Teachers Involved
(Dr J C Y Lee, Biological Sciences)

Course Objectives
Nutritional needs vary at different stages of the life cycle. This course aims to cover the functional roles of essential macro- and micro-nutrients and highlight the nutritional concerns during specific times of growth, development, and aging.

Course Contents & Topics
Teaching and learning will take place through an evidence-based approach and will be organized around key issues: needs of macro- and micronutrients, as well as the physiological and psychological determinants that influence nutrient requirements at different stages of the human life cycle.

Course Learning Outcomes
On successful completion of this course, students should be able to:

1. Demonstrate thorough grasp of the subject matter covered. Show exceptional ability on knowledge integration, problem identification and solving. Demonstrate highly effective team-based organization and presentation skills.

2. Demonstrate substantial grasp of the subject matter covered. Show full ability on knowledge integration, problem identification and solving. Show reasonable ability on knowledge integration, problem identification and solving. Use elementary approaches to analyze and interpret scientific data and draw sometimes erroneous conclusions. Demonstrate moderate effective team-based organization and presentation skills.

3. Demonstrate general but incomplete grasp of the subject matter covered. Might show misunderstanding of the materials. Show some ability on knowledge integration, problem identification and solving. Use elementary approaches to analyze and interpret scientific data and draw sometimes erroneous conclusions. Demonstrate moderately effective team-based organization and presentation skills.

4. Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Demonstrate moderate effective team-based organization and presentation skills.

5. Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organization and presentation skills.

6. Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw occasionally appropriate but often erroneous conclusions to real-world problems. Demonstrate moderate effective team-based organization and presentation skills.

7. Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw incorrectly, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffective team-based organization and presentation skills.

Assessment Methods

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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<tbody>
<tr>
<td>Examinations</td>
<td>Laboratory reports</td>
<td>40</td>
<td>CLO 2,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>Laboratory &amp; research reports</td>
<td>20</td>
<td>CLO 1.2</td>
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Laboratory reports Laboratory & research reports 20 CLO 2,4

Examination 40 CLO 1,2

Laboratory reports Laboratory & research reports 20 CLO 1,3

Examination 40 CLO 1,2

Laboratory reports Laboratory & research reports 20 CLO 1,3

Examination 40 CLO 1,2

Course Website
http://moodle.hku.hk/
School of Biological Sciences

<table>
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<tr>
<th>Course Type</th>
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<tr>
<td>Course Teaching &amp; Learning Activities</td>
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<td>Lectures</td>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
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<tr>
<td></td>
<td>Assignments</td>
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<td></td>
<td>Examination</td>
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<td>Test</td>
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</table>

Required/recommended reading and online materials
- http://moodle.hku.hk/

Course Website

BIOL3205 Human physiology (6 credits)  
Academic Year: 2019  
Offering Department: Biological Sciences  
Quota: 135  
Course Co-ordinator: Dr W Y Lui, Biological Sciences (wylui@hku.hk)  
Teachers Involved:  
- Dr C B Chan, Biological Sciences  
- Dr Philip C N Chu, Obstetrics & Gynaecology  
- Dr W Y Lui, Biological Sciences  

Course Objectives
The course covers major aspects of the physiology of the human body using an integrated approach. After completing this course, students will have acquired fundamental principles of how the body works. Students interested in nutrition and human biology will find this course most useful.

Course Contents & Topics
Overview of the physiological systems and homeostasis; Neural and hormonal communication; Nervous system physiology; The digestive system; Cardiac physiology, the blood vessels and blood pressure; The respiratory system; The urinary system; The skeletal & muscular system; Sensory mechanisms; Biological rhythms; Central-peripheral communication in energy homeostasis.

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 comprehend the essence of how the body meets changing conditions while maintaining a relatively constant internal environment
- CLO 2 understand the functions of various body systems
- CLO 3 explain normal body functions through integration of basic physiologic concepts

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC2600 or BIOL2103 or BIOL2220 or MEDE2301

Offer in 2019 - 2020
- Y 1st sem  Offer in 2020 - 2021: Y  
- Examination  Dec

Grade Descriptors (A to F)
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills.
- B: Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational skills.
- C: Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective organizational skills.
- D: Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills.
- Fail: Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organizational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities | Activities | Details | No. of Hours |
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Lectures</td>
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<td>Tutorials</td>
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<td></td>
<td>Reading / Self study</td>
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<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
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<tr>
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<td>Examination</td>
<td>70</td>
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<tr>
<td></td>
<td>Test</td>
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Required/recommended reading and online materials
- Mulrowney S.E. & Myers A.K. Neter’s Essential Physiology (Saunders, 2009)
- http://moodle.hku.hk/

Course Website

BIOL3206 Clinical nutrition (6 credits)  
Academic Year: 2019  
Offering Department: Biological Sciences  
Quota: 70  
Course Co-ordinator: Dr J M F Wan, Biological Sciences (jmfwan@hku.hk)
### Course Objectives
This course aims to provide understanding and insight into diseases associated with diet and basic dietetics, specifically to:

1. Explain the relationships between diet and disease.
2. Describe the role of diet in the development and prevention of common chronic diseases such as diabetes, obesity and anorexia, cardiovascular disease, cancer, immune deficiency and renal failure.
3. Differentiate risk factors that influence dietary choice.
4. Describe the rationales for postoperative nutritional support for hospitalized patients.

### Course Contents & Topics
The basics of nutrition for health and fitness and medical nutrition therapy. The role of diet in the development and prevention of chronic diseases such as cancer, diabetes, obesity and anorexia as well as bulimia nervosa, cardiovascular diseases, renal failure, etc. Malnutrition. Nutrition and immune function. Medical nutrition therapy for food allergy and food intolerance. Nutrition in pregnancy and lactation.

### Course Learning Outcomes

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
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<tbody>
<tr>
<td>A</td>
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<td>B</td>
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<td>C</td>
<td>Offers in BIOL3202 or BIOL3203 or BIOL3204 or BIOL3205</td>
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<tr>
<td>D</td>
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<th>Examination</th>
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<tbody>
<tr>
<td>Offer in 2020 - 2021</td>
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### Pre-requisites and Co-requisites
No specific pre-requisites are required for this course.

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
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### Assessment Methods and Weighting

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<th>Details</th>
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<th>Assessment Methods to CLO Mapping</th>
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<td>20</td>
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<tr>
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<tr>
<td>Presentation</td>
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<td>20</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

### Required/recommended readings and online materials
Selected readings will also be available on the class website.

S. Rodwell Williams: Nutrition and Diet Therapy (7th ed.).
Sutor & Hunter: Nutrition: Principles and Application in Health Promotion Wardlaw Gordon: Perspectives in Nutrition (2nd ed.).

### Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3207
Principles of toxicology (6 credits)

<table>
<thead>
<tr>
<th>Department</th>
<th>Offered by</th>
<th>Academic Year</th>
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<tbody>
<tr>
<td>Biological Sciences</td>
<td>Dr H S El-Nezami</td>
<td>2019</td>
</tr>
</tbody>
</table>

### Course Co-ordinator
Dr H S El-Nezami, Biological Sciences (elnezami@hku.hk)

### Teachers Involved
Dr H S El-Nezami, Biological Sciences

### Course Objectives
To introduce students to methods used in assessing the toxicity of food contaminants, and to develop their confidence in the handling and interpretation of toxicological data. Students will also be introduced to the basic concepts behind toxicological evaluation, and the criteria for setting guidance values for dietary and non-dietary exposure to chemicals. Students will understand the role of biochemical, metabolic and toxicokinetic studies in toxicological evaluation. This course aims to equip students with basic skills in conducting food toxicological studies.

### Course Contents & Topics
Topics include a discussion on exposure and entry routes, fates of toxic substances in the body (toxicokinetics), concepts in experimental toxicology, the dose response relationship, actions of toxic substances, target organ effects, the actions and types of carcinogens. A survey of the health effects of common classes of toxic substances is also presented.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 demonstrate an understanding of the processes involved in absorption, distribution, metabolism and excretion of toxicants, including an understanding of the toxicokinetic behavior of toxicants in mammals.
## Course Learnin

**Course Objectives**

To provide exposure to some key management concepts used to produce safe high-quality food products that will succeed in the marketplace. To introduce students to analysis and problem-solving of realistic business situations in food safety management.

### Course Contents & Topics

- The regulatory, social and business imperative for food safety.
- Basic concepts in TQM
- Statistical Process Control
- Quality Function Deployment
- Quality management standards (ISO 9000)
- Development and implementation of a Hazard Analysis Critical Control Point (HACCP) plan (within an ISO 22000 food safety management system/ supply chain approach)
- Role of environmental management systems (ISO 14000) in the food industry
- Intellectual Property issues in the food industry
- Religious, ethical, and cultural food choices
- Illustrative business case studies on food safety management will be discussed

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand the historical development of government regulation of food safety
- CLO 2 be familiar with a set of management techniques applicable in the food industry
- CLO 3 be able to analyze food production problems and make recommendations for action to improve quality and safety

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2600 or BIOL2220 or BIOL3205 or MEDE2301

<table>
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<th>Y</th>
<th>2nd sem</th>
<th>Offer in 2020 - 2021 : Y</th>
<th>Examination</th>
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<tr>
<td>Grade Descriptors (A+ to F)</td>
<td>A</td>
<td>Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.</td>
<td></td>
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<tr>
<td></td>
<td>C</td>
<td>Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentational skills.</td>
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<tr>
<td></td>
<td>D</td>
<td>Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate team-based organizational and presentational skills of limited effectiveness.</td>
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<tr>
<td></td>
<td>F</td>
<td>Fail</td>
<td>Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.</td>
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### Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

### Required/recommended reading and online materials

S. S. Deshpande: Handbook of Food Toxicology (Marcel Dekker Inc., NY, 2002)

### Course Website

http://moodle.hku.hk/

### Additional Course Information

To provide exposure to some key management concepts used to produce safe high-quality food products that will succeed in the marketplace. To introduce students to analysis and problem-solving of realistic business situations in food safety management.

- The regulatory, social and business imperative for food safety.
- Basic concepts in TQM
- Statistical Process Control
- Quality Function Deployment
- Quality management standards (ISO 9000)
- Development and implementation of a Hazard Analysis Critical Control Point (HACCP) plan (within an ISO 22000 food safety management system/ supply chain approach)
- Role of environmental management systems (ISO 14000) in the food industry
- Intellectual Property issues in the food industry
- Religious, ethical, and cultural food choices
- Illustrative business case studies on food safety management will be discussed

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand the historical development of government regulation of food safety
- CLO 2 be familiar with a set of management techniques applicable in the food industry
- CLO 3 be able to analyze food production problems and make recommendations for action to improve quality and safety

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2601 or BIOL3203

<table>
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<tr>
<th>Offer in 2019 - 2020</th>
<th>N</th>
<th>Offer in 2020 - 2021 : N</th>
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<tr>
<td>Grade Descriptors (A+ to F)</td>
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<td>Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use quality management skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.</td>
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### Course Website

http://moodle.hku.hk/

### Additional Course Information

S. S. Deshpande: Handbook of Food Toxicology (Marcel Dekker Inc., NY, 2002)

### Required/recommended reading and online materials

S. S. Deshpande: Handbook of Food Toxicology (Marcel Dekker Inc., NY, 2002)
Course Type: Lecture-based course

Activities | Details | No. of Hours
--- | --- | ---
Lectures | | 36
Tutorials | including presentation | 12
Group work | | 30
Reading / Self study | | 100

Assessment Methods and Weighting

Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Assignments | 10 | | CLO 2
Examination | 60 | | CLO 1,2,3
Project reports including presentation | 30 | | CLO 2,3

Required/recommended reading and online materials


Course Website: http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3209 Food and nutrient analysis (6 credits) Academic Year 2019

Offering Department: Biological Sciences
Quota: 80

Course Co-ordinator: Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)
Teachers Involved: (Dr J C Y Lee,Biological Sciences) (Dr M F Wang,Biological Sciences)

Course Objectives
To introduce basic principles and provide practical training in food and nutrient analysis. To help students to understand the principles behind analytical instruments used in food analysis. To train students to analyze major and minor food components as well as some food adulterants.

Course Contents & Topics
The key concepts in professional food analysis in an industry context will be introduced. Basic analytical techniques for macronutrients (e.g. protein, carbohydrate and fats), micronutrients (vitamins and minerals) and adulterants in food will be covered. A variety of classical and instrumental techniques used in food analysis will be discussed: rheology and texture measurement, thermal analysis, color, spectroscopy, chromatography and electrophoresis.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 2 be familiar with a variety of classical and instrumental analytical techniques
- CLO 3 understand the principles behind analytical instruments associated with food
- CLO 4 be able apply their knowledge and laboratory skills in novel situations to measure and analyze the macronutrient and micronutrient of food products
- CLO 5 be able to select and justify an appropriate analytical technique to solve practical food analysis problems

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL2101 or BIOL3201

Offer in 2019 - 2020 Grade Descriptors (A+ to F)

| Grade | Details | Examination |
--- | --- | ---
A | Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills. | Dec |
B | Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills. | |
C | Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentational skills. | |
D | Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results incoherently leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills. | |
Fail | Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. ‘Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results incoherently leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills. | |
BIOL3210 Grain production and utilization (6 credits) Academic Year 2019
Offering Department Biological Sciences
Course Co-ordinator Prof H Corke, Biological Sciences (harold@hku.hk)

Course Objectives
To provide a broad understanding of the utilization and significance of the major grains in the food industry and in human health and nutrition.

Course Contents & Topics
- Global grain production and consumption
- The Green Revolution and its aftermath
- International grain trade
- Wheat: flour milling, dough rheology, the baking process, baking quality
- Wheat: quality of Asian products including steamed bread and noodles
- Wheat: small-scale tests for quality
- Rice: nutritional quality, consumer preferences, milling, quality, quality testing, products
- Maize: products of wet milling, animal feed development
- Biofuels focusing on bioethanol
- Illustrative business case studies on the grain processing industry will be discussed

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand the major technology, import, and export patterns that support the global utilization of grain
CLO 2 understand the technology behind the production of grain-based foods
CLO 3 understand the scope and nature of professional level quality testing for grain products
CLO 4 appreciate the constraints to global food sufficiency
CLO 5 appreciate the ethical issues behind the diversion of grain into meat and biofuel production

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in any level 2 BIOL course

Offer in 2019 - 2020 N Offer in 2020 - 2021 : N Examination ---

Grade Descriptors (A+ to F)
A Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.
B Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.
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Fail Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Course Type Lecture-based course
Course Teaching & Learning Activities Details No. of Hours
Activities
Lectures
36
Tutorials
12
Reading / Self study
100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examinations
70 CLO 1.2.3.4.5
Project reports including presentation
30 CLO 2.3

Required/recommended reading and online materials
Other readings to be provided

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3211 Nutrigenomics (6 credits) Academic Year 2019
Offering Department Biological Sciences
Course Co-ordinator Dr K C Tan-Un, Biological Sciences (kctanun@hku.hk)
Teachers Involved (Dr K C Tan-Un, Biological Sciences)

Course Objectives
Recent advances in the understanding of the human genome have resulted in the emergence of a new science called Nutrigenomics. This course aims to provide students with an understanding of the biochemical mechanisms underlying the science of nutrition and the relation between genes and diet-related diseases. It explains the role of nutrition at the molecular level and the concepts of nutrigenomics and nutrigenetics.
### Course Contents & Topics

- Concepts of nutrigenomics, nutrigenetics, metabolomics and nutritional biochemistry.
- Regulation of gene expression: Single Nucleotide Polymorphisms and relation to diseases.
- Overview of lipid metabolism; cholesterol metabolic pathway; hyperlipidaemia, LDL receptor mutations.
- Relevance of folate, vitamin B12; hyperhomocysteinemia and gene polymorphisms in diseases.
- Epigenetics, Barker’s hypothesis, influence of maternal nutrition in fetal gene expression. Obesity, genetic predisposition, candidate genes like leptin, FTO and other hormones involved in the control of appetite. Polyunsaturated fatty acid and their roles in the control of gene expression example lipogenesis and lipid oxidation pathways; Inborn errors of metabolism in the context of genetic mutations and personalized diet therapy.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 explain the principles of the control of gene expression.
- CLO 2 demonstrate understanding of the role of metabolic pathways in relationship to diet, gene expression and disease.
- CLO 3 discuss how genetic variations are used to study the role of genes in nutrient-related cellular processes.
- CLO 4 explain the relationship between genotype, epigenetics and diet-related diseases.
- CLO 5 critically evaluate current theories of personalized nutrition based on individual genetic variation.

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2600 or BIOL2220 or MEDE2301.

### Offer in 2019 - 2020

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<td>C</td>
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<tr>
<td>D</td>
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</table>

### Assessment Methods and Weighting

- **Methods**
  - Assignments
  - Examination
  - Test
- **Details**
  - 20
  - 60
  - 20
- **Weighting in final course grade (%)**
  - CLO 1
  - CLO 2
  - CLO 3
  - CLO 4
  - CLO 5
- **Assessment Methods to CLO Mapping**
  - CLO 1
  - CLO 2
  - CLO 3
  - CLO 4
  - CLO 5

### Required/recommended reading and online materials

- Lehninger Principles of Biochemistry
- Ordovas: Nutrigenetics and Nutrigenomics. Wiley, 2004
- Rimbach, Fuchs, Packer: Nutrigenomics, CRC Press. 2005
- Journals in Nutrition, Molecular Biology and Genetics

### Course Website

http://moodle.hku.hk/

### Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3215

- **Principles of dietary assessment (6 credits)**
- **Offering Department**: Biological Sciences
- **Course Co-ordinator**: Dr J C Y Louie, Biological Sciences (jimmyl@hku.hk)
- **Teachers Involved**: (Dr J C Y Louie, Biological Sciences)
- **Course Objectives**
  - This course examines the various methods used to measure dietary intake in populations and healthy individuals, how to assess these measurements against international standards, and how to make recommendations for improvement.
- **Course Contents & Topics**
  - Topics covered will include the validity and reliability of different methods, estimations of energy requirements, the use of food composition databases, nutrition screening tools and the planning and use of national surveys for monitoring and evaluation. Students will conduct project work and produce and present professional-level reports using dietary assessment tools.
- **Course Learning Outcomes**
  - On successful completion of this course, students should be able to:
    - CLO 1 understand the principles of dietary assessment methods, and the strengths of limitations of these methods.
    - CLO 2 evaluate the validity and reliability of dietary assessment tools.
    - CLO 3 choose the most appropriate nutrition assessment methods for different purposes.
    - CLO 4 explain the meaning and uses of Dietary Reference Intakes.
    - CLO 5 competently use dietary assessment software with local and international nutrition databases to assess individual dietary intake.
    - CLO 6 interpret foods and diets in terms of nutritional quality and nutrient adequacy, and make appropriate recommendation(s) for improvement, in both product development and dietary review contexts.
- **Pre-requisites (and Co-requisites and Impermissible combinations)**
  - Pass in BIOL2102
- **Offer in 2019 - 2020**
  - N
- **Grade Descriptors (A+ to F)**
  - A: Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use practical skills and techniques.
Course Type: Laboratory and workshop course

Course Teaching & Learning Activities:
- **Activities**
  - Workshops: 48
  - Tutorials: 12
  - Reading / Self study: 96

Assessment Methods and Weighting:
- **Methods**
  - Laboratory reports: 40 CLO 1,2,3,4,5,6
  - Presentation: Group presentation - 30 CLO 1,2,3,4
  - Project reports: 20 CLO 1,2,3,4

Required/recommended reading and online materials:
- Lee RD and Nieman DC, Nutritional Assessment 6th Ed, McGraw Hill
- Gibson RS, Principles of Nutritional Assessment 2nd Ed. Oxford University Press

Course Website:
- http://moodle.hku.hk

Additional Course Information:
- This course will be offered subject to a minimum enrollment number and availability of teachers

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**BIOL3216**

**Food waste management (6 credits)**

**Offering Department:** Biological Sciences

**Teachers Involved:** Dr O Habimana, School of Biological Sciences

**Course Objectives:** To allow students to develop an understanding of the propagation, treatment and disposal of food waste relevant within the farm to table chain. To allow students to critically evaluate food waste management and resource recovery potential in Hong Kong in comparison to other countries in Asia/Worldwide.

**Course Contents & Topics:**
- With our current global population estimated to reach 9.1 billion in 2050, food production will be expected to increase by 70% to meet food demand. However, our current world food supply is instead declining, with 1/4 to 1/3 of all food produced for human consumption lost or wasted. This amounts to a staggering 1 to 2 billion metric tons per year! Clearly we should be worried about food wastage.
- In this course, the social, economic, and environmental implications associated with food waste will be identified, by presenting relevant facts and figures and case studies embodying agricultural, industrial and consumer waste-types. Basic waste management concepts will also be covered, examining current waste management in Hong Kong compared to other countries in Asia, while providing the basis for examining our own personal waste footprint. This course will address current applications and limitations of food waste treatment technologies.

**Course Learning Outcomes:** On successful completion of this course, students should be able to:
- CLO 1 understand and define the various types of waste as well as create an awareness of individual waste footprint.
- CLO 2 be able to define the 3 R’s in waste management (reduce, reuse, recycle), and be familiarized with waste polices in Hong Kong compared to other countries in Asia /Worldwide.
- CLO 3 be able to describe current and novel technologies for treating waste, as well as transforming waste into value added resources.
- CLO 4 to develop written and oral presentation skills necessary to effectively convey technical, economic, and social information related to waste management.

**Pre-requisites (and Co-requisites and Impermissible combinations):** Pass in BIOL2101 or BIOL3201

**Offer in 2019 - 2020:** Y 2nd sem Off in 2020 - 2021 : Y

**Grade Descriptors (A+ to F):**
- **A** demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use quality management skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.

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**School of Biological Sciences**
School of Biological Sciences

BIOL3217  
Food, environment and health (6 credits)  
Academic Year: 2019  
Quota: 50

**Offering Department**  
Biological Sciences

**Teachers Involved**  
Dr T. Sobko, Biological Sciences (tsobko@hku.hk)

**Course Objectives**  
A cross-disciplinary exploration of the environmental, socio-economic, public health and personal nutrition contexts of food systems. To focus on how our food choices influence the environment and how the environment impacts our diet. To examine the interactions among environment (e.g., pollution, soil and water quality, climate change), food resources (growth, production, consumption, processing, distribution and disposal) and health.

**Course Contents & Topics**  
The environment, human well-being and the functioning of society are highly influenced by food production and consumption. Are we destroying the environment as we struggle to feed growing populations? Is the environment becoming increasingly toxic for our health? The course will consist of three blocks: 1) The influence of food consumption on the environment; 2) The impact of environment on food and human health, and 3) What actions can improve these interactions, through evidence-based case examples. A Problem Based Learning (PBL) approach will be used with emphasis on ‘real-life’ cases connecting human nutrition, well-being and environmental health. Topics will include impacts of certain dietary habits and demands on food systems (e.g., demand for cheap food resources (growth, production, consumption, processing, distribution and disposal) and health.

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

- CLO 1: To understand multifactorial and interdisciplinary relations in sustainable environment and nutrition
- CLO 2: To address today’s national and global challenges in the environmental and food sectors
- CLO 3: To understand historical and current aspects (agricultural production, policy initiatives) locally, in Asia and worldwide
- CLO 4: To address and analyze food/environment issues including food production, consumption, and the fulfilment of the right to adequate food; strengths and weaknesses of political, social, and economic policies and other interventions
- CLO 5: To demonstrate skills to become effective environmental educators to communicate the issues of food and environment to a variety of audiences and to apply theoretical knowledge while designing an applicable intervention in public setting

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in BIOL 2101 or ENV52001 or ENV52002 or BIOL3201

**Offer in 2019 - 2020**  
Grade Descriptors (A to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>A</td>
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<th>Assessment Methods</th>
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<th>Weighting in final course grade (%)</th>
<th>CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td>30</td>
<td>CLO 2,3,4</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Course Information**  
This course will be offered subject to a minimum enrolment number and availability of teachers.
To provide exposure to some key management, microbiology and food processing concepts used to produce safe high-quality food products. To introduce students to analysis and problem-solving of realistic business situations in food safety management.

- The regulatory, social and business imperative for food safety.
- Basic concepts in TQM
- Statistical Process Control
- Quality Function Deployment
- Quality management standards (ISO 9000)
- Development and implementation of a Hazard Analysis Critical Control Point (HACCP) plan (within an ISO 22000 food safety management system/ supply chain approach)
- Role of environmental management systems (ISO 14000) in the food industry
- A review of microbiology in a food safety context
- Religious, ethical, and cultural food choices
- Illustrative business case studies on food safety management will be discussed

On successful completion of this course, students should be able to:

- CLO 1 understand the basic microbiological and food processing concepts in food safety
- CLO 2 be familiar with a set of management techniques applicable in the food industry for promoting food safety
- CLO 3 be able to analyze food production problems and make recommendations for action to improve quality and safety

Pass in BIOL2101 or BIOL3201 or BIOL3203
Not for students who have passed in BIOL3208

_Required/recommended reading and online materials_ There is no course textbook. Most of the reading material will be provided on Moodle or distributed during lectures.

_Course Website_ http://moodle.hku.hk
### BIOL3301
**Marine biology (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr M Yasuhara, Biological Sciences (<a href="mailto:yasuhara@hku.hk">yasuhara@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr B Russell, Biological Sciences)</td>
</tr>
<tr>
<td></td>
<td>(Dr M Yasuhara, Biological Sciences)</td>
</tr>
<tr>
<td></td>
<td>(Dr S Cannici, Biological Sciences)</td>
</tr>
</tbody>
</table>

#### Course Objectives
To develop a basic understanding and appreciation of the field of marine biology, including the fascinating diversity of marine life, their function, ecology and inter-relationships. Contemporary issues including the benefits we derive from marine biological resources and threats to their long-term sustainability will also be discussed with case studies highlighting key issues.

#### Course Contents & Topics
The topics cover:
1. The physical and chemical environments (e.g., light, current, atmospheric-ocean interactions, salinity, temperature, pH, dissolved oxygen, nutrients) and how these may affect the marine biota.
2. Important groups of marine organisms (e.g., phytoplankton, zooplankton, benthos, nekton, marine mammals) and marine food web.
3. Major marine habitats and ecosystems (e.g., intertidal, benthic, pelagic, deep sea, coral reefs, mangroves).
4. Exploitation of marine biological resources (e.g., fisheries and bioactive compounds).
5. Contemporary issues (e.g., climate change, marine pollution, sustainable use of marine living resources, invasive species).

#### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 demonstrate a basic understanding of the diversity and function of marine biota.
- CLO 2 recognize the interactions of marine biota and their environments.
- CLO 3 appreciate the importance of marine ecosystems and the threats of human activities on their long-term sustainability as well as possible solutions.

#### Pre-requisites
Pass in BIOL2306 or ENV2002

#### Offer in 2019 - 2020
Y 1st sem Y 2020 - 2021: Y

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
<tr>
<td>Weighting</td>
<td>60</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>100</td>
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#### Course Type
Lecture with laboratory component course

#### Assessment Methods and Weighting
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
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<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>80</td>
<td>CLO 1, 2, 3</td>
</tr>
</tbody>
</table>

#### Required/recommended reading and online materials
- J. W. Nybakken: Marine Biology: An Ecological View (Benjamin Cummings, 2000)

#### Course Website
http://moodle.hku.hk

### BIOL3302
**Systematics and phylogenetics (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof R M Saunders, Biological Sciences (<a href="mailto:saunders@hku.hk">saunders@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Prof R M Saunders, Biological Sciences)</td>
</tr>
</tbody>
</table>

#### Course Objectives
To give students an understanding of the principles of systematics and phylogenetics and an appreciation of current trends and controversies. Systematics forms an invaluable grounding for many fields of biology (including anatomy, ecology, population biology and evolutionary biology), and enables the integration of a wide range of techniques (including anatomy, biochemistry, chemistry, molecular biology, cytology, palaeontology and ethology). Causes of taxonomy complexity: environmental factors; hybridization; breeding systems. Principles of nomenclature. Laboratory sessions will be aimed at illustrating taxonomic procedures and problems; students will not be expected to memorize large numbers of scientific names.

#### Course Contents & Topics
Current classificatory theories: phenetic systematics (classifications based on overall resemblances) and cladistics (evolutionary reconstruction). The species concept. Sources of taxonomic data: morphology & anatomy, biochemistry, chemistry, molecular biology, cytology, and ethology. Causes of taxonomies complexity: environmental factors; hybridization; breeding systems. Principles of nomenclature. Laboratory sessions will be aimed at illustrating taxonomic procedures and problems; students will not be expected to memorize large numbers of scientific names.

#### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 explain taxon concepts (with particular reference to species) and show how multivariate statistical methods
Conservation biology (6 credits)

Course Code: BIOL3303

Offering Department: Biological Sciences

Course Co-ordinator: Dr T C Bonebrake, Biological Sciences (tbone@hku.hk)

Teachers Involved: (Dr J G Galtan-Expitia, Biological Sciences)
(Dr L A Ashton, Biological Sciences)
(Dr T C Bonebrake, Biological Sciences)

Course Objectives:
- To introduce students to the theory and practice of conservation and to provide students with a thorough understanding of practical, economic, and management skills required for proficiency in conservation biology. Our ultimate aim is to promote an understanding of the natural biodiversity, the threats to it, and the best ways to manage them. We hope these will be your aims too, and that you will be able to use the skills and knowledge you learn from the course to reduce the local, regional and global loss of biodiversity.

Course Contents & Topics:
- Among the many environmental issues, the most serious is the increasingly rapid loss of biodiversity. This loss is irreversible on a human timescale and will reduce the options available to all future human generations. Conservation Biology/Ecology is the science of preserving biological diversity. This course also provides insights to the many benefits and services that nature offers and explores strategies for management options to sustain ecological integrity and production. It is an inexact, applied, mission-oriented, multidisciplinary science which, like medicine, has built-in values: to a conservation biologist, as to a doctor, it matters whether the patient lives or dies. It is also a very new science, bringing together elements from ecology, environmental science, forestry, resource management and many other fields.

The course is designed to provide the knowledge, theories, and research related to biodiversity conservation. Our teaching focuses on biodiversity conservation, conservation issues associated with climate change, the key theoretical underpinning of biodiversity conservation and an introduction to conservation legislation and economics. We emphasize on the integration of knowledge, skills and abilities that are required to practice conservation. Our problem based learning approach will require students to actively participate in their group project/class room debate by researching.

Course Learning Outcomes:
- On successful completion of this course, students should be able to:
  - CLO 1 understand the principles of population viability analysis, the basis of single-species conservation management and the role of ex situ conservation, ecological restoration and reintroduction in conservation

Pre-requisites
- Pass in BIOL1309; and
- Any level 2 BIOL course

Grade Descriptors
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining most or all of the course learning outcomes, with evidence of extensive background reading and use of named examples. Show evidence of significant critical abilities and logical thinking. Apply highly effective presentation skills. Demonstrate effective use of data and results to draw appropriate and insightful conclusions. Show evidence of integration of a wide range of appropriate theories, principles, evidence and techniques.
- B: Demonstrate substantial command of knowledge required for attaining most of the course learning outcomes, with evidence of some background reading and use of named examples. Show evidence of critical abilities and logical thinking. Apply effective presentation skills. Demonstrate use of data and results to draw appropriate and insightful conclusions. Show evidence of general integration of appropriate theories, principles, evidence and techniques.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes, with evidence of limited background reading and use of named examples. Show evidence of some critical abilities and logical thinking. Apply moderately effective presentation skills. Demonstrate mostly correct use of data and results to draw appropriate and insightful conclusions. Show evidence of partial integration of appropriate theories, principles, evidence and techniques.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes, with insufficient evidence of background reading and use of named examples. Show evidence of limited critical abilities and logical thinking. Apply limited presentation skills. Demonstrate limited ability to use data and results to draw appropriate and insightful conclusions. Show evidence of limited integration of appropriate theories, principles, evidence and techniques.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes, with no evidence of background reading or use of named examples. Show little or no evidence of critical abilities and logical thinking. Presentational skills are minimally effective or ineffective. Misuse of data and results to draw appropriate conclusions. Little or no evidence of integration of appropriate theories, principles, evidence and techniques.

Assessment Methods and Weighting
- Assignments: 15
- Examination: 70
- Laboratory reports: 15

Required/recommended reading and online materials
- TBC

Course Website: http://moodle.hku.hk

BIOLOGY Website: http://moodle.hku.hk
### CLO 5 outline the legal and administrative basis for conservation in Hong Kong and the world

CLO 6 appreciate the roles and relationships of economic, social and environmental sciences in the conservation of biodiversity

<table>
<thead>
<tr>
<th>Pre-requisites and Impermissible Combinations</th>
<th>Offer in 2019 - 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass in BIOL2306</td>
<td>Y 2nd sem Offer in 2020 - 2021 : Y</td>
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<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Show strong analytical and critical abilities and logical thinking.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of limited analytical and logical thinking.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking.</td>
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<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
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<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
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<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1,2,3,4,5,6</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>group presentation</td>
<td>10 CLO 1,2,3,5,6</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>10</td>
<td>CLO 1,2,3</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>V. D. Fred: Conservation biology [electronic resource]: foundations, concepts, applications (Springer, 2008)</td>
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</table>

| Course Website | http://moodle.hku.hk |

### BIOL3305 Tropical and temperate marine ecology field course (6 credits)

<table>
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<th>Offering Department</th>
<th>Biological Sciences</th>
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<tbody>
<tr>
<td>Quota</td>
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</table>

<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Dr R Russell, Biological Sciences (<a href="mailto:brussell@hku.hk">brussell@hku.hk</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>(Dr B Russell, Biological Sciences) (Dr S Cannicci, Biological Sciences)</td>
</tr>
</tbody>
</table>

| Course Objectives | This course uses a field-based approach to provide students with an advanced understanding of marine and estuarine ecology in both tropical and temperate regions. Students will learn scientific techniques in Hong Kong and then apply them to compare these ecosystems in Australia, experiencing their similarities and differences. The course culminates with students developing field-based research projects to answer ecological questions, using creative and innovative thinking to overcome problems for successful outcomes. |

| Course Contents & Topics | The course will cover the structure and function of mangrove forests, reefs (coral and rocky), and algal forests in both tropical and temperate regions. Students will be introduced to the concepts in the course through a series of lectures and field trips in Hong Kong before travelling to northern and southern Australia to experience the ecosystems in the field. The lectures will provide students with background knowledge about the ecosystems which they will encounter, the structure and function of the systems and how human activities degrade them, sampling techniques, logical experimental design, and good report writing practices. These concepts will be drawn together in the field with students quantifying species richness, observing system structure and testing hypotheses with experiments that they design themselves. |

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>On successful completion of this course, students should be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>Demonstrate an understanding of the complexity and function of marine ecosystems.</td>
</tr>
<tr>
<td>CLO 2</td>
<td>Explain the role of physical and biological processes in shaping the similarities and differences among marine ecosystems tropical and temperate regions.</td>
</tr>
<tr>
<td>CLO 3</td>
<td>Demonstrate skills for field sampling in marine and estuarine habitats.</td>
</tr>
<tr>
<td>CLO 4</td>
<td>Demonstrate knowledge in hypothesis testing and experimental design.</td>
</tr>
<tr>
<td>CLO 5</td>
<td>Identify a range of marine species and their role in ecosystems.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-requisites and Impermissible Combinations</th>
<th>Offer in 2019 - 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass in &quot;C&quot; or above in BIOL2306 or BIOL3301 or BIOL3303 or ENVS2001</td>
<td>N Offer in 2020 - 2021 : Y</td>
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</table>

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Evidence of a thorough grasp of the subject and relevant research techniques. Eagerness and enthusiasm to learn and excellent familiarity with relevant background reading and case studies. Example handling of field data collection and excellent analytical skills. Ample evidence of independent critical thought with excellent use of a broad range of fundamental concepts and broader comparative perspective to draw insightful and logical conclusions. Show outstanding abilities of independent work, effective presentation skills with excellent analytical argumentation. Excellent or outstanding work relative to what is required at degree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examination</th>
<th>---</th>
</tr>
</thead>
</table>
Course Type: Field camps

Course Teaching & Learning Activities
- Activities: Lectures, Pre-course lectures and field trips, Field work, Reading / Self study
- Details: No. of Hours
  - Lectures: Pre-course lectures and field trips: 20
  - Field work: 80 hours + travel time: 80
  - Reading / Self study: 40

Assessment Methods and Weighting
- Methods: Assignments, Report, Test
- Details: No. of Hours
  - Assignments: Presentation: 20
  - Report: Field report (20%) + Project report (55%): 75
  - Test: Pre-trip quiz: 5
- Weighting in final course grade (%): CLO 1,2,3,4,5
- Assessment Methods to CLO Mapping: CLO 1,2,3,4,5

Required/recommended reading and online materials
- Students will be directed to relevant scientific literature and websites

Course Website
- http://moodle.hku.hk

Additional Course Information
- This course involves a two-week field course to Australia, one week in the Sydney (temperate region) and one week on Orpheus Island (tropical region). Students will be exposed to some harsh environmental conditions including working in contact with seawater, potentially cold and rainy weather. Orpheus Island can have an abundance of biting insects (mosquitos and sand flies).
- There will be extra costs involved in the course, including but not limited to airfares, accommodation and meal costs.
- Enrollment Procedure: Enrollment for this course will close at the end of the add/drop period of the second semester because airfares and accommodation for the trip need to be booked in advance.

BIOL3313
- Offering Department: Biological Sciences
- Course Co-ordinator: Prof D Dudgeon, Biological Sciences (ddudgeon@hku.hk)
- Course Objectives
  - This course introduces freshwater science by integrating the physical and biological components of rivers and their drainage basins in the context of sustaining human livelihoods and biodiversity. Conservation and management of lakes and maintenance of water quality are considered also. Case studies are used to illustrate the principles of river science and human use of drainage basins. Emphasis will be placed upon conservation of freshwater biodiversity in Asia in the context of increasing human modification of ecosystems, habitat degradation and water scarcity.
- Course Contents & Topics
  - The amount of water on Earth is fixed. Less than 0.01% of the world's water is in lakes and rivers, yet this water hosts 10% of the Earth's species. Global water use has increased 300% since 1950 and is growing faster than the Earth's population; many people in Asia already face water stress. This course introduces the physicochemical processes involved in the hydrological cycle and flow of water in drainage basins, as well as their seasonal fluctuations, and describes the main longitudinal changes that occur along rivers and their floodplains. Energy flows in freshwater ecosystems are described with particular reference to the transfer of materials between water and land and the relative importance of aquatic primary production versus energy derived from detrital inputs from the land. The range of organisms associated with Asian fresh waters is introduced and their functional roles explained, and students will become familiar with some common Hong Kong species in field trips and laboratory sessions. The dependence of humans on freshwater ecosystems and the role they play in sustaining livelihoods is explained, together with the causes and consequences of human modification of fresh waters, and the implications for conservation of aquatic biodiversity. Finally the range of management strategies used to reduce or mitigate human impacts on freshwater ecosystems and maintain water quality is introduced.
- Course Learning Outcomes
  - On successful completion of this course, students should be able to:
    - CLO 1: describe the global water cycle, the main sources and pathways of energy in freshwaters, and the influence of land-water interactions on aquatic productivity
    - CLO 2: describe the composition of the freshwater biota (major groups) and their functional roles in aquatic ecosystems, and identify some of the common animals that occur in Hong Kong fresh waters
    - CLO 3: describe the results of modification of freshwater ecosystems by humans, list the main threats to freshwater biodiversity in Asia, explain why freshwater biota are vulnerable to human impacts, and indicate the management strategies used to reduce or mitigate them
- Pre-requisites (and Co-requisites and Impermissible combinations): Pass in BIOL2102 and BIOL2306
- Offer in 2019 - 2020
- Grade Descriptors: Evidence of original logical (or coherent) thought, strong analytical (or critical) abilities and a thorough grasp of the subject as
- Examination: ---
The course will investigate various cell, tissue and organ types in the vascular plant body, with functional explanations for their diversity and discussions of the value of such knowledge in understanding plant phylogeny. Information on plant structure will be integrated with our current understanding of developmental genetics and taxonomic relationships derived from molecular phylogenetic research. Topics such as food storage, strength, water conduction, growth and development, pollination, fertilization, fruit and seed dispersal, germination, etc., will be discussed.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** recognise the main plant cell types and explain how cells are integrated to form specific primary tissues (such as the xylem and phloem).
- **CLO 2** describe the developmental changes that occur in primary tissues with the onset of secondary growth.
- **CLO 3** describe the structure, function and development of secondary vegetative structures (wood and bark).
- **CLO 4** integrate knowledge of the genetic control of floral development with the evolution of organ diversity.
- **CLO 5** describe the structure of fruits from a functional perspective, and recognise how these structures are derived from the flower.
- **CLO 6** explain how seeds develop after fertilization of the ovule, and how differences in seed structure influence germination patterns.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL1300; and Any level 2 BIOL course

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Course Teaching &amp; Learning Activities</th>
<th>Assessment Methods and Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>demonstrated by background reading and excellent use of named (organism) examples. Show excellent presentational, analytical skills and/or lab/field skills, and substantial knowledge of general freshwater biodiversity or selected taxa. Excellent or outstanding (for A+) work relative to what is required at degree level.</td>
<td>Assignments: 30 CLO 2</td>
</tr>
<tr>
<td>B</td>
<td>Evidence of analytical (or critical) abilities and logical (or coherent) thinking with an adequate (but incomplete) grasp of the subject as demonstrated by background reading and use of named (organism) examples. Show good presentational, analytical and/or lab/field skills, and knowledge of general freshwater biodiversity or selected taxa. Work more than sufficient for what is required at degree level.</td>
<td>Examination: 60 CLO 1,2,3</td>
</tr>
<tr>
<td>C</td>
<td>Evidence of some analytical (or critical) abilities and logical (or coherent) thinking with an adequate (but incomplete) grasp of the subject, but little or no evidence of original thinking, with limited background reading and use of named (organism) examples. Show fair presentational, analytical and/or lab/field skills, and some knowledge of general freshwater biodiversity or selected taxa. Work sufficiently for what is required for degree level.</td>
<td>Laboratory reports: 10 CLO 3</td>
</tr>
<tr>
<td>D</td>
<td>Evidence of retention of a minimum of relevant information of the subject (i.e. knowledge is very incomplete), with limited organizational, analytical or presentation skills. Shows insufficient evidence of background reading, or familiarity with lab/field techniques or freshwater biodiversity. Work merely (for D+) or barely (D) adequate for what is required at degree level.</td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>Evidence of poor or inadequate knowledge and understanding of the subject, and a lack of coherence, poor organization and/or excessive irrelevancy. Little or no evidence of familiarity with relevant reading material and lab/field techniques, or any knowledge of freshwater biodiversity. Work fails to reach degree level.</td>
<td></td>
</tr>
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**BIOL3314**

Plant structure and evolution (6 credits)
School of Biological Sciences

**Course Type**
Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
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<tbody>
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<tr>
<td>Laboratory</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
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**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1.2,3,4,5,6</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>30</td>
<td>CLO 1.2,3,4,5,6</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**Course Website**
hmoodle.hku.hk

**Additional Course Information**
Offer in alternative year from 2018-2019

This course will be offered subject to a minimum enrollment number and availability of teachers.

**BIOL3318**
Experimental intertidal ecology (6 credits)

**Offering Department**
Biological Sciences

**Course Co-ordinator**
Prof G A Williams, Biological Sciences (hrbwa@hku.hk)

**Teachers Involved**
(Prof G A Williams, School of Biological Sciences)

**Course Objectives**
To examine the communities of coastal systems: their distribution, composition and the factors which regulate them. This course will examine, using an experimental approach, patterns exhibited by a range of shores and the deterministic and stochastic processes that create and sustain them. Hong Kong shores will be used as examples but comparisons will be drawn from the coastlines of the world.

**Course Contents & Topics**
The first part of this course describes shores of the marine to brackish water continuum and the communities found on them. Lectures will cover the physical environment of the intertidal (e.g. tides; waves; geological and hydrological processes) the resultant variations in exposure and shore types and consequent distribution of animals and algae on these shores (vertical and horizontal zonation patterns) with specific Hong Kong examples. The second part of the course uses an experimental approach (e.g. sampling methodology; manipulative techniques; experimental design and data analysis) to investigate the factors (e.g. predation; herbivory; competition; disturbance; succession; patchiness and recruitment; supply side ecology) that structure these shores, with particular focus on rocky intertidal shores.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- **CLO 1**: describe the physical environmental factors (e.g., waves, tides) shaping the intertidal environment and how they interact with geographic features to produce different kinds of shores (e.g., sandy shores, mangroves)
- **CLO 2**: understand the factors limiting species distribution patterns on the vertical intertidal gradient and appreciate methods to measure and investigate these patterns
- **CLO 3**: identify and quantify the distribution of a variety of local species on different Hong Kong shores
- **CLO 4**: review, critique and design experimental studies to investigate patterns (e.g., zonation) and processes (e.g., herbivory, competition) in intertidal areas
- **CLO 5**: explain the role of biological processes (e.g., predation, succession) and their interaction with the physical environment in shaping intertidal communities
- **CLO 6**: plan, design, execute, analyse and present a simple experimental study on intertidal ecology

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in BIOL2102 or BIOL3301

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
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<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Field work</td>
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<td>28</td>
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<tr>
<td>Project work</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>40</td>
<td>CLO 1.2,3,4,5,6</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1.2,3,4,5,6</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

- TBC
This course focuses on the ecology of terrestrial habitats providing an overview of patterns and processes at global and regional scale. Students will learn about the evolution of climate and topography over geological times and their roles in shaping current biodiversity and ecosystems distribution. The course also focuses on the taxonomic, functional and ecological composition of organisms within terrestrial ecosystems of Tropical East Asia with emphasis on the major processes regulating communities. An introduction to several global major threats on terrestrial ecosystems and their mechanisms is provided. Finally, the study of habitats recovery through ecological succession using particular examples in Hong Kong is provided.

The practical component of the course will introduce students to basic field techniques used in ecology. Students will participate to a group project, collecting and analysing their own data involving both field and laboratory work, and write a short scientific paper. Particular emphasis will be given on how to efficiently read and write scientific literature and present data efficiently. Attendance and participation in class are encouraged through series of discussions to stimulate critical thinking on chosen topics in terrestrial ecology. Assessment includes problem-based learning exercise, group presentation, a final term paper and a final examination covering the content of the course.
and dolphins have. This course covers the evolutionary biology, ecology, behaviour, and conservation of marine mammals: whales, dolphins and porpoises (cetaceans), seals and walruses (pinnipeds), manatees and dugongs (sirenians) and sea otters. Students will learn to understand the ecology of mammalian life in the aquatic environment, their role in the marine ecosystem, their behavioural complexity and socio-ecology, and the current threats to these animals in the human-dominated world.

**Course Contents & Topics**

The course begins with an overview of marine mammal species and their global distribution, followed by a review of the various adaptations that have evolved to meet the challenges of the marine environment. Next, the course discusses the life history, reproductive strategies, ecology and population dynamics of marine mammals, highlighting the similarities and differences between species in this taxonomically diverse group of animals. This is followed by sessions on behaviour and behavioural ecology; here we discuss animal movement, diving and ranging behaviour, foraging strategies, ecology of group living and social behaviour, behavioural complexity, cognition, and social strategies that guide the daily lives of these animals. The course concludes with a discussion of human influences on the fate of marine mammals, examples of critically endangered species and populations, and a review of conservation and management strategies; our emphasis is on the importance of applying the knowledge of population ecology, behaviour and behavioural ecology in ensuring long-term effective conservation of marine mammal populations. This course is designed for 3rd and 4th year students; it includes field trips, discussions of current scientific research, innovative research techniques and recent discoveries. Students will undertake independent literature-searches and will discuss their projects during classroom debates, training their skills in conceptual and analytical approaches to science.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** appreciate marine mammal diversity and biogeography.
- **CLO 2** understand how mammals adapt and function in an aquatic environment and their role in the marine ecosystem.
- **CLO 3** understand and appreciate the complexity of interactions between environmental selective pressures and marine mammal behaviour, population structure and demography.
- **CLO 4** appreciate the socio-ecological diversity and behavioural complexity of marine mammals.
- **CLO 5** think analytically in terms of marine mammal ecology and anthropogenic impacts in the rapidly changing world.

**Pre-requisites**

Pass in BIOL2306

**Offer in 2019 - 2020**

Offer in 2020 - 2021 : N

**Grade Descriptors (A+ to F)**

- **A** Evidence of a thorough grasp of the subject in a broader comparative perspective as demonstrated by background reading and excellent use of named examples and case studies. Evidence of independent critical thought with excellent use of a broad range of fundamental concepts to draw insightful and logical conclusions. Shows eagerness to learn, great abilities of independent work, effective presentation skills with excellent analytical argumentation. Excellent or outstanding work relative to what is required at degree level.

- **B** Evidence of a good grasp of the subject as demonstrated by some background reading and appropriate use of named examples and some case studies. Evidence of good critical thinking, although not necessarily original. Good and very good (but not outstanding) abilities of independent work, effective presentation skills with good analytical and logical argumentation. Good general command of acquired knowledge to draw meaningful and logical conclusions. Work more than sufficient for what is required at degree level.

- **C** Demonstrate an adequate, but not coherent and incomplete grasp of the subject, with limited background reading and limited use of named examples and some case studies. Some abilities of logical critical thinking, but not insightful and/or independent; only partial abilities to use acquired knowledge and work independently to draw meaningful conclusions. Fair presentation skills, with mostly correct argumentation, but limited (or no) abilities to integrate broader concepts. Work sufficient for what is required for degree level.

- **D** Demonstrate some grasp of the subject, but partial and limited to the most basic concepts, examples, and limited (or none) case studies. Insufficient evidence of background reading, limited abilities of critical independent thinking, and not particularly effective presentation skills with generally weak logical argumentation and restricted ability of drawing appropriate conclusions. Work barely meets what is required at degree level.

- **Fail** No evidence of basic minimum knowledge and understanding of the subject. No evidence of background reading and no familiarity with any relevant examples and case studies. Inadequate evidence of coherent logical thought; ineffective presentation skills with poor argumentation and no abilities to draw meaningful conclusions. Work fails to reach degree level.

**Course Type**

Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>including field trips, research site vists, demonstration of research techniques, interactive classroom debates</td>
<td>32</td>
</tr>
<tr>
<td>Project work</td>
<td>project work review</td>
<td>8</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>60</td>
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**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>including active participation/continuous assessment/presentation</td>
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<td>CLO 1,2,3,4,5</td>
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<td>Examination</td>
<td>45</td>
<td>CLO 1,2,3,4,5</td>
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**Required/recommended reading and online materials**


**Course Website**

http://moodle.hku.hk

**Additional Course Information**

This course is offered in alternate year. This course will be offered subject to a minimum enrollment number and availability of teachers.

**BIOL3322**

Marine invertebrate zoology (6 credits)

**Offering Department**

Biological Sciences

**Course Co-ordinator**

Dr S Cannici, Biological Sciences (cannici@hku.hk)

**Teachers Involved**

Dr S Cannici, Biological Sciences

**Course Objectives**

This course introduces the students to the diversity, biology and ecology of marine invertebrates. Students will be introduced to various aspects of the systematics, anatomy, physiology and functional ecology of the major phyla of
Invertebrates make up 95% of all animal species. While insects dominate the terrestrial landscapes, marine environments have a much broader phylectic diversity, with taxa such as Porifera (sponges), Polychaetes (marine worms), Coelenterata (corals and sea anemones) and Echinoderms (sea urchins and starfish) entirely confined to the seas. Together with marine molluscs and crustaceans, these groups play fundamental roles in the functioning of all marine ecosystems, and are a fundamental focus of evolutionary studies of extant taxa and their fossil relatives. This course will lead the students through the discovery of the amazing variety of body plans, adaptations, structure and function of marine invertebrates. In the first part of the course, the study of the phylogenetic relationships and the body plans of marine invertebrates groups, together with the associated evolutionary pathways, will be described to provide students with an evolutionary grand tour of life on Earth. In the second part, students will learn the mechanisms underpinning the ecological functions of marine ecosystems, through the study of the functional biology and ecology of the dominant groups. The diversity of invertebrates present in South East Asian seas will be introduced, and students will become familiar the commonest Hong Kong taxa and species in field trips and laboratory sessions.

On successful completion of this course, students should be able to:

CLO 1 identify major taxa of marine invertebrates
CLO 2 describe the evolutionary history of the different taxa, understanding their relationships
CLO 3 describe the composition of the invertebrates communities and their roles in marine ecosystems, and learn to identify common species and taxa typical of Hong Kong coastal waters
CLO 4 understand the functional biology of marine invertebrates and their contribution to ecological functioning of marine ecosystems

Evidence of a thorough grasp of the subject and relevant research techniques. Eagerness and enthusiasm to learn and excellent familiarity with relevant background reading and case studies. Exemplary handling of field data collection and excellent analytical skills. Ample evidence of independent critical thought with excellent use of a broad range of fundamental concepts and broader comparative perspective to draw insightful and logical conclusions. Show outstanding abilities of independent work, effective presentation skills with excellent analytical argumentation. Excellent or outstanding work relative to what is required at degree level.

Evidence of a good grasp of the subject and relevant research techniques. Interest in learning and good-to-moderate familiarity with relevant background reading and case studies. Good handling of field data collection and commendable analytical skills. Good evidence of critical thought (although not always independent), with an appreciable use of fundamental concepts and consideration of broader comparative perspective in drawing logical conclusions. Good abilities of independent work, effective presentation skills with logical and analytical argumentation. Work more than sufficient for what is required at degree level.

Demonstrate an adequate, but incomplete grasp of the subject and relevant research techniques. Moderate familiarity with relevant background reading and case studies, but no interest in learning beyond the adequate average level. Evidence of logical critical thinking (although not always independent), with mostly good use of fundamental concepts to draw logical conclusions. Fair presentation skills, with mostly correct argumentation, but limited (or no) abilities to integrate broader concepts. Work sufficient for what is required for degree level.

No evidence of basic a minimum grasp of the subject and the minimum relevant research techniques. No evidence of background reading and no familiarity with any relevant examples and case studies. Inadequate evidence of coherent logical thought; ineffective presentation skills with poor argumentation and no abilities to draw meaningful conclusions. Work fails to reach degree level.

Evidence of a thorough grasp of the subject and relevant research techniques. Eagerness and enthusiasm to learn and excellent familiarity with relevant background reading and case studies. Exemplary handling of field data collection and excellent analytical skills. Ample evidence of independent critical thought with excellent use of a broad range of fundamental concepts and broader comparative perspective to draw insightful and logical conclusions. Show outstanding abilities of independent work, effective presentation skills with excellent analytical argumentation. Excellent or outstanding work relative to what is required at degree level.

Evidence of a good grasp of the subject and relevant research techniques. Interest in learning and good-to-moderate familiarity with relevant background reading and case studies. Good handling of field data collection and commendable analytical skills. Good evidence of critical thought (although not always independent), with an appreciable use of fundamental concepts and consideration of broader comparative perspective in drawing logical conclusions. Good abilities of independent work, effective presentation skills with logical and analytical argumentation. Work more than sufficient for what is required at degree level.

Demonstrate an adequate, but incomplete grasp of the subject and relevant research techniques. Moderate familiarity with relevant background reading and case studies, but no interest in learning beyond the adequate average level. Evidence of logical critical thinking (although not always independent), with mostly good use of fundamental concepts to draw logical conclusions. Fair presentation skills, with mostly correct argumentation, but limited (or no) abilities to integrate broader concepts. Work sufficient for what is required for degree level.

No evidence of basic a minimum grasp of the subject and the minimum relevant research techniques. No evidence of background reading and no familiarity with any relevant examples and case studies. Inadequate evidence of coherent logical thought; ineffective presentation skills with poor argumentation and no abilities to draw meaningful conclusions. Work fails to reach degree level.

Pass in BIOL2306

Offer in 2019 - 2020

Offer in alternate year from 2017-2018

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Course Teaching &amp; Learning Activities</th>
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<tbody>
<tr>
<td></td>
<td>Lecture with laboratory component course</td>
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<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
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<tbody>
<tr>
<td>Methods</td>
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<tr>
<td>---------</td>
</tr>
<tr>
<td>Assignments</td>
</tr>
<tr>
<td>Examination</td>
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<tr>
<td>Laboratory reports</td>
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Students will be directed to relevant scientific literature and websites http://moodle.hku.hk

Offer in alternate year from 2017-2018

This course will be offered subject to a minimum enrollment number and availability of teachers

<table>
<thead>
<tr>
<th>BIOL3328 - Nearshore marine and estuarine ecology (6 credits)</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
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<tbody>
<tr>
<td>Biological Sciences</td>
<td>2019</td>
<td>10</td>
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<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
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</thead>
<tbody>
<tr>
<td>Prof. G.A. Williams, Biological Sciences (<a href="mailto:hrsbwgaa@hku.hk">hrsbwgaa@hku.hk</a>)</td>
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</table>

<table>
<thead>
<tr>
<th>Teachers Involved</th>
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<tbody>
<tr>
<td>(Prof. G.A. Williams, School of Biological sciences)</td>
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<table>
<thead>
<tr>
<th>Course Objectives</th>
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<tbody>
<tr>
<td>Using a comparative approach between Hong Kong and South African shores, students will learn to identify the relevant environmental gradients which define the intertidal zone, and the species interactions which are found in these communities. This will be achieved through an intensive field-based approach, visiting and working in different intertidal habitats in both Hong Kong and, during a residential fieldcamp, in South Africa.</td>
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</tbody>
</table>
**Course Contents & Topics**

Students will learn the abiotic and biotic factors that structure intertidal communities in Hong Kong and, during a residential field camp, different South African intertidal communities. In South Africa, specific topics will focus on:

1. Intertidal biodiversity and species interactions
2. Species distribution patterns on intertidal shores
3. Species interactions and behaviour
4. Trophic interactions and connectivity between local terrestrial and marine communities.
5. Larger-scale connectivity from freshwaters to marine systems

HKU Students will work in groups with students from the University of Johannesburg and North West University, South Africa to collect data; design and carry out experiments; present their findings; and write up formal scientific reports on the different topics. Note individual topics may change in different years and are weather dependent.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 compare the contrast the shallow water coastal environments of Hong Kong and the Eastern Cape Province of South Africa
- CLO 2 identify a range of species and their roles and relationships in the intertidal zone
- CLO 3 understand the abiotic conditions defining the intertidal environment and quantify and interpret the distribution of species over relevant environmental gradients
- CLO 4 design, execute and analyse experiments to investigate species interactions
- CLO 5 integrate abiotic and biotic interactions to determine patterns of connectivity between intertidal habitats
- CLO 6 analyse, interpret and present data using a variety of media to demonstrate scientific understanding of topics

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL2306 or BIOL3301

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>N</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
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</thead>
<tbody>
<tr>
<td>Y</td>
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**Grade Descriptors (A to F)**

- A: Thorough and complete grasp of the subject. Strong analytical and critical abilities and logical thinking, with evidence of original thought. Excellent lab / fieldwork skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Excellent organizational and presentational skills.
- B: Good and near-complete grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Competent lab / fieldwork skills and techniques. Correct use of data of results to draw appropriate conclusions. Good organizational and presentational skills.
- C: Adequate (but incomplete) grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Adequate lab / fieldwork skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Fair organizational and presentational skills.
- D: Limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Barely adequate lab / fieldwork skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Barely satisfactory organizational and presentational skills.
- Fail: Poor or inadequate knowledge and understanding of the subject. Lack of analytical and critical abilities, logical and coherent thinking. Inadequate lab / fieldwork skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Incoherent organization and poor presentational skills.

**Course Type & Course Teaching & Learning Activities**

Field camps

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<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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<td>Pre-course modules</td>
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<tr>
<td>Field work</td>
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<td>Tutorials</td>
<td>Pre-course assignments</td>
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<td>Reading / Self study</td>
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<td>50</td>
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**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighing in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Group presentation</td>
<td>30 (%), CLO 3, 4, 5, 6</td>
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<tr>
<td>Report</td>
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<td>60 (%), CLO 1, 2, 3, 4, 5, 6</td>
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<tr>
<td>Test</td>
<td>Pre-course</td>
<td>10 (%), CLO 1, 2, 6</td>
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**Required/recommended reading and online materials**

Students will be directed to relevant scientific literature, websites and appropriate teaching materials.

**Course Website**

http://moodle.hku.hk

**Additional Course Information**

Students who have taken BIOL3318 will be at an advantage. Students will join undergraduate students from the University of Johannesburg and North Western University, South Africa on a residential field camp at Tsitsikamma (Storms River Camp, Eastern Province, South Africa) in the second Reading Week (Second Semester). Students will be expected to live in tented accommodation and contribute to daily camp activities as well as conduct fieldwork in potentially harsh environmental conditions. Extra costs may be involved in the course, which may include airfares. Accommodation, meal costs and internal travel in South Africa are covered by South African hosts.

**BIOL3401**

<table>
<thead>
<tr>
<th>Molecular biology (6 credits)</th>
<th>Academic Year</th>
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</thead>
<tbody>
<tr>
<td>Biological Sciences</td>
<td>2019</td>
</tr>
</tbody>
</table>

**Offering Department**

Biological Sciences

**Course Co-ordinator**

Dr K W Y Yuen, Biological Sciences (kwyyuen@hku.hk)

**Teachers Involved**

(Dr C B Chan, Biological Sciences)

(Dr K W Y Yuen, Biological Sciences)

(Dr Y L Zhai, Biological Sciences)

**Course Objectives**

To provide students with recent knowledge in molecular biology with special emphasis on the study of gene structure and function at the molecular level.

**Course Contents & Topics**

The course includes a detailed account of the molecular processes in eukaryotic and prokaryotic cells, from DNA replication, RNA transcription, protein translation, to post-translational modifications with special emphasis on the regulation of prokaryotic and eukaryotic gene expression. Recently developed biochemical techniques including oligonucleotide synthesis, DNA sequencing, complementary screening and DNA cloning, site-directed mutagenesis, polymerase chain reaction and transgenic technology will also be discussed.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: know the basic structures of DNA, RNA and protein, and how DNA is package in the nucleus of eukaryotic cells
- CLO 2: understand the biochemical processes involved in DNA replication, transcription, translation and post-
translational modifications in prokaryotes and eukaryotes

CLO 3 explain and describe the regulation of gene transcription in prokaryotes and eukaryotes

CLO 4 demonstrate knowledge and understanding of the underlying concepts associated with recently developed techniques including PCR, site-directed mutagenesis, DNA sequencing

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2600 or BIOL2103 or BIOL2220 or MEDE2301

Offer in 2019 - 2020

Y 1st sem Offer in 2020 - 2021: Y Examination Dec

Grade Descriptors (A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type

Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>20</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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Assessment Methods and Weighting

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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>assessment of practical work</td>
<td>20</td>
<td>CLO 1,2,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>80</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

R. Weaver: Molecular Biology (McGraw-Hill, 2005 or 2008)
B. Lewin: Gene IX (Jones and Bertlett, 2008)
Selected journal articles and web learning materials.
TBC

Course Website

http://moodle.hku.hk/

BIOL3402

Cell biology and cell technology (6 credits)

Academic Year 2019

Offering Department

Biological Sciences

Quota 120

Course Co-ordinator

Prof A S T Wong, Biological Sciences (awong1@hku.hk)

Teachers Involved

(Dr Juliana Xu,Biological Sciences)

(Dr W Y Lui,Biological Sciences)

(Prof A S T Wong,Biological Sciences)

Course Objectives

To provide a coherent understanding of the structure and function of cells, and the principles and applications of cell culture and instrumentation in biology and biotechnology

Course Contents & Topics

I. Cell Biology


II. Techniques in animal cell culture


III. Techniques in plant cell culture


Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 acquire fundamental knowledge on cell biology and cell technology

CLO 2 demonstrate basic laboratory techniques on cell culture

CLO 3 gain insight into real-life applications in cell biology and cell technology

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2600 or BIOL2103 or BIOL2220 or MEDE2301

Offer in 2019 - 2020

Y 1st sem Offer in 2020 - 2021: Y Examination Dec

Grade Descriptors (A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Writings consistently demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.
Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills. Writings mostly indicate informed, intellectual engagement with concepts or theories but not always with sufficient depth, breadth or understanding.

D
Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills. Writings indicate some intellectual engagement with concepts or theories but mostly at a superficial level.

Fail
Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organizational skills are minimally effective or ineffective. Writings reveal an absence of intellectual engagement with concepts or theories. Writings are irrelevant or superficial.

Course Type
Lecture with laboratory component course

Offering Department
Biological Sciences

Course Co-ordinator
Dr W B L Lim, Biological Sciences (bilim@hku.hk)

Teachers Involved
(Dr Chaogu Zheng, Biological Sciences) (Dr W B L Lim, Biological Sciences)

Course Objectives
To provide a broad understanding of the animal immune system. Topics will also include the application of a variety of immunological methods to research and disease diagnosis.

Course Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 describe the structure and function of the immune molecules which are involved in the body defense mechanisms, including antibody, T-cell receptor, cytokines, MHC and complement proteins
CLO 2 describe the organization of the mammalian immune system in terms of genes, cells and tissues
CLO 3 explain the underlying mechanisms associated with transplant rejection, transfusion reaction and vaccination
CLO 4 explain how the immune system responds to infections by bacteria, viruses and parasites
CLO 5 understand antigen-antibody interaction and the principle of immunossays

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC2600 or BIOL2103 or BIOL2220 or MEDE2301

Required/recommended reading and online materials
Textbooks:

References:
TBC

Course Website
http://moodle.hku.hk/
## BIOL3404
### Description
**Course Co-ordinator:** Dr Y L Zhai, Biological Sciences (zhai@hku.hk)  
**Teachers Involved:** (Dr C M Qian, Biomedical Sciences) (Dr Y L Zhai, Biological Sciences)

**Course Objectives:** To provide students with a good understanding of protein structure, how structure subserves function, and the methods for study of both. This course provides a strong foundation for advanced courses in biochemistry and biotechnology.

**Course Contents & Topics:**
- Elements of macromolecular structure: sequencing, prediction and determination of secondary, tertiary and quaternary structures;  
- The relationship of protein structure and function: molecular motifs, binding and recognition, enzyme catalysis and specificity;  
- Methods for protein structure determination: X-ray crystallography and nuclear magnetic resonance;  
- Enzymology: enzyme nomenclature, enzyme assay, kinetics and energetics of binding, transition state and molecular mechanisms of catalysis;  
- Protein purification and characterization: various liquid chromatographical methods and their uses in combination, separation techniques, methods of determination of molecular mass, activity and purity, optical methods in protein determination, ultracentrifugation, protein polishing, stability and storage, methods and devices for protein delivery.

**Course Learning Outcomes:** On successful completion of this course, students should be able to:
- CLO 1: fundamental understanding of principles of protein structure  
- CLO 2: demonstrate a basic understanding of the relationship between protein structure and function  
- CLO 3: design assaying methods for enzymes  
- CLO 4: find out kinetic parameters of proteins or enzymes by graphical techniques  
- CLO 5: learn about the ways to purify protein and the many industrial uses of proteins

**Pre-requisites (and Co-requisites and Impermissible combinations):** Pass in BIOL2600 or BIOL2220 or MEDE2301

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## BIOL3405
### Description
**Course Co-ordinator:** ---, Biological Sciences  
**Teachers Involved:** (---, Biological Sciences)

**Course Objectives:** This course is intended for biology, biotechnology and biochemistry students who would like to understand the modern fundamentals of microbiology. At the end of the course the students are expected to know the physiological, biochemical and molecular aspects of microbiology.

**Course Contents & Topics:** The basic biochemistry of microorganisms will be described. The intrinsic factors that affect the growth of microbes in the environment will be examined. The adaptation of the microbes to the environment by means of physiological changes and genetical alterations will be illustrated. The molecular biology of bacteria and viruses will be considered. The molecular biology of plasmids and transposable elements and their association with medical aspect will be discussed. The use of modern technology in studying microorganisms will be explored.

**Course Learning Outcomes:** On successful completion of this course, students should be able to:
- CLO 1: understand the intrinsic reorganization of microbes in response to the changing environments  
- CLO 2: comprehend the major modes of regulation in the microbe  
- CLO 3: explain the biology of bacteriophages and plasmids  
- CLO 4: realize the importance of transposable elements in the survival of the microbes  
- CLO 5: appreciate the development of modern techniques in studying microorganisms

**Pre-requisites (and Co-requisites and Impermissible combinations):** Pass in BIOL2103
### Course Objectives

To provide a comprehensive overview on modern concepts and recent advances in reproductive biology & reproductive biotechnology in human and animal models.

### Course Contents & Topics

- Basic concepts of reproduction, evolution of sex, human & animal reproductive strategies and sexual behavior.
- Molecular mechanisms for sex determination, developmental aspects of gametogenesis and reproductive systems.
- Neuroendocrinology of reproductive system and recent advances in kisspeptin & GnRH system and steroid feedback via KNDy neuronal circuit.
- Environmental endocrine disruptors and recent advances in biotechnology for fertility control & assisted reproduction in human.
- Recent advances in embryonic stem cells & induced pluripotent stem cells and their applications in regenerative medicine/therapeutic cloning.
- New technology for genome editing by TALENT & CRISPR/Cas9 systems and gene therapy, animal cloning and primordial germ cell transplantation in animal models.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

### Required/recommended reading and online materials

- NCBI3406
- Reproduction and reproductive biotechnology (6 credits)
- Academic Year: 2019
- Offering Department: Biological Sciences
- Course Co-ordinator: Prof A O L Wong, Biological Sciences (olwong@hku.hk)
- Teachers Involved: (Prof A O L Wong, Biological Sciences)

### Course Website

http://moodle.hku.hk/

### Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.
Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities
- Activities: Details
  - Lectures: 24
  - Laboratory: 24
  - Tutorials: 6
  - Reading / Self study: 100

Assessment Methods and Weighting
- Methods: Details
  - Examination: 70 CLO 1,2,3,4
  - Laboratory reports: 15 CLO 2,3,4
  - Test & Continuous Assessment: 15 CLO 1,2,3,4
- Weighting in final course grade (%): 70
- Assessment Methods to CLO Mapping: A+ to F

Additional Course Information
- Course Website: http://moodle.hku.hk/
- This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3408 Genetics (6 credits) Academic Year: 2019

Offering Department: Biological Sciences

Course Co-ordinator: Dr G Y W Chan, Biological Sciences (gywchan@hku.hk)

Teachers Involved:
- (Dr C Schunter, Biological Sciences)
- (Dr G Y W Chan, Biological Science)

Course Objectives:
This course aims to provide students with fundamental knowledge of classical, molecular and population genetics.

Course Contents & Topics:
Topics include cellular reproduction, principles and chromosomal basis of Mendelian genetics, linkage analysis and mapping, concept and definition of the gene, molecular mechanisms of mutation, DNA repair and recombination, DNA transposition, extranuclear inheritance, developmental genetics, quantitative and population genetics. Students are strongly encouraged to take BIOL2303 Molecular Biology to get a more comprehensive coverage of topics in molecular genetics.

Course Learning Outcomes:
On successful completion of this course, students should be able to:
- CLO 1 appreciate the beauty of genetic organizations in nature
- CLO 2 use different genetic principles to explain hereditary traits observed in nature and laboratories
- CLO 3 apply qualitative and quantitative experimental methodologies for genetic analysis at individual and population levels

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in BIOL1110 and BIOL2102

Offer in 2019 - 2020: Y

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Integration of the full range of appropriate theories, principles, evidence and techniques</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. General integration of theories, principles, evidence and techniques</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Some partial integration of theories, principles, evidence and techniques</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited integration of theories, principles, evidence and techniques</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities
- Activities: Details
  - Lectures: 24
  - Laboratory: 24
  - Tutorials: 6
  - Reading / Self study: 100

Assessment Methods and Weighting
- Methods: Details
  - Assignments: laboratory reports, assignments 30 CLO 1,2,3
  - Examination: 70 CLO 1,2,3

Additional Course Information
- This course will be offered subject to a minimum enrollment number and availability of teachers.
BIOL3409 Business aspects of biotechnology (6 credits) Academic Year 2019

Offering Department Biological Sciences Quota 40

Course Co-ordinator Dr W B L Lim, Biological Sciences (bllim@hku.hk)

Teachers Involved (Dr W B L Lim,School of Biological Science)

Course Objectives
The course will give an overview of the innovative developments in biotech industry and provide the students with useful tools in learning how an exciting research idea can be turned into a viable business.

Course Contents & Topics
The purpose of the course is to introduce you to the entrepreneurial process with a focus on the biotechnology industry. The course will provide a thoughtful, practical guide to the process of successfully launching an entrepreneurial venture. We place a special emphasis on the decision to become a biotech entrepreneur and how to develop successful business ideas, however we will also discuss the process of moving from an idea to a biotech firm. Topics on intellectual properties, patent laws, patent application process, licensing and fundraising will be covered as well. Throughout the course, guest entrepreneurs, managers and directors of the biotech industry will be presenting case studies and explain their involvement in various biotech and pharmaceutical companies.

Topics:
1. Introduction to Biotechnology Industry: 4 P in Biotechnology Business (3 hours)
2. IP rights: Patent application, Patent system, USPTO, SIPO, PCT (6 hours)
3. Licensing of IP rights (3 hours)
4. Technology Transfer Office and HKSTP (3 hours)
5. How to raise fund for startup companies (3 hours)?
6. Agrobiotechnology and Green Tech (Monsanto, Novozymes, etc) (4.5 hours)
7. Drug development and clinical trials (Gilead Sciences, Wuxi PharmaTech, etc). (6 hours)
8. Diagnostics business (BGI, Diagcor, etc) (4.5 hours)
9. Company analysis (3 hours)
10. Company Visit
11. Company analysis

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand and demonstrate knowledge of the development and management of biotechnology business

CLO 2 understand and demonstrate how discoveries and inventions are commercialized

CLO 3 navigate the various steps in the development of a biotechnology derived product: from bench, to scale-up, to market

CLO 4 gain technical and business knowledge of the biotechnology and bioprocessing industries

CLO 5 participate and contribute to the business side of scientific enterprises

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in any level 3 BIOL or BIOC or BBMS course; NOT for students who have passed in BIOL2409.
This course is only for students admitted in 2017-2018 or before.

Offer in 2019 - 2020 Y 2nd sem Offer in 2020 - 2021 : N
Examination No Exam

Grade Descriptors (A+ to F)
A Students acquire exceptional skills and knowledge from the course and are capable of independently analyzing the business and technological developments of various biotechnology ventures.
B Students demonstrate a broad and in-depth understanding of the current developments in biotechnology industry and are capable of analyzing the business and technological developments of various biotechnology ventures under guidance.
C Students demonstrate a broad and in-depth understanding of the current developments in biotechnology industry.
D Students demonstrate a moderate understanding of the current developments in biotechnology industry.
Fail Students fail to demonstrate a moderate understanding of the current developments in biotechnology industry.

Course Type Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Field work 6
Group work Presentation 12
Reading / Self study 60
Assessment Assignment 18

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 60 CLO 1,2,3,4,5
Presentation 20 CLO 1,2,3,4,5
Test 20 CLO 1,2,3,4,5

Required/recommended reading and online materials
Company annual reports
Online materials

Course Website http://moodle.hku.hk/

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers. Priority will be given to students majoring or minoring in MBB

BIOL3419 Insect ecology: the little things that run the world (6 credits) Academic Year 2019

Offering Department Biological Sciences Quota 25

Course Co-ordinator Dr B Guenard, Biological Sciences (bguenard@hku.hk)

Teachers Involved (Dr B Guenard,School of Biological Sciences)

Course Objectives
This course introduces the students with the biology of terrestrial arthropods. With a main focus on insects and arachnids, students will be introduced to various aspects of their anatomy and physiology, systematics, and ecology to understand the fundamental roles that arthropods play in natural and human-shaped ecosystems. The course will focus particularly on the diversity and importance of insects in South East Asia.

Course Contents & Topics
With about 1.1 million and 110,000 species described respectively, insects and arachnids represent nearly 80% of all species known on the planet. A diversity also reflected in the diversity of behaviours, evolutionary adaptations or ecological interactions played at all trophic levels within ecosystems. As herbivores, pollinators, seed-dispersal...
agents, predators, parasitoids, disease vectors or decomposers, arthropods are major components in the stability and functioning of most ecosystems. Yet their importance is often underestimated by many fields of biology to the profit of larger “charismatic” vertebrates. However, arthropods offer incredible opportunities for scientific discoveries, revealing sometimes attributes in morphology, reproduction or behaviour beyond the most prolific imagination, and challenging existing paradigms in ecology and evolution. This course will propose an introduction to these extremely successful organisms and give them the value they deserve. A first step to the study of arthropods is to learn how to identify them correctly. Part of this course will present the main criteria to recognize major insects and arachnids groups. The second part will focus on their diversity, distribution and ecological functions within ecosystems. Finally the last part of the course will present the impacts of human activities on arthropods, how they have been used historically and nowadays, and what kind of problems or solution they represent for human societies?

### Course Objectives

On successful completion of this course, students should be able to:

- CLO 1 identify major groups of insects and arthropods
- CLO 2 understand and use the main collecting methods to sample arthropod diversity
- CLO 3 understand the ecological diversity of arthropod groups and their importance in ecosystems
- CLO 4 understand the biotic and abiotic factors that drive terrestrial arthropod species richness and abundance
- CLO 5 understand how human activities modify insect diversity
- CLO 6 describe the multiple roles played by insects on human activities

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL1309 and BIOL2306

### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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</thead>
<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
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<tr>
<td>C</td>
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<tr>
<td>D</td>
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<tr>
<td>Fail</td>
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### Course Type

Lecture with laboratory component course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>This part includes 4 hours of lectures about identification and curation of arthropod collection.</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>Students will collect independently their own insect collection, curate and identify the specimen collected</td>
<td>28</td>
</tr>
<tr>
<td>Project work</td>
<td></td>
<td>48</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>50</td>
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### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,5,6</td>
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<tr>
<td>Examination</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4,5,6</td>
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<tr>
<td>Laboratory reports</td>
<td></td>
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<td>CLO 1,2,3</td>
</tr>
</tbody>
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### Required/recommended reading and online materials


### Course Website

http://moodle.hku.hk

### Additional Course Information

Offer in alternate year from 2017-2018
This course will be offered subject to a minimum enrollment number and availability of teachers

### BIOL3501

Evolution (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
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</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr M Sun, Biological Sciences (<a href="mailto:meisun@hku.hk">meisun@hku.hk</a>)</td>
</tr>
</tbody>
</table>

### Course Objectives

Evolution is the cornerstone of modern biology. The course aims to introduce students to the major themes of contemporary evolutionary biology, including the history of evolutionary biology, evolutionary processes, adaptation, speciation, and evolution as an explanatory framework at all levels of biological organization.

The course emphasizes the interplay between theory and empirical tests of hypotheses, thus acquainting students with the process of science.

### Course Contents & Topics

- Introduction to Evolution
- The relevance of evolution to everyday life
- Cases for evolutionary thinking
- Evolution as Fact
- Patterns of evolutionary change
- The evidence for evolution
- Evolution as Theory
- Before Darwin
- Darwinism
- The Modern Synthesis & beyond
- The Mechanisms of Evolution
- The origin of genetic variation: mutation
- Genetic drift: evolution at random.
Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 familiar with the facts and theory of evolution

CLO 2 describe Darwin's theory of evolution by natural selection and how the process of natural selection can lead to speciation

CLO 3 have an advanced understanding of the modern evolutionary theory

CLO 4 apply evolutionary thinking to real world problems in agriculture, medicine, and biodiversity conservation

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2306

Offer in 2019 - 2020

N Offer in 2020 - 2021 : N

Course Type

Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
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<td>36</td>
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<td>Tutorials</td>
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<tr>
<td>Project work</td>
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</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
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</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>10</td>
<td>CLO 1, 2, 3, 4</td>
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<tr>
<td>Essay</td>
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<td>CLO 1, 2, 3, 4</td>
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<tr>
<td>Examination</td>
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<td>CLO 1, 2, 3, 4</td>
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<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Project reports including computer lab</td>
<td></td>
<td>15</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1, 2, 3, 4</td>
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Required/recommended reading and online materials

J.C. Herron and S. Freeman: Evolutionary Analysis (5th ed. Pearson, 2013)
eBooks available.

Course Website

http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3502 Conservation genetics (6 credits)

Academic Year 2019

Offering Department Biological Sciences

Quota 50

Course Co-ordinator Dr M Sun, Biological Sciences (meisun@hku.hk)

Course Objectives

The course aims to familiarize students with fundamental principles and recent advances in conservation genetics. The theories and methods will be taught with a balanced range of examples - mammals, birds, reptiles, amphibians, fish, invertebrates, as well as plants - to demonstrate how genetic data can be used to answer a range of important questions in real world conservation practice.

Course Contents & Topics

Introduction to conservation genetics.

Part I. Evolutionary Genetics of Natural Populations:
- genetic diversity
- characterizing genetic diversity: single loci and quantitative variation;
- evolutionary impacts of natural selection, mutation, migration and their interactions in large populations;
- genetic consequences of small population sizes;
- maintenance of genetic diversity;
- population genomics.

Part II. Effects of Population Size Reduction:
- loss of genetic diversity in small populations;
- inbreeding;
- inbreeding depression;
- population fragmentation;
- genetically viable populations.

Part III. From Theory to Practice:
Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 demonstrate an advanced understanding of the concepts of conservation genetics
CLO 2 understand the criteria for determining the conservation status of endangered, vulnerable, or threatened species
CLO 3 know the methods for characterizing genetic diversity at population and species levels
CLO 4 comprehend the relationships between genetic diversity, inbreeding, reproductive fitness, and evolutionary potential in wild populations
CLO 5 describe the effects of habitat fragmentation and population size reduction on genetic diversity and the implications in managing nature reserves
CLO 6 gain ability to integrate genetic information in resolving taxonomic uncertainties, in understanding species biology, in setting conservation priorities, and in developing management strategies for wild and captive populations

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2306 or BIOL3303 or BIOL3408

Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
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<tbody>
<tr>
<td>N</td>
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Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Exceptionally good performance demonstrating excellent understanding of the subject matter, extensive knowledge over a wide range of topics covered by the course, and skilful applications of concepts/theories in solving new or unfamiliar problems, showing strong abilities in critical thinking and logical reasoning, with evidence of significant insight and original thought in dealing with the critical issues in the field.</td>
</tr>
<tr>
<td>B</td>
<td>Good performance demonstrating capacity to use the appropriate concepts, a good understanding of the subject matter, and an ability to handle the problems and materials encountered in the subject, showing evidence of attaining most of the course learning outcomes.</td>
</tr>
<tr>
<td>C</td>
<td>Adequate performance demonstrating some understanding of the subject matter, an ability to handle relatively simple problems, but showing incomplete command of knowledge required for attaining most of the expected course learning outcomes.</td>
</tr>
<tr>
<td>D</td>
<td>Minimally acceptable performance demonstrating at least partial familiarity with the subject matter and some capacity to deal with relatively simple problems, but also demonstrating serious deficiencies in knowledge required for attaining most of the expected course learning outcomes.</td>
</tr>
<tr>
<td>Fail</td>
<td>Poor performance in all aspects of the course, showing little evidence of learning, lacking real understanding of the subject matter, demonstrating deficiencies serious enough to make it inadvisable to proceed further without additional course work.</td>
</tr>
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</table>

Course Type

Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
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<td>Project work</td>
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<td>Tutorials</td>
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Assessment Methods and Weighting

<table>
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<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<td>Assignments</td>
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<td>Project report</td>
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<td></td>
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</table>

Required/recommended reading and online materials

e-book available

Course Website

http://moodle.hku.hk/

Additional Course Information

Website - to be listed
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3503 Endocrinology: human physiology II (6 credits)

Academic Year 2019

Offering Department Biological Sciences
Quota 60

Course Co-ordinator Dr C B Chan, Biological Sciences (chancb@hku.hk)

Teachers Involved (Dr C B Chan, Biological Sciences)
(Prof A S T Wong, Biological Sciences)
(Prof B K C Chow, Biological Sciences)

Course Objectives

To provide an advanced course on hormones and how they regulate metabolism/growth, reproduction and water/salt homeostasis in our body.

Course Contents & Topics


The hypothalamic pituitary axis


The enteric nervous system. The cephalic phase, stomach phase and intestinal phase of food digestion. Regulation of acid secretion. Regulation of pancreatic exocrine and endocrine secretion. Gut hormones: gastrin, GIP, CCK, secretin, GLP-1, GLP-2 and motilin. Regulation of feeding, energy balance and food intake. Insulin and glucagon.

Reproduction

The GnRH-gonadotropin-sex hormone axis. Regulation of LH and FSH release. Male reproductive system. Interaction of hormones produced by various cells in the testis to regulate spermatogenesis. Biological actions of...
Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand the definition and natures of hormones
- CLO 2 explain and describe secondary messenger pathways for hormones
- CLO 3 describe the connection between pituitary the master gland with higher brain centers and peripheral organs
- CLO 4 explain and describe hormones involved in the regulation of 3 most important body functions including metabolism/growth, reproduction and water/salt homeostasis

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2103

Offer in 2019 - 2020

N Offer in 2020 - 2021 : Y Examination —

Course Type

Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<td>a 5-hour laboratory session per week for 5 weeks</td>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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Assessment Methods and Weighting

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</table>

Required/recommended reading and online materials


Course Website
http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3505 Oyster aquaculture and restoration (6 credits)

Offering Department

Biological Sciences

Quota 20

Course Co-ordinator

Dr T Vengatesan, Biological Sciences (rajan@hku.hk)

Course Objectives

Introduce larval biology and hatchery technology:
Provide scientific basis for coastal aquaculture through field demonstrations and laboratory exercises;
Enable students to design, construct and maintain larval hatchery for production of seeds for aquaculture and restoration of wild oysters;
Understand the reasons for restoration of marine, estuarine and coastal ecosystems;
Facilitate transfer of academic knowledge to aquaculture for sustainable food production.

Course Contents & Topics

This experiential learning course is to enhance students’ knowledge in applied larval biology techniques and advanced coastal aquaculture production systems that will enable them to design, construct, operate and maintain oyster aquaculture facilities for food production and restoration of wild population. This is an interdisciplinary endeavor encompassing larval hatchery technology and aquaculture. After reading about basic oyster biology and coastal aquaculture, we will focus on hatchery technology and aquaculture. Environmental issues, legislation pertaining to coastal aquaculture will also be covered using oyster farming in Hong Kong as an example. Students will learn why oyster habitat is declining in HK and would also explore scientific and management ways to restore oyster habitat. Students will be exposed to few aquaculture facilities in Hong Kong & will be taken to Penang (Malaysia) to learn practical skills of oyster farming. This course is designed to meet the needs of an expanding sustainable aquaculture in Hong Kong. Students will be exposed to a unique learning environment involving not only HKU but also teachers from Universiti Sains Malaysia (USM), bringing with them diverse range of expertise, culture, and learning opportunities. Career and small scale business opportunities in aquaculture industry will be discussed. Thus, students will be provided adequate knowledge & analytical capabilities for a successful career in larval biology research and aquaculture.

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 examine the influence of environmental variables on larval development and recruitment, and consider the potential effects of these variables on hatchery and farming
- CLO 2 acquire skills and experiential learning opportunities (e.g. hands-on experiences at laboratories and farms) in oyster hatchery and farming
- CLO 3 explain the importance of oyster farming in coastal habitat restoration
- CLO 4 plan and execute a commercially important research project in larval biology and aquaculture

Pre-requisites

Pass in BIOL2103 or BIOL2306 or BIOL3301 or BIOL3303
### Course Objectives

1. The course aims to introduce students to the major themes of contemporary evolutionary biology, including the history of evolutionary biology, evolutionary processes, adaptation, speciation, and evolution as an explanatory framework at all levels of biological organization.
2. The course emphasizes the interplay between theory and empirical tests of hypotheses, thus acquainting students with the process of science.

### Course Contents & Topics

- Introduction to Evolutionary Biology
- The tree of life
- Patterns of evolution
- Biogeography
- The evolution of biodiversity
- Mechanisms of evolution (Natural selection, mutation, genetic drift)
- Phenotypic evolution
- Social interactions in evolution (sex, kinship, co-evolution)
- Species and speciation
- Evolution of genes and genomes
- Evolutionary Development ( Evo-Devo)
- Macroevolution

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<td>CLO 4</td>
</tr>
<tr>
<td>Test</td>
<td>25</td>
<td>CLO 1.2</td>
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</table>

### Required/recommended reading and online materials

- Ecology of Marine Invertebrate Larvae (Larry McEdward, CRC Press)
- Shellfish Aquaculture and the Environment (S.E. Shumway, John Wiley & Sons)
- Molluscan Shellfish Farming (Brian Spencer, John Wiley & Sons)

### Additional Course Information

Taught and trained by several teachers, guest lecturers from government and aquaculture business sector; This course is offered in close collaboration with USM (Penang, Malaysia); Tentative duration: 1-15 June, 2018; In Part 1 - First 5 days at HKU for lectures, practicals and field visits - then flight to Penang to visit various oyster aquaculture facilities; Few USM (Malaysia) students may join the course; Fund for the Penang visit will be collected from students (about 6000 HKD including airfare, accommodation and selective meals for 7 days).

This course will be offered in alternative year.
CLO 3: understand mechanisms involved in the modern evolutionary theory
CLO 4: apply evolutionary thinking to real world problems in agriculture, medicine, and biodiversity conservation
CLO 5: reflect and theorize about evolutionary processes

<table>
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<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Pass in BIOL2306 Not for students who have passed in BIOL3501</th>
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<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Exceptionally good performance demonstrating excellent understanding of the subject matter, extensive knowledge over a wide range of topics covered by the course, and skilful applications of concepts/theories in solving new or unfamiliar problems, showing strong abilities in critical thinking and logical reasoning, with evidence of significant insight and original thought in dealing with the critical issues in the field.</th>
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</thead>
</table>

| A | Exceptionally good performance demonstrating excellent understanding of the subject matter, extensive knowledge over a wide range of topics covered by the course, and skilful applications of concepts/theories in solving new or unfamiliar problems, showing strong abilities in critical thinking and logical reasoning, with evidence of significant insight and original thought in dealing with the critical issues in the field. |
| B | Good performance demonstrating capacity to use the appropriate concepts, a good understanding of the subject matter, and an ability to handle the problems and materials encountered in the subject, showing evidence of attaining most of the course learning outcomes. |
| C | Adequate performance demonstrating some understanding of the subject matter, an ability to handle relatively simple problems, but showing incomplete command of knowledge required for attaining most of the expected course learning outcomes. |
| D | Minimally acceptable performance demonstrating at least partial familiarity with the subject matter and some capacity to deal with relatively simple problems, but also demonstrating serious deficiencies in knowledge required for attaining most of the expected course learning outcomes. |

| Fail | Poor performance in all aspects of the course, showing little evidence of learning, lacking real understanding of the subject matter, demonstrating deficiencies serious enough to make it inadvisable to proceed further without additional course work. |

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
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</table>

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<td>Laboratory</td>
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<td>Project work</td>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<td>Project report</td>
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<td>Test</td>
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|---|---|

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<tr>
<th>Course Website</th>
<th><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></th>
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<table>
<thead>
<tr>
<th>Additional Course Information</th>
<th>This course will be offered subject to a minimum enrollment number and availability of teachers.</th>
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<table>
<thead>
<tr>
<th>BIOL3508</th>
<th>Microbial physiology and biotechnology (6 credits)</th>
<th>Academic Year</th>
<th>2019</th>
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</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Biological Sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr A Yan, Biological Sciences (<a href="mailto:ayan8@hku.hk">ayan8@hku.hk</a>)</td>
<td></td>
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<tr>
<td>Teachers Involved</td>
<td>(Dr A Yan, Biological Sciences)</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Microbes are amazing and important entities on earth. Knowledge of microbes is widely applied in food, pharmaceutics, biotechnologies, diseases control, and biogeochemical processes. Microbial Physiology and Biotechnology provides both molecular basis for understanding of these important processes and up-to-date applications in modern Biotechnology, and to serve as essential foundations for sub-disciplines of Microbiology, such as environmental, food, and medicinal Microbiology. Upon completion, students will acquire fundamental knowledge about microorganisms, gain laboratory skills on methodologies for microbial studies, and be able to apply the knowledge in Microbial Biotechnologies.</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Course Contents &amp; Topics</th>
<th>Serving as a course which blends fundamental knowledge about the world of microorganisms with applied Microbial Biotechnology. This course is organized and presented in three themes: 'Microbial Rules', 'Microbial Breath', and 'Microbial Biotechnology'. Under these three themes, a broad range of highly educational and interesting topics are presented including: 'Microorganisms and their position in the living world', 'Fundamental methodologies for the study of microbes', 'Microbial structures and functions', 'Microbial growth and control', 'Energy Generation', 'Central metabolism', and 'Microbial biotechnological applications in biodegradation, biofuels and synthetic biology'. Topics are taught in a coherent manner with a highly interactive tutorial session following each of the topics such that students will achieve a high quality, stimulating, and problem-based learning experiences.</th>
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<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>On successful completion of this course, students should be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>appreciate the diversity of microbial metabolisms and applications in biotechnology</td>
</tr>
<tr>
<td>CLO 2</td>
<td>comprehend the principles underlying the dynamic nature of microbial physiology</td>
</tr>
<tr>
<td>CLO 3</td>
<td>gain laboratory skills on methodologies for microbial studies</td>
</tr>
<tr>
<td>CLO 4</td>
<td>relate knowledge to practical application of microbes in industry and medicine</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Pass in BIOL2103 or BIOL2220 or BIOC2600 or BIOC3604; Not for students who have passed in BIOL3108; and Not for students who have passed in BIOL4402.</th>
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<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills.</th>
</tr>
</thead>
</table>

| A | Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills. |
| B | Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational skills. |
| C | Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills. |

| Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show... |
Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
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<tbody>
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<td>Laboratory</td>
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<td>Project work</td>
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<tr>
<td>Reading / Self study</td>
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Assessment Methods and Weighting

<table>
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Examination</td>
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<td>CLO 1,3,4</td>
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Required/recommended reading and online materials

Supplementary Reading:
Brock Biology of Microorganisms, by Michael Madigan, John Martiniko, Kelly Bender, Daniel Buckley, David Stahl, Pearson Publisher
On-line textbook of Bacteriology: Kenneth Tobar, U. of Wisconsin-Madison, Department of Bacteriology. URL (http://www.textbookofbacteriology.net/)

Course Website: http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3606 Diet and disease (6 credits) Academic Year 2019

Offering Department: Biological Sciences

Course Co-ordinator: Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)

Teachers Involved: (Dr J C Y Lee, School of Biological Sciences)

Course Objectives

This course aims to provide understanding and insight into diseases associated with diet and basic dietetics, specifically:

1. Explain the relationships between diet and disease.
2. Describe the role of diet in the development and prevention of common chronic diseases such as diabetes, obesity and anorexia, cardiovascular disease, cancer, immune deficiency and renal failure.
3. Differentiate risk factors that influence dietary choice.
4. Describe the rationales for postoperative nutritional support for hospitalized patients.

Course Contents & Topics

The basics of nutrition for health and fitness and medical nutrition therapy. The role of diet in the development and prevention of chronic diseases such as cancer, diabetes, obesity and anorexia as well as bulimia nervosa, cardiovascular diseases, renal failure, etc. Malnutrition. Nutrition and immune function. Medical nutrition therapy for food allergy and food intolerance. Nutrition in pregnancy and lactation.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 discuss the different relationships between diet and disease
CLO 2 describe the role of diet in the development and prevention of diabetes, obesity and anorexia, cardiovascular disease, cancer, immune deficiency, and renal failure
CLO 3 clearly differentiate and interpret risk factors that influence dietary choice.
CLO 4 describe the rationales for postoperative nutritional support for hospitalized patients

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2220 or BIOC2600 or BIOL3202 or BIOL3204 or BIOL3205
Not for students who have passed in BIOL3206

Offer in 2019 - 2020

Y 2nd sem Offer in 2020 - 2021: Y Examination May

Grade Descriptors (A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective laboratory/fieldwork skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Substantial grasp of the subject. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective laboratory/fieldwork skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining at least most of the course learning outcomes. General but incomplete grasp of the subject. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective laboratory/fieldwork skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining most of the course learning outcomes. General but incomplete grasp of the subject, retention of some relevant information of the subject. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective laboratory/fieldwork skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Little or no grasp of the knowledge and understanding of the subject. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective laboratory/fieldwork skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
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<tr>
<td>Laboratory</td>
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<td>36</td>
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<tr>
<td>Reading / Self study</td>
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</tbody>
</table>
### BIOL3608

**Offering Department:** Biological Sciences  
**Course Co-ordinator:** Prof N P Shah, Biological Sciences (npshah@hku.hk)  
**Teachers Involved:** (Dr L Karczmarski, School of Biological Sciences)  
**Course Objectives:**  
To give students a broad understanding of modern practice and technologies used in agriculture products including meat, dairy and grain production, processing and marketing.  
**Course Contents & Topics:**  
Principles of animal nutrition and feed formulation; genetic selection and breeding of farm animals; slaughter and carcass inspection; meat preservation and safety; sensory quality of meat. Dairy processing emphasizing fermented products such as cheese and yogurt; probiotics and health effects. Grain production related to milling; dough rheology; the baking process and quality. Meat, dairy and grain product marketing.

**Course Learning Outcomes:**  
On successful completion of this course, students should be able to:  
- CLO 1 understand modern practices in meat, dairy and grain production  
- CLO 2 demonstrate a knowledge and understanding of meat and dairy sensory quality, and the technologies used in processing, preservation or improvement of meat and dairy products  
- CLO 3 demonstrate knowledge of selected issues related to meat and dairy safety  
- CLO 4 understand the technology behind the production of grain-based foods

**Pre-requisites and (Co-requisites and Impermissible combinations):**  
Pass in BIOL3201 or (BIOL2101 and any level 3 BIOL course); and  
Not for students who have passed in BIOL3210;  
Not for students who have passed in BIOL4207; and  
Not for students who have passed in BIOL4208.

**Offer in 2019 - 2020:**  
2nd sem  
Offer in 2020 - 2021: Y  
**Assessment Methods:**  
<table>
<thead>
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<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1.3,4</td>
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<tr>
<td>Examination</td>
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<td>CLO 1.2,3,4</td>
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<tr>
<td>Laboratory reports</td>
<td>Laboratory &amp; Research Reports</td>
<td>30</td>
<td>CLO 1.2,3</td>
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**Course Type:** Lecture with laboratory component course  
**Assessment Methods and Weighting:**  
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<th>Assessment Methods to CLO Mapping</th>
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<td>Laboratory &amp; research reports</td>
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<td>CLO 1.2,4</td>
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### BIOL3951

**Offering Department:** Biological Sciences  
**Course Co-ordinator:** Dr L Karczmarski, Biological Sciences (leszek@hku.hk)  
**Teachers Involved:** (Dr L Karczmarski, Biological Sciences)  
**Course Objectives:**  
This course is offered as a capstone experience and will require intense study of a topic relevant to the Ecology & Biodiversity Major during a field course, inside or outside Hong Kong.  
**Course Contents & Topics:**  
Every year a number of different potential courses may be offered. The precise contents will be tailored to best suit the topic and locality involved and will therefore vary according to the specific course being held. The basic contents will involve lectures, seminars and extensive field and follow-up laboratory work. It is essential that...
Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: understand the biodiversity and primary habitats in the ecosystem studied
- CLO 2: establish the basic skills needed to identify target species associated with the field course
- CLO 3: be knowledgeable about and able to implement sampling techniques for organisms in the particular ecosystems studied
- CLO 4: understand the basic ecology of target species and how biotic and abiotic factors shape focal communities

Pre-requisites (and Co-requisites and Impermissible combinations)

Passes in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Ecology & Biodiversity Major.

This capstone course is for Ecology & Biodiversity Major students only.

The earliest that a student is allowed to take this capstone course is their year 3 study.

Grades Descriptors (A+ to F)

A: Evidence of a thorough grasp of the subject and relevant research techniques. Eagerness and enthusiasm to learn and excellent familiarity with relevant background reading and case studies. Exemplary handling of field data collection and excellent analytical skills. Ample evidence of independent critical thought with excellent use of a broad range of fundamental concepts and broader comparative perspective to draw insightful and logical conclusions. Show outstanding abilities of independent work, effective presentation skills with excellent analytical presentation. Excellent or outstanding work relative to what is required at degree level.

B: Evidence of a good grasp of the subject and relevant research techniques. Interest in learning and good-to-moderate familiarity with relevant background reading and case studies. Good handling of field data collection and commendable analytical skills. Good evidence of critical thought (although not always independent), with an appreciable use of fundamental concepts and consideration of broader comparative perspective in drawing logical conclusions. Good abilities of independent work, effective presentation skills with logical and analytical argumentation. Work more than sufficient for what is required at degree level.

C: Demonstrate an adequate, but incomplete grasp of the subject and relevant research techniques. Moderate familiarity with relevant background reading and case studies, but no interest in learning beyond the adequate average level. Evidence of logical critical thinking (although not always independent), with mostly good use of fundamental concepts to draw logical conclusions. Fair presentation skills, with mostly correct argumentation, but limited (or no) abilities to integrate broader concepts. Work sufficient for what is required for degree level.

D: Demonstrate some grasp of the subject, but only partial and with limited understanding of relevant research concepts and research techniques. Some familiarity with relevant case studies, but insufficient evidence of background reading and limited abilities of critical independent thinking. Ineffective presentation skills with generally weak logical argumentation with restricted ability of drawing appropriate conclusions. Work barely meets what is required at degree level.

Fail: No evidence of basic a minimum grasp of the subject and the minimum relevant research techniques. No evidence of background reading and no familiarity with any relevant examples and case studies. Inadequate evidence of coherent logical thought, ineffective presentation skills with poor argumentation and no abilities to draw meaningful conclusions. Work fails to reach degree level.

Course Type

Field camps

Course Teaching & Learning Activities

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<tr>
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<td>Field work</td>
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<tr>
<td>Reading / Self study</td>
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Assessment Methods and Weighting

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<th>Methods</th>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Assignments</td>
<td></td>
<td>35</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Report</td>
<td>project report (35%), group investigation &amp; presentation (30%)</td>
<td>65</td>
<td>CLO 1,2,3,4</td>
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Required/recommended reading and online materials

Students will be directed to relevant scientific literature and websites.

Course Website

http://www.biosch.hku.hk/ecology/lsic/

Additional Course Information

Students can choose either one of the following courses:

- Subclass A: Marine Mammal Field Course
- Subclass B: Animal Behaviour Field Course

Enrollment Procedure:

The course is open to enrollment only during the add/drop period of the 2nd semester. Students are required to submit a brief (maximum 1-page) application letter (PDF file) via email to the Course Coordinator (leszek@hku.hk) not later than 11 January 2016. The application shall include the following:

1. Personal and academic details
2. ID photograph
3. Brief description of academic interests
4. GPA
5. Pre-requisite courses taken and grades received (if pre-requisites are not met, a reasoned request for waiver)

All applications will be reviewed prior to the commencement of the 2nd semester and results will be announced within the 1st week of the add/drop period of the 2nd semester.

BIOL3991

Directed studies in ecology & biodiversity (6 credits)

Academic Year: 2019

Offering Department: Biological Sciences

Quota: ---

Teachers Involved: Dr M Yasuhara, Biological Sciences (yasuhara@hku.hk)

Course Objectives

Students will undertake a dissertation on a topic related to the field of ecology and biodiversity. The dissertation will not involve any practical research in terms of laboratory or fieldwork, but will take the form of a desk-top study. Conducting a dissertation is an independent learning experience and will enable students to develop skills including the use of library and Web-based resources; the logical development of scientific arguments; written presentation skills; and personal time management.

Course Contents & Topics

An appropriate dissertation topic will be selected from a predetermitned list and following discussion with a member of Ecology & Biodiversity staff, who will act as the student's supervisor. Formal teaching will be limited and aimed at introducing students to the techniques necessary for successful completion of their dissertation.

On successful completion of this course, students should be able to:

- CLO 1: identify a relevant scientific question or knowledge gap
- CLO 2: establish a desk-top literature approach to test the question posed / address the knowledge gap
- CLO 3: undertake the appropriate research to test the question / address the knowledge gap using sound scientific principles; including statistical analyses where appropriate
BIOL3992

Directed studies in food & nutritional science (6 credits)

Offering Department
Biological Sciences

Teachers Involved
Dr O Habimana, Biological Sciences (ohabim@hku.hk)

Course Objectives
This course aims to provide a stimulating capstone experience for all Food & Nutritional Science Major undergraduates to integrate and apply their knowledge and skills obtained from the Major.

Course Contents & Topics
The directed study can be a review of literature on a specific topic, or a lab or field study that enhances the student’s understanding of the topic in the field of food & nutritional science. The student should obtain the commitment of a supervisor in the area of the dissertation topic before submitting the registration form for the course. For any questions, contact the supervisor before registering.

Pre-requisites (and Co-requisites and Impermissible combinations)
Passes in at least 24 credits of advanced level disciplinary core / elective courses in the Food & Nutritional Science Major / Food & Nutritional Science (Intensive) Major.

Grade Descriptors (A to F)
A Work displaying a high level of scholarship and originality; virtually flawless presentation with excellent introduction to dissertation topic, showing a thorough grasp of the topic from background reading and analysis; clear statement of the objectives of the study; comprehensive exploration of the topic, demonstrating a well-developed understanding of the literature; comprehensive and up-to-date references integrated into argument or logical reasoning; critical evaluations of the main points or problems and their solutions and implications; thought-provoking discussions; accurate summary. All chapters/paragraphs are well-connected and presented logically with clarity of goals, arguments, and supporting evidence. The length of the dissertation meets the specified requirements. All other aspects of the dissertation conform to a high academic standard.

B Work showing some evidence of originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; demonstrating substantial understanding of fundamental concepts of the field of study; adequate grasp of the topic from background reading and analysis; a systematic exploration of the topic which may include an attempt at critical comment or appraisal; regular support provided from the literature; comprehensive and up-to-date references included; main points fully elaborated; summary given in the final chapter/paragraphs; communicating information and ideas clearly and fluently, demonstrating good organizational, rhetorical and presentational skills. The length of the dissertation meets the specified requirements. Most aspects conform to a high academic standard.

C Work showing some evidence of originality and insight, but the presentation demonstrated adequate understanding and comprehensive. Most aspects of the dissertation topic; essential topic material was read and acknowledged; the main points presented in logically sequential paragraphs; reasonably balanced discussion of the major issues; acceptable interpretation of the topic, some explanation, illustration and support provided from the literature; summary given in the final chapter/paragraphs; most presentation details met (front page, margin, legibility, citations correctly reported and tabulated, etc.); few typos or grammatical errors; Most aspects conform to an acceptable academic standard.

D Demonstrating superficial or partial or faulty understanding of the fundamental concepts of the field of study; showing the bare minimum of information, poorly digested and not very well organized in presentation; irrelevant material; showing no evidence of

Course Type
Project-based course

Assessment Methods and Weighting

Methods
Research report

Details
Mid-term written essay plan (20%), Written report 6000-7000 words (excluding figures and references) (80%)

Weighting in final course grade (%)
100

Assessment Method to CLO Mapping
CLO 1, 2, 3, 4, 5

Course Website
http://moodle.hku.hk

Additional Course Information
Regular meetings between the supervisor and student. Guidance from the supervisor on the scientific methods, and on how to think and write scientifically. Students should spend at least 120 hours on the dissertation or project. Recommended reading may be assigned.

BIOL3XX (excluding figures and references)
School of Biological Sciences

BIOL3993
Directed studies in Molecular biology & biotechnology (6 credits)

Offering Department
Biological Sciences

Quota
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Course Teaching & Learning Activities
Activities
Reading / Self study
Details
at least 120 hours on the dissertation or project
No. of Hours
120

Assessment Methods and Weighting
Methods
Oral presentation
Details
15 minutes (Plus 5 minutes for questions and answers).
Weighting in final course grade (%)
20
Assessment Methods to CLO Mapping
CLO 1,2,3,4

Research report
Details
Written report 6000-8000 words (excluding figures and references).
Weighting in final course grade (%)
80
Assessment Methods to CLO Mapping
CLO 1,2,3,4

Course Website
http://moodle.hku.hk/

Additional Course Information
Regular meetings between the supervisor and student. Guidance from the supervisor on the scientific methods, and on how to think and write scientifically. Students should spend at least 120 hours on the dissertation or project. Recommended reading may be assigned.

Course Type
Project-based course

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 acquaint with the process of science
CLO 2 have a better understanding of the nature of molecular biology & biotechnology
CLO 3 apply scientific methods to address important issues in various biological disciplines
CLO 4 develop the key intellectual skills that will be valuable for all scientific studies

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in at least 24 credits of advanced level disciplinary core / elective courses in the Molecular Biology & Biotechnology Major.

Course Contents & Topics
The directed study can be a review of literature on a specific topic, or a lab or field study that enhances the student's understanding of the topic in the field of molecular biology & biotechnology. The student should obtain the commitment of a supervisor in the area of the dissertation topic before submitting the registration form for the course (available from the General Office of School of Biological Sciences). Supervisor will introduce various methodologies/techniques and guide students to completion of the dissertation. Teaching will be informal and students will gain knowledge through discussion and feedback from their supervisors.

Academic Year
2019

Grade Descriptors (A to F)

A Work displaying a high level of scholarship and originality; virtually flawless presentation with excellent introduction to dissertation topic; showing a thorough grasp of the topic from background reading and analysis; clear statement of the objectives of the research; comprehensive exploration of the topic, personal synthesis of the issues with detailed support from the literature; comprehensive and up-to-date references integrated into argument or logical reasoning; critical evaluations of the main points or problems and their solutions and implications; thought-provoking discussions; accurate summary. All chapters/paragraphs are well-connected and presented logically with clarity of goals, demonstrating excellent organizational, rhetorical and presentational skills. The length of the dissertation meet the specified requirements. Most aspects conform to a high academic standard.

B Work showing some evidence of originality and insight in identifying, generating and communicating compelling arguments, perspectives or problem solving approaches; demonstrating substantial understanding of the field of study; adequate grasp of the topic from background reading and analysis; a systematic exploration of the topic which may include an attempt at critical comment or appraisal; regular support provided from the literature; comprehensive and up-to-date references included; main points fully elaborated; summary given in the final chapter/paragraphs; communicating information and ideas clearly and fluently, demonstrating good organizational, rhetorical and presentational skills. The length of the dissertation meet the specified requirements. Most aspects conform to an acceptable academic standard.

C Work showing no evidence of originality and insight, but the presentation demonstrated adequate understanding and comprehension of most aspects of the dissertation topic; essential topic materials have been read and acknowledged; the main points presented in logically sequential paragraphs; reasonably balanced discussion of the major issues; acceptable interpretation of the topic, some explanation, illustration and support provided from the literature; summary given in the final chapter/paragraphs; most presentation details met (front page, margin, legibility, citations correctly reported and tabulated, etc.); few typoi or grammatical errors; Most aspects conform to an acceptable academic standard.

D Demonstrating superficial or partial or faulty understanding of the fundamental concepts of the field of study; showing the bare minimum of information, poorly digested and not very well organized in presentation; irrelevant material; showing no evidence of critical thinking; arguments undeveloped or inappropriate or unsupported; lack of clarity or structure in communicating information or ideas; dissertation topic not fully covered; discussion too brief or just repeating the data or findings; overuse quotations with little explanation; insufficient support from literature; reading not well incorporated into the text; limited acknowledgements and tight bibliography; some major points missed. Minimum conform to an acceptable academic standard.

Fail The dissertation topic was not covered acceptably; demonstrating evidence of poor knowledge, clear deficiencies in understanding fundamental concepts; materials largely irrelevant; incomplete or confusing communication of information or ideas; ineffective; incoherent argument; complete misrepresentation of the topic or data; no evidence of reading (no acknowledgements or bibliography); structure confused or not discernible; Fail to meet most or all of the basic requirements of the course. The written work is not of an academic standard.

Teachers Involved
Dr A Yan, Biological Sciences (ayan8@hku.hk)

Course Objectives
This course aims to provide a stimulating capstone experience for all Molecular Biology & Biotechnology Major undergraduates and to engage and apply their knowledge and skills obtained from the Major courses and on how to think and write scientifically. Students should spend at least 120 hours on the dissertation or project. Recommended reading may be assigned.

Additional Course Information
Regular meetings between the supervisor and student. Guidance from the supervisor on the scientific methods, and on how to think and write scientifically. Students should spend at least 120 hours on the dissertation or project. Recommended reading may be assigned.

Course Type
Project-based course

Course Teaching & Learning Activities
Activities
Reading / Self study
Details
at least 120 hours on the dissertation or project
No. of Hours
120

Assessment Methods and Weighting
Methods
Oral presentation
Details
15 minutes (Plus 5 minutes for questions and answers).
Weighting in final course grade (%)
20
Assessment Methods to CLO Mapping
CLO 1,2,3,4

Research report
Details
Written report 6000-8000 words (excluding figures and references).
Weighting in final course grade (%)
80
Assessment Methods to CLO Mapping
CLO 1,2,3,4

School of Biological Sciences

633
BIOL3994
Directed studies in biological sciences (6 credits)

Academic Year: 2019

Offering Department: Biological Sciences

Course Co-ordinator: Dr S Cannicci, Biological Sciences (cannicci@hku.hk)

Teachers Involved: (All academic staff in Biological Sciences Major, Biological Sciences)

Course Objectives: This course aims to provide a stimulating capstone experience for all Biological Sciences Major undergraduates to integrate and apply their knowledge and skills obtained from the Major.

Course Contents & Topics: The directed study can be a review of literature on a specific topic, or a lab or field study that enhances the student's understanding of the topic in the field of biological sciences. The student should obtain the commitment of a supervisor in the area of the dissertation topic before submitting the registration form for the course (available from the General Office of School of Biological Sciences). Supervisor will introduce various methodologies/techniques and guide students to completion of the dissertation. Teaching will be informal and students will gain knowledge through discussion and feedback from their supervisors.

Course Learning Outcomes: On successful completion of this course, students should be able to:

- CLO 1: Acquaint with the process of science
- CLO 2: Have a better understanding of the nature of biological sciences
- CLO 3: Apply scientific methods to address important issues in various biological disciplines
- CLO 4: Develop the key intellectual skills that will be valuable for all scientific studies

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOI3XXX or BIOL4XXX) in the Biological Sciences Major.

This capstone course is for Biological Sciences Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020: Y

Y 1st sem 2nd sem Offer in 2020 - 2021: Y

Examination: No Exam

Grade Descriptors (A to F):

A: Work displaying a high level of scholarship and originality; virtually flawless presentation with excellent introduction to dissertation topic, showing a thorough grasp of the topic from background reading and analysis; clear statement of the objectives of the research; comprehensive exploration of the topic, personal synthesis of the issues with detailed support from the literature; comprehensive and up-to-date references integrated into argument or logical reasoning; critical evaluations of the main points or problems and their solutions and implications; thought-provoking discussions; accurate summary. All chapters/paragraphs are well-connected and presented logically with clarity of goals, demonstrating excellent organizational, rhetorical and presentational skills. The length of the dissertation meet the specified requirements. All other aspects of the dissertation conform to a high academic standard.

B: Work showing some evidence of originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; demonstrating substantial understanding of fundamental concepts of the field of study; adequate grasp of the topic from background reading and analysis; a systematic exploration of the topic which may include an attempt at critical comment or appraisal; regular support provided from the literature; comprehensive and up-to-date references included; main points fully elaborated; summary given in the final chapter/paragraphs; communicating information and ideas clearly and fluently, demonstrating good organizational, rhetorical and presentational skills. The length of the dissertation meet the specified requirements. Most aspects conform to a high academic standard.

C: Work showing no evidence of originality and insight, but the presentation demonstrated adequate understanding and comprehension of most aspects of the dissertation topic; essential topic materials have been read and acknowledged; the main points presented in logically sequential paragraphs; reasonably balanced discussion of the major issues; acceptable interpretation of the topic, some explanation, illustration and support provided from the literature; summary given in the final chapter/paragraphs, most presentation details met (front page, margin, legibility, citations correctly reported and tabulated, etc.); few typographical errors; Most aspects conform to an acceptable academic standard.

D: Demonstrating superficial or partial or faulty understanding of the fundamental concepts of the field of study; showing the bare minimum of information, poorly digested and not very well organized in presentation; insufficient material; showing no evidence of critical thinking; arguments undeveloped or inappropriate or unsupported; lack of clarity or structure in communicating information or ideas; dissertation topic not covered sufficiently; discussion too brief or just repeating the data or findings; inadequate presentation of evidence and/or explanations within the text; limited acknowledgments and limited bibliography; some major points missed. Minimum conform to an acceptable academic standard.

Fail: The dissertation topic was not covered acceptably; demonstrating evidence of poor knowledge, clear deficiencies in understanding fundamental concepts; materials largely irrelevant; incomplete or confused communication of information or ideas; unacceptable; incoherent argument; complete misinterpretation of the topic or data; no evidence of reading (no acknowledgments or bibliography); structure confused or not discernible; Fail to meet most or all of the basic requirements of the course. The written work is not of an academic standard.

Course Type: Project-based course

Course Teaching & Learning Activities:

- Activities: Reading / Self study
- Details: at least 120 hours on the dissertation or project
- No. of Hours: 120

Assessment Methods and Weighting:

- Methods: Oral presentation, Research report
- Details: 15 minutes (Plus 5 minutes for questions and answers), Written report
- Weighting in final course grade (%): 20
- Assessment Methods to CLO Mappings: CLO 1, 2, 3, 4

Course Website: http://moodle.hku.hk/

Additional Course Information: Regular meetings between the supervisor and student. Guidance from the supervisor on the scientific methods, and on how to think and write scientifically. Students should spend at least 120 hours on the dissertation or project. Recommended reading may be assigned.
overnutrition: definitions, prevalence, public health consequences, and interventions. Epidemiology, public health consequences, and elimination of vitamin and mineral deficiencies. Disease prevention. Educating the public for healthy eating and food safety.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1**: have a broad knowledge of the scope and methodologies of public health nutrition
- **CLO 2**: have a clear technical understanding of a range of selected examples of public health nutrition cases in less-developed and developed countries
- **CLO 3**: be able to formulate recommendations for action for nutritional interventions at the community level
- **CLO 4**: understand the impact of socio-cultural factors on community food choices and consequently on health outcomes

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL3201 or BIOL3202

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
<th>May</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Y 2nd sem</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective laboratory/fielwork skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.</td>
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<tr>
<td>C</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Substantial grasp of the subject. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective laboratory/fielwork skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.</td>
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<tr>
<td>D</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. General but incomplete grasp of the subject. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective laboratory/fielwork skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.</td>
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<tr>
<td>F</td>
<td>Fail</td>
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**Course Type**

Lecture with laboratory component course

**Course Teaching & Learning Activities**

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<td>Lectures</td>
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<tr>
<td>Laboratory</td>
<td>24</td>
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<tr>
<td>Reading / Self study</td>
<td>90</td>
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**Assessment Methods and Weighting**

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<th>Weighting in final course grade (%)</th>
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<td>Assignments</td>
<td>30</td>
<td>CLO 3</td>
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<tr>
<td>Examination</td>
<td>70</td>
<td>CLO 1, 2, 3, 4</td>
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**Required/recommended reading and online materials**


**Course Website**

http://moodle.hku.hk/

**Additional Course Information**

This course will be offered subject to a minimum enrollment number and availability of teachers.

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**BIOL4202**

Nutrition and sports performance (6 credits) Academic Year 2019

**Offering Department**

Biological Sciences

**Course Co-ordinator**

Dr T Sobko, Biological Sciences (tsobko@hku.hk)

**Teachers Involved**

(Dr T Sobko, School of Biological Sciences)

**Course Objectives**

To demonstrate evidence-based links between nutrition, exercise and sport performance. More specifically, to gain in-depth understanding about how the metabolic demands of exercise influence physiological and cognitive functions and exercise performance. To focus on the role of major macronutrients, minerals, vitamins, antioxidants, supplements and hydration in sustaining and enhancing sports performance during short-duration, intermittent and endurance exercise.

**Course Contents & Topics**

Nutrition aims and requirements differ during habitual exercise and competitive sports: from endogenous adaptations to developing metabolic efficiency to competition nutrition. Professional athletes enhance their performance through appropriate nutrition, following the recommendations of the International Olympic Committee: "The amount, composition and timing of food intake can profoundly affect sports performance" (Maughan et al, 2004). The course will firstly examine the physiological needs pre-, during and post-competition and/or habitual exercise to perform at its best. Secondly, it will investigate how and why nutrient and energy intakes vary between different athlete groups, the difference between energy metabolism and requirements during aerobic and anaerobic exercise. Putting exercise and sports performance in focus, the topics will include: energy balance; macronutrients; selected micronutrients; fluid balance and hydration strategies; weight loss and weight gain in athletes, sport foods and supplements; position stands and new perspectives on sports nutrition, nutrient/energy requirements in exercise and sports, ergogenic aids and myths of sport nutrition

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1**: critically examine and describe the need of energy, nutrients and fluid before, during and after the physical exercise in relation to different sports, individual athletes and performance situations
- **CLO 2**: describe the impact of dietary macronutrients, vitamins and minerals on physical performance
- **CLO 3**: provide an overview of the position stands on major misconceptions in sports nutrition. Being able to evaluate, explain and communicate current, evidence based epidemiological knowledge behind these position stands.
CLO 4 access and analyze the importance of meal frequency, energy source and supplements on the performance in different sports.

CLO 5 demonstrate convincing argument for importance of balanced nutrition for sports performance and good health.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL3202

Offer in 2019 - 2020

N Offer in 2020 - 2021 : Y Examination ---

Grade Descriptors (A to F)

A Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critical use quality management skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.

B Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use quality management skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.

C Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use quality management skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentational skills.

D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use quality management skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate team-based organizational and presentational skills of limited effectiveness.

Fail Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use quality management skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures with practicals 36
Tutorials 10
Discussion 20
Reading / Self study 50

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Tutorial assessment (40%); Group project and presentation (50%) and Critical review (10%) 100 CLO 1,2

Required/recommended reading and online materials

Most of the reading material will be provided on Moodle or given during lectures; however, do make use of the book and journal resources in HKU’s libraries including:

Course Website

http://moodle.hku.hk

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4204 Diet, brain function and behavior (6 credits)

Offering Department

Biological Sciences

Course Co-ordinator

Dr E T S Li, Biological Sciences (etsli@hku.hk)

Teachers Involved

(Dr E T S Li, Biological Sciences)

(Dr J C Y Lee, Biological Sciences)

Course Objectives

To highlight the impact of nutrient provision on brain structure and function, and to discuss various effects of nutrition and diet on mental function and behaviour.

Course Contents & Topics

Fundamentals of the central nervous system; Nutrition & brain development; Diet, learning & memory function; Dietary CNS stimulants; Neurotransmitters, drugs & behaviour; Physiological and socio-cultural determinants of dietary behaviour.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand the basic structure and functions of the brain and how nutrition influences its development

CLO 2 be able to explain the consequences of malnutrition on cognition

CLO 3 Appreciate appetite control as a function of food-gut-brain interaction

CLO 4 understand the differences between bioactive food ingredients and drugs

CLO 5 critically evaluate and interpret the internal and external cues that determine dietary behaviour

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL3204, or already enrolled in this course

Offer in 2019 - 2020

N Offer in 2020 - 2021 : N Examination ---

Grade Descriptors (A to F)

A Demonstrate thorough grasp of the subject matter covered. Show exceptional ability on knowledge integration, problem identification and solving. Show outstanding ability to critically analyze and interpret scientific data and draw appropriate conclusions. Demonstrate highly effective presentation / writing skills.

B Demonstrate substantial grasp of the subject matter covered. Show full ability on knowledge integration, problem identification and solving. Show reasonable ability to critically analyze and interpret scientific data and draw appropriate conclusions. Demonstrate effective presentation / writing skills.

C Demonstrate general but incomplete grasp of the subject matter covered. Show misunderstanding of the materials. Show some ability on knowledge integration, problem identification and solving. Show some ability to analyze and interpret scientific data and draw proper conclusions. Demonstrate adequate organization / writing skills.

D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Misunderstanding of the materials is not uncommon. Show limited ability on knowledge integration, problem identification and solving. Use elementary approaches to analyze and interpret scientific data and draw sometimes erroneous conclusions. Demonstrate basic organization / writing skills.

636 School of Biological Sciences
Course Type: Lecture-based course

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assignments</td>
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<td>CLO 1, 2, 4</td>
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<tr>
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<td>Examination</td>
<td>60</td>
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<td></td>
<td>Presentation</td>
<td>20</td>
<td>CLO 2, 4</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

- Nutritional Neuroscience (Journal)
- Physiology and Behavior (Journal)
- Appetite (Journal)
- Journal of Nutritional Biochemistry (Journal)

Course Website: http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4205 Food technology (6 credits) Academic Year: 2019

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof N P Shah, Biological Sciences (<a href="mailto:npshah@hku.hk">npshah@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Prof N P Shah, Biological Sciences)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To provide students with basic principles and methodologies of food processing and preservation technology. To cover key engineering principles relevant to the food industry. Students will gain hands-on experience with selected food processing and preservation techniques.</td>
</tr>
</tbody>
</table>

Course Contents & Topics

Food processing is a multidisciplinary field combining applied physical sciences with knowledge of product properties and requirements. This course introduces the technical knowledge required to implement cost-effective production and commercialization of food products and services. The design and development of processes, equipment and machinery used to convert raw agricultural materials and ingredients into safe, convenient, and nutritious consumer food products are covered. We discuss the basic engineering principles and applications of methods in food processing and preservation. Techniques discussed will include those for high and low temperature processing, concentration, dehydration, baking and extirpation.

Course Learning Objectives

On successful completion of this course, students should be able to:

- CLO 1 understand basic principles of food processing methods and preservation technology
- CLO 2 be able to apply their knowledge and practical skills to process and develop food products
- CLO 3 demonstrate in-depth understanding of selected methods and problems in food processing and preservation

Pre-requisites and Co-requisites (and Impermissible combinations)

Pass in BIOL3201 or BIOL3209

Offer in 2019 - 2020

Y 2nd sem Offer in 2020 - 2021 : Y Examination May

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
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<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough grasp of the subject matter covered. Show strong evidence of analytical and critical abilities of the changes that take place in variety of food during preparation, processing and storage. Identifies and uses advanced techniques and equipment for a variety of food-specific purposes. Demonstrates advance skills in designing, producing and evaluating solutions of excellent quality for specific food purposes. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities of the changes that take place in variety of food during preparation, processing and storage. Identifies and uses techniques and equipment for a variety of food-specific purposes. Demonstrates high-level skills in designing, producing and evaluating solutions of high quality for specific food purposes. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions.</td>
<td></td>
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<tr>
<td>C</td>
<td>Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking of the changes that take place in variety of food during preparation, processing and storage. Identifies and uses basic techniques and equipment for a variety of food-specific purposes. Demonstrates basic skills in designing, producing and evaluating solutions for specific food purposes. Use lab skills and techniques and analysis of data and results to draw moderately appropriate conclusions occasionally.</td>
<td></td>
<td></td>
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<tr>
<td>D</td>
<td>Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking of the changes that take place in variety of food during preparation, processing and storage. Identifies and uses factors and uses some appropriate techniques and equipment for a limited range of food-specific purposes. With guidance, demonstrates limited skills in designing, producing and evaluating solutions for specific food purposes. Use lab skills and techniques and analysis of data and results inadequately, leading generally to inappropriate and usually erroneous conclusions.</td>
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Course Type: Lecture with laboratory component course

<table>
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<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
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<tr>
<td>Laboratory</td>
<td>laboratory/field trip/seminar</td>
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<tr>
<td>Tutorials</td>
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<td>Reading / Self study</td>
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</table>
BIOL4207

Meat and dairy sciences (6 credits)

Academic Year: 2019

Offering Department: Biological Sciences

Quota: 50

Course Co-ordinator: Prof N P Shah, Biological Sciences (npshah@hku.hk)

Pre-requisites: Pass in BIOL3201

This course will be offered subject to a minimum enrollment number and availability of teachers.

Course Website: http://moodle.hku.hk/

Additional Course Information: This course will be offered subject to a minimum enrollment number and availability of teachers.

Course Objectives:

To give students a broad understanding of modern practice and technologies used in meat and dairy production, processing and marketing.

Course Contents & Topics:

Principles of animal nutrition and feed formulation; genetic selection and breeding of farm animals; slaughter and carcass inspection; meat preservation and safety; sensory quality of meat. Dairy processing emphasizing fermented products such as cheese and yogurt; probiotics and health effects. Meat and dairy product marketing.

Course Learning Outcomes:

On successful completion of this course, students should be able to:

- CLO 1 understand modern practices in meat and dairy production
- CLO 2 demonstrate a knowledge and understanding of meat and dairy sensory quality, and the technologies used in processing, preservation or improvement of meat and dairy products
- CLO 3 demonstrate knowledge of selected issues related to meat and dairy safety

Assessment Methods and Weighting:

- Examination: 80 CLO 1, 2, 3
- Laboratory reports: 20 CLO 2, 3

Course Type:

Lecture with laboratory component course

Course Teaching & Learning Activities:

Activities: Details
- Lectures: 24
- Laboratory: 24
- Tutorials: 6
- Reading / Self study: 100

Required/recommended reading and online materials:


Course Website: http://moodle.hku.hk/

Additional Course Information:

This course will be offered subject to a minimum enrollment number and availability of teachers.

Grade Descriptors (A+ to F):

- A: Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentation skills.
- B: Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentation skills.
- C: Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentation skills.
- D: Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate team-based organizational and presenational skills of limited effectiveness.
- Fail: Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentation skills.

Course Objectives:

To give students a broad understanding of modern practice and technologies used in agriculture products including meat, dairy and grain production, processing and marketing.

Course Contents & Topics:

Principles of animal nutrition and feed formulation; genetic selection and breeding of farm animals; slaughter and carcass inspection; meat preservation and safety; sensory quality of meat. Dairy processing emphasizing fermented products such as cheese and yogurt; probiotics and health effects. Grain production related to milling; dough rheology; the baking process and quality, Meat, dairy and grain product marketing.

Course Learning Outcomes:

On successful completion of this course, students should be able to:

- CLO 1 understand modern practices in meat, dairy and grain production
- CLO 2 demonstrate a knowledge and understanding of meat and dairy sensory quality, and the technologies used in processing, preservation or improvement of meat and dairy products
- CLO 3 demonstrate knowledge of selected issues related to meat and dairy safety
Offering Department: Biological Sciences

Offer in 2019 - 2020: N

Grade Descriptors (A+ to F)

- **A**: Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.

- **B**: Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.

- **C**: Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentational skills.

- **D**: Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate team-based organizational and presentational skills of limited effectiveness.

- **F**: Fail

Course Type: Lecture-based course

Course Teaching & Learning Activities

<table>
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<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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<td>Laboratory</td>
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<td>24</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
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Assessment Methods and Weighting

<table>
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Laboratory reports</td>
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<td>30</td>
<td>CLO 1,2,3</td>
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</table>

Required/recommended reading and online materials

- http://moodle@hku.hk

Additional Course Information

The course will be offered subjected to a minimum enrollment number and availability of teachers.

**BIOL4209**

**Functional foods (6 credits)**

**Offering Department**: Biological Sciences

**Course Co-ordinator**: Dr M F Wang, Biological Sciences (mfwang@hku.hk)

**Teachers Involved**: (Dr L Zhang, Biological Sciences)

**Course Objectives**: To provide a fundamental understanding of the rapidly emerging functional food/nutraceutical industry with an emphasis on the history, regulation, chemical basis and quality control of healthy ingredients/products and their effects on human health.

**Course Contents & Topics**: Concept, history and global regulation of functional foods and nutraceuticals; classification of functional foods and nutraceuticals based on their chemical structures; unsaturated fatty acids, proteins, food pigments and dietary fibers as healthy food ingredients; health benefits of dietary phenolics, terpenes, phytosterols and sulphur-containing compounds; probiotics and prebiotics; small berries, spices, teas and herbs for health; quality control and assurance of functional foods and nutraceuticals.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- CLO 1 understand the definition and global regulation of functional foods and nutraceuticals
- CLO 2 have substantial chemical knowledge of functional food and nutraceutical products
- CLO 3 be able to describe examples of functional foods and interpret critically their claimed health benefits
- CLO 4 demonstrate understanding of the current functional food and nutraceutical industry
- CLO 5 understand major techniques and technologies for quality control and manufacturing of healthy products

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL3201 or BIOL3202

**Offer in 2019 - 2020**: Y

**Grade Descriptors (A+ to F)**

- **A**: Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.

- **B**: Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use knowledge to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.

- **C**: Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use knowledge to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentational skills.

- **D**: Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use knowledge to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate team-based organizational and presentational skills of limited effectiveness.

- **F**: Fail

**Course Type**: Lecture-based course
BIOL4210

Food product development (6 credits)

Offering Department
Biological Sciences

Course Co-ordinator
Dr M F Wang, Biological Sciences (mfwang@hku.hk)

Teachers Involved
Dr M F Wang, Biological Sciences

Course Objectives
To introduce the key concepts and techniques used in food product development. To provide small group experience in the design, development and production of a new food product.

Course Contents & Topics
History and future of the food industry; industrial product development process; idea generation and prototype development for new food products; quality management and legal protection; marketing strategies; food labeling; food package design; new product development for different food industries.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the food product development cycle
CLO 2 know the key steps in new product development
CLO 3 demonstrate enhanced insight and understanding of current and future trends in the food industry
CLO 4 have professional level practical experience in new product development
CLO 5 know the main characteristics of different sectors of the food industry

Pre-requisites
Pass in BIOL3203 or BIOL4205

Offer in 2019 - 2020
N

Exercise
---

Grade Descriptors
(A to F)

A
Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.

B
Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.

C
Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentational skills.

D
Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate team-based organizational and presentational skills of limited effectiveness.

Fail
Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Course Type
Laboratory and workshop course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures
Tutorials tutorials/seminars
Reading / Self study

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments
Examination

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk/

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4301

Fish and fisheries (6 credits)

Offering Department
Biological Sciences

Course Co-ordinator
TBC, Biological Sciences

Teachers Involved
(TBC.)

Academic Year
2019

Quota
40
Course Objectives
- to acquaint students with the principles governing interrelationships among fishes as well as with biotic and abiotic aspects of their environment for an understanding of population dynamics and multispecies interactions.
- to provide an understanding of how species diversity and selected aspects of their life history are relevant to fishery management challenges, sustainable supply of seafood, and the conservation of threatened species.
- to cover the theoretical and practical aspects of marine fisheries management, fish farming and fish conservation using local, regional and global examples.

Course Contents & Topics
Introduction to course: phylogenetic, biological and ecological concepts and adaptation. Multispecies interactions in marine and freshwater fish assemblages. Fishery theory; how do fisheries work? Status of the world’s capture fisheries; fish stock assessment and fishery management practices using local, regional and global examples. The roles of mariculture and capture fisheries for seafood supply and relationship to capture fisheries. Fishery management and fish conservation. Conclusion: fish biodiversity and fishery production; ethics of fish research and exploitation; climate change and the future of fish and fisheries.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand the basis of fish species diversity in relation to phylogenetic, ecological and biological factors
CLO 2 appreciate the direct and indirect impacts and consequences of human activities on fish species and species assemblages and implications for seafood security
CLO 3 understand the functioning of fisheries and standards of fisheries assessment, development and management
CLO 4 appreciate the mutual dependency of humans with fished populations in relation to their long-term sustainability
CLO 5 enhance the ability for critical and synthetic thinking and to consider innovative approaches to research and management

Pre-requisites (and Co-requisites and impermissible combinations)
Pass in BIOL3301 or BIOL3303

Offer in 2019 - 2020
N

Offer in 2020 - 2021 : N

Examination ---

Grade Descriptors (A to F)
A
Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, ability to integrate and synthesize information, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective presentational skills. Strong evidence of clear attention to thoughtful and reflective thinking.

B
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, integration of materials and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate effective presentational skills. Evidence of clear attention to thoughtful and reflective thinking.

C
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective presentational skills. Little evidence of clear attention to thoughtful and reflective thinking.

D
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities and little attempt at integration. Show limited ability to apply knowledge to solve problems. Apply limited effectiveness in presentational skills. Lack of attention to thoughtful and reflective thinking.

Fail
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures
Field work
Reading / Self study

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Examination Test

Required/recommended reading and online materials
G. Helfman, B. Collette and D. Facey: The Diversity of Fishes (Blackwell Science, 1997)

Additional Course Information
Offer in alternate year from 2017–2018
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4302 Environmental impact assessment (6 credits)

Offering Department Biological Sciences

Course Co-ordinator Dr J Wu, Biological Sciences (jinwu@hku.hk)

Teachers Involved
(Prof K M Y Leung, Biological Sciences)

Course Objectives
To introduce the general principles, processes, techniques, current practices and problems of environmental impact assessment (EIA).

Course Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand the operation of EIA systems in Hong Kong and overseas
CLO 2 apply a variety of techniques in assessing environmental impact
CLO 3 evaluate different options and determine acceptability in environmental impact assessment
CLO 4 prepare EIA reports for small scale projects

Academic Year 2019

Quota 30
### Course Objectives

On successful completion of this course, students should be able to:

- **CLO 1** learn to appreciate the causes, functions, development, and evolution of animal behaviour
- **CLO 2** appreciate the complexity of interactions between environmental selective pressures and animal behaviour
- **CLO 3** appreciate current theories that form basis for modern understanding of animal behaviour
- **CLO 4** learn the scientific reasoning and methodology in the field of Animal Behaviour
- **CLO 5** think analytically in terms of behavioural ecology, animal socio-behavioural complexity, and how the understanding of species' behaviour contributes to its conservation

### Pre-requisites

Pass in BIOL3306; and
Pass in one of the following courses: BIOL3301, BIOL3313, BIOL3319, BIOL3320 or BIOL3419

### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>N</td>
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</tbody>
</table>

### Course Contents & Topics

This course will introduce students to scientific reasoning and conceptual basis of an understanding of animal behaviour and behavioural ecology. What causes specific behaviour and what are the underlying mechanisms? How does behaviour develop within the individual's lifetime and what functions does it serve? For example, why are some species monogamous while others are polygamous? What makes one organism the hunter and another the hunted? Several animal species, including humans, tend to live in groups; social life is among the most complex and effective survival strategy. However, how could, for instance, the birth of sterile castes, like in bees, be explained through an evolving mechanism which emphasizes the reproductive success of as many individuals as possible? Why, among animals living in small groups like squirrels, would an individual risk its own life to save the rest of the group? In this course, based upon ecological and evolutionary principles, students will learn to think within the paradigm of behavioural ecology and understand the causes, functions, development, and evolution of behaviour. We will discuss several classical studies that form the foundation of this field, as well as more recent research that represents the current concepts which have led to modern understanding of animal behaviour. We will also illustrate the links between the recent extraordinary advances in behavioural ecology and socio-ecology with their application in animal conservation.

### Course Assessment

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
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<td>CLO 1,2,3,4</td>
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<tr>
<td>Lectures</td>
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<tr>
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<td>field trip / tutorials</td>
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<tr>
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<tr>
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<td>70</td>
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### Course Credit

Animal behaviour (6 credits)

<table>
<thead>
<tr>
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<th>Offer</th>
<th>Examination</th>
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</thead>
<tbody>
<tr>
<td>A</td>
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</table>

### Course Learning Outcomes

- **CLO 1** learn to appreciate the causes, functions, development, and evolution of animal behaviour
- **CLO 2** appreciate the complexity of interactions between environmental selective pressures and animal behaviour
- **CLO 3** appreciate current theories that form basis for modern understanding of animal behaviour
- **CLO 4** learn the scientific reasoning and methodology in the field of Animal Behaviour
- **CLO 5** think analytically in terms of behavioural ecology, animal socio-behavioural complexity, and how the understanding of species' behaviour contributes to its conservation

### Course Teaching & Learning Activities

Lecture with laboratory component course

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Field work</td>
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</tr>
<tr>
<td>Reading / Self study</td>
<td>student center learning</td>
<td>24</td>
</tr>
</tbody>
</table>

### Course Website

http://moodle.hku.hk

### Additional Course Information

The course will be offered subject to a minimum enrollment number and availability of teachers.
Natural ecosystems provide trillions of dollars' worth of ecosystem services to humans every year. Many of these services go unrecognized and undervalued. In fact, because humans rely on ecosystems many of these services are considered independent and creative thinking when proposing solutions to the question of how to value ecosystems for their inherent properties rather than perceived monetary value.

Course Objectives
This course will introduce the functioning of terrestrial, fresh water and marine ecosystems and the services which they provide human populations. The concept of ecosystem services will be further expanded into "value", including financial, cultural, social and, importantly, the intrinsic value that may be priceless. We will also explore how human activities degrade these ecosystem services and how protecting ecosystems and biodiversity can increase the ecosystem services supplied to humans.

Course Contents & Topics
Natural ecosystems provide trillions of dollars' worth of ecosystem services to humans every year. Many of these services go unrecognized and undervalued. In fact, because humans rely on ecosystems many of these services may be priceless. This course will first cover the function of different ecosystems from terrestrial, fresh water and marine environments. Students will then be introduced to the concept of ecosystem services and what they provide to human populations. Finally, human activities which degrade ecosystems and reduce the extent that ecosystems can provide these services, and what that means for human populations, will be covered. Students will develop independent and creative thinking when proposing solutions to the question of how to value ecosystems for their inherent properties rather than perceived monetary value.

Required/recommended reading and online materials

Assessment Methods and Weighting
- In addition to the weightings shown in the table, in the final written examination, students will be assessed on their ability to apply knowledge, skills and concepts to new situations, as well as their ability to use critical thinking and problem-solving skills.
- This course is offered in alternate year.
- This course will be offered subject to a minimum enrollment number and availability of teachers.

Course Website
- http://www.biosch.hku.hk/ecology/lsc

Additional Course Information
- This course is offered in alternate year.
- This course will be offered subject to a minimum enrollment number and availability of teachers.

Course Contents & Topics
Natural ecosystems provide trillions of dollars' worth of ecosystem services to humans every year. Many of these services go unrecognized and undervalued. In fact, because humans rely on ecosystems many of these services may be priceless. This course will first cover the function of different ecosystems from terrestrial, fresh water and marine environments. Students will then be introduced to the concept of ecosystem services and what they provide to human populations. Finally, human activities which degrade ecosystems and reduce the extent that ecosystems can provide these services, and what that means for human populations, will be covered. Students will develop independent and creative thinking when proposing solutions to the question of how to value ecosystems for their inherent properties rather than perceived monetary value.

Course Objectives
- Natural ecosystems provide trillions of dollars' worth of ecosystem services to humans every year. Many of these services go unrecognized and undervalued. In fact, because humans rely on ecosystems many of these services may be priceless. This course will first cover the function of different ecosystems from terrestrial, fresh water and marine environments. Students will then be introduced to the concept of ecosystem services and what they provide to human populations. Finally, human activities which degrade ecosystems and reduce the extent that ecosystems can provide these services, and what that means for human populations, will be covered. Students will develop independent and creative thinking when proposing solutions to the question of how to value ecosystems for their inherent properties rather than perceived monetary value.

Required/recommended reading and online materials

Assessment Methods and Weighting
- In addition to the weightings shown in the table, in the final written examination, students will be assessed on their ability to apply knowledge, skills and concepts to new situations, as well as their ability to use critical thinking and problem-solving skills.
- This course is offered in alternate year.
- This course will be offered subject to a minimum enrollment number and availability of teachers.

Course Website
- http://www.biosch.hku.hk/ecology/lsc

Additional Course Information
- This course is offered in alternate year.
- This course will be offered subject to a minimum enrollment number and availability of teachers.

Course Contents & Topics
Natural ecosystems provide trillions of dollars' worth of ecosystem services to humans every year. Many of these services go unrecognized and undervalued. In fact, because humans rely on ecosystems many of these services may be priceless. This course will first cover the function of different ecosystems from terrestrial, fresh water and marine environments. Students will then be introduced to the concept of ecosystem services and what they provide to human populations. Finally, human activities which degrade ecosystems and reduce the extent that ecosystems can provide these services, and what that means for human populations, will be covered. Students will develop independent and creative thinking when proposing solutions to the question of how to value ecosystems for their inherent properties rather than perceived monetary value.

Required/recommended reading and online materials

Assessment Methods and Weighting
- In addition to the weightings shown in the table, in the final written examination, students will be assessed on their ability to apply knowledge, skills and concepts to new situations, as well as their ability to use critical thinking and problem-solving skills.
- This course is offered in alternate year.
- This course will be offered subject to a minimum enrollment number and availability of teachers.
Medical microbiology and applied immunology (6 credits)

**Course Description**
- Clinical laboratory analyses in serology, haematology, blood banking, microbiology and chemical pathology
- Principles and application of flow cytometry
- Microbial pathogens and associated diseases, host immune response, antimicrobial agents and multidrug resistance, epidemiology and prevention of microbial infections
- Application of antigen-antibody interaction in advanced research: CHIP assay, co-immunoprecipitation, immunohistochemistry and dual immunofluorescence

**Course Objectives**
The objective is to provide students the knowledge on the practical applications of immunology and microbiology in biological research, clinical analysis and disease diagnosis.

**Course Contents & Topics**
- Basic parameters affecting antigen-antibody interactions
- Application of antigen-antibody interaction in advanced research: CHIP assay, co-immunoprecipitation, immunohistochemistry and dual immunofluorescence
- Principles and application of flow cytometry
- Techniques in cellular immunology and tumor immunology
- Microbial pathogens and associated diseases, host immune response, antimicrobial agents and multidrug resistance, epidemiology and prevention of microbial infections

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1 apply the principles of antigen-antibody interaction in various advanced research techniques
- CLO 2 demonstrate knowledge on microbial pathogens, mechanisms for their disease-causing, and principles of antibiotic development
- CLO 3 understand the scientific principles of various clinical laboratory analyses
- CLO 4 promote public attention on control of microbial infection and the spread of antibiotic resistance

**Pre-requisites**
Pass in BIOL3401 or BIOL3403

**Required/recommended reading and online materials**
Students will be directed to relevant scientific literature and websites.

**Course Website**
http://moodle.hku.hk

**Additional Course Information**
Offer in alternate year from 2016-2017
This course will be offered subject to a minimum enrollment number and availability of teachers.

**Grade Descriptors (A+ to F)**

- **A**
  - Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

- **B**
  - Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

- **C**
  - Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

- **D**
  - Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

- **Fail**
  - Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities and logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.
**BIOL4402 Microbial biotechnology (6 credits)**

**Offering Department**
Biological Sciences

**Course C-ordinator**
---, Biological Sciences ()

**Teachers Involved**

**Course Objectives**
This course is intended for students who would like to understand the application of modern microbiology in biotechnology. The microbial systems being used include different types of viruses, bacteria, fungi and algae. At the end of the course the students are expected to know the parameters and conditions that affect the yield of production and the systems available for the expression of various types of biotechnology products.

**Course Contents & Topics**
- Upstream and downstream processing will be briefly described to equip the students with the background for microbial biotechnology. The latest advances in microbial expression systems using viruses, bacteria, yeasts and algae will be reviewed. Specific examples on the use of these systems will be provided. These include but not limited to production of recombinant vaccines, secondary metabolites, food and food additives, industrial enzymes and biocides as well as bioremediation and medical diagnostics.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1 explain the fundamental biochemical concepts underlying the industrial production of selected microbial biotechnology products
- CLO 2 understand the importance of the current recombinant technology for large-scale manufacturing of various protein products
- CLO 3 describe the major expression systems, understand their purposes, advantages, and disadvantages
- CLO 4 deliver a professional group presentation on a self-decided topic related to microbial biotechnology

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in BIOL3401

**Offer in 2019 - 2020**
N

**Course Type**
Lecture-based course

**Course Teaching & Learning Activities**

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<td>Reading / Self study</td>
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**Assessment Methods and Weighting**

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<th>Weighting in final course grade</th>
<th>Assessment Methods to CLO Mapping</th>
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<td>Examination</td>
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<td>CLO 1,2,3</td>
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**Required/recommended reading and online materials**

**Course Website**
http://moodle.hku.hk/
7. Baltimore Class IV (+) s.s. RNA viruses: Picomaviruses
8. Baltimore Class V (-) s.s. RNA viruses: Myxoviruses
9. Ambisense RNA viruses: Bunyaviruses and Arenaviruses
10. 11. Baltimore Class VI (+) s.s. RNA viruses: Retroviruses
12. Baltimore Class III d.s. RNA viruses: Reoviruses
13. 14. Baltimore Class I d.s. DNA viruses: Adenoviruses, Herpesviruses
15. Baltimore Class II s.s. (+) DNA viruses: Parvoviruses
16. Mechanisms of Viral Oncogenesis
17. Anti-viral treatments
18. Viruses as Tools in Medicine and Biotechnology

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 be familiar with virus classification and the modes of replication and transmission of various viral families
- CLO 2 gain hand-on experiences on common virological techniques
- CLO 3 carry out researches on virology after taking this course

**Pre-requisites (and Co-requisites and Impermissible combinations)**

- Pass in BIOL3401 or BIOL3403

### Course Type

- Lecture with laboratory component course

### Course Teaching & Learning Activities

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<td>Laboratory</td>
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<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
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### Assessment Methods and Weighting

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### Required/recommended reading and online materials


### Course Website

- http://moodle.hku.hk/

### Additional Course Information

- Offer in alternate year from 2017-2018
- This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL4411

**Plant and food biotechnology (6 credits)**

**Offering Department**

- Biological Sciences

**Course Co-ordinator**

- Dr. Juliana Xu, Biological Sciences (julianax@hku.hk)

**Course Objectives**

- This course covers the principles and key concepts of plant and food biotechnology and its applications in increasing global food supply. The significances of biotechnology in agriculture and food production, and the emerging importance of plant biotechnology in molecular farming for the production of biopharmaceuticals and other high-value proteins will be discussed. The course will also provide an insight on the real-life applications of plant and food biotechnology.

**Course Contents & Topics**

- Genetic improvements in agriculture.
- Transgenic crops in global food production.
- Tools in plant genetic engineering: promoters and marker genes.
- Techniques in plant gene transfer: Agrobacterium-mediated transformation, biolistics and microinjection.
- Nuclear and plastid transformation.
- Gene silencing in plants. Genetic manipulation of commercially useful biosynthetic pathways in crops.
- Genetically-engineered biofortified foods: provitamin A-enriched rice, omega-3-enriched soy and high-antocyanin tomatoes.
- Biotechnology in plant pest and disease management:
- Producing crops resistant to phytopathogens and pests.
- Short-interfering RNAs in gene silencing to defend against plant viruses.
- Protecting crops in the field using the Bt toxin.
- Pest-resistant genetically-transformed seeds using the alpha-amylase inhibitor
Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 acquire key concepts in plant and food biotechnology and basic laboratory techniques in plant biotechnology
CLO 2 gain insight into real-life applications in plant and food biotechnology
CLO 3 develop scientific inquiry and critical thinking skills

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL3211 or BIOL3401

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y Examination Dec

Grade Descriptors (A+ to F)
A Demonstrate thorough and complete mastery of extensive knowledge and skills required for attaining the learning outcomes in Plant and Food Biotechnology. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations in plant biotechnology. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes in plant biotechnology. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Show moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Some evidence of coherent and logical thinking, accompanied with limited analytical and critical skills. Show limited ability to apply knowledge in plant biotechnology. Show limited or barely effective organizational and presentational skills.

Fail Fail to demonstrate command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. No evidence in ability to apply knowledge in plant biotechnology. Ineffective organizational and presentational skills.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 24
Laboratory practical/laboratory/project 30
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 70 CLO 1.2, 3
Laboratory reports 10 CLO 1.2, 3
Presentation 20 CLO 1.2, 3

Required/recommended reading and online materials
E-reserves (HKU Library) Lecture notes on Moodle

Course Website
http://moodle.hku.hk/

Additional Course Information
Core in Molecular Biology & Biotechnology Major
An advanced elective course in FNS Major
An advanced elective course in Plant Science Minor

BIOL4415 Healthcare biotechnology (6 credits) Academic Year 2019
Offering Department Biological Sciences Quota 70
Course Co-ordinator Prof A S T Wong, Biological Sciences (awong1@hku.hk)
Teachers Involved (Dr K W Y Yuen,Biological Sciences)
(Prof A S T Wong,Biological Sciences)

Course Objectives
This course discusses the key concepts and principles involved in healthcare biotechnology, and their applications in molecular medicine.

Course Contents & Topics
Genetic biotechnology in animals (transgenics, knockouts and other related technologies): Transgenic animals as models in the study of human diseases, as bioreactors for the production of hormones, antibiotics and vaccines and organs for xenotransplantation.
Advanced molecular biology techniques related to human and animal science basic research, disease diagnosis and development of new therapies. These include but not limited to: applications of DNA technologies in diagnostic medicine and forensic science; tissue engineering.
An overview of the drug development process, with a focus on the early-stage, preclinical drug discovery, drug target identification, high-throughput assay development, and screening of chemical libraries (synthetic and natural products). The concept of individualized medicine will also be discussed.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 describe key concepts in genetic biotechnology and human health
CLO 2 acquire and apply advanced laboratory techniques essential to biotechnology
CLO 3 develop scientific inquiry and critical thinking skills to understand, analyze, and evaluate problems in order to develop solutions
CLO 4 gain insight into real-world applications in healthcare biotechnology

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL3401

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y Examination May

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Show moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Some evidence of coherent and logical thinking, accompanied with limited analytical and critical skills. Show limited ability to apply knowledge in plant biotechnology. Show limited or barely effective organizational and presentational skills.

Fail Fail to demonstrate command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. No evidence in ability to apply knowledge in plant biotechnology. Ineffective organizational and presentational skills.
### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<tbody>
<tr>
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<tr>
<td>Laboratory</td>
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<tr>
<td>Tutorials</td>
<td>tutorials/assignments/computer sessions</td>
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</tr>
<tr>
<td>Reading / Self study</td>
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### Assessment Methods and Weighting

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<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>Assignment/Discussion</td>
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<td>CLO 1.3,4</td>
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<tr>
<td>Examination</td>
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<tr>
<td>Laboratory reports</td>
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<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1,3</td>
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### Required/recommended reading and online materials
- Textbook of Drug Design and Discovery (Krogsgaard-Larsen, Liljefors, and Madsen, Taylor & Francis, 2002)
- Human Molecular Genetics (Strachan and Read, Garland Science, 2010)
- Suggested readings for each topic will be provided.

### Course Website
http://moodle.hku.hk/

### Additional Course Information
Moodle

### BIOL4416
Stem cells and regenerative biology (6 credits)

#### Offering Department
Biological Sciences

#### Course Co-ordinator
Dr K W Y Yuen, Biological Sciences (kwyyuen@hku.hk)

#### Teachers Involved
- (Dr J Zhang, Biological Sciences)
- (Dr K W Y Yuen, Biological Sciences)

#### Course Objectives
To introduce the current understanding in regenerative biology, aging and longevity at the cellular and molecular level, and to present the interconnection between these biological events.

#### Course Contents & Topics
The course will discuss cutting-edge research in

(i) regenerative and stem cell biology:
- the basic characteristics of stem cells
- the molecular and genetic control of cell fate specification and differentiation
- embryonic and adult stem cells
- experimental inducible pluripotent stem cells and tissue engineering
- therapeutics potentials for stem cell technology
- ethical issues in stem cell research

(ii) aging and longevity:
- model systems used for aging and life-span studies
- cellular and molecular biology of aging
- telomeres and cellular senescence
- genomic stability, DNA mutations and repair
- mitochondrial defects and oxidative stress
- genetic aging diseases
- genetic biochemical and metabolic pathways involved in longevity

#### Course Learning Outcomes
On successful completion of this course, students should be able to:

- **CLO 1** appreciate the complex regulations of cell potency, cell age and organism longevity
- **CLO 2** describe the characteristics of stem cells and the different types of stem cells
- **CLO 3** describe applications of stem cell research, and understand ethical concerns involved
- **CLO 4** describe the cellular mechanisms of aging, and the pathways involved in longevity

#### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL3601 or BIOL3604 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408

#### Offer in 2019 - 2020
N

#### Grade Descriptors (A+ to F)
A
- Demonstrate thorough and complete mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presential skills.

B
- Demonstrate substantial command of a broad range of knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presential skills.

C
- Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills.

D
- Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities and logical thinking. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills.

Fail
- Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presential skills are minimally effective or ineffective.
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<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<td>Tutorials</td>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<td>Essentials of stem cell biology</td>
<td>edited by Robert Paul Lanza 2009</td>
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<tr>
<td>Science in medicine: the JCI textbook of molecular medicine</td>
<td>By Andrew R. Marks, American Society for Clinical Investigation, Usha S. Neill</td>
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<tbody>
<tr>
<td>Additional Course Information</td>
<td>Offer in alternate year from 2017-2018</td>
</tr>
<tr>
<td>This course will be offered subject to a minimum enrollment number and availability of teachers.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Title</th>
<th>'Omics' and systems biology (6 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Biological Sciences</td>
</tr>
<tr>
<td>Quota</td>
<td>40</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr J W Zhang, Biological Sciences (<a href="mailto:jzhang1@hku.hk">jzhang1@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr J W Zhang, Biological Sciences)</td>
</tr>
</tbody>
</table>

| Course Objectives | Recent progress in high-throughput omics technology has revolutionized the biological research. Genome-wide profiling of various biomolecules simultaneously by omics technology generates huge amounts of data, providing the potential to obtain a global and holistic view of the system. This course aims to introduce the technologies of Omics and Systems Biology, and overview of various applications of omics technology in agricultural, biomedical, environmental, and nutritional sciences. This course will make the state-of-the-art knowledge of Systems Biology and know-how available to those working on an omics project as well as those preparing their research proposal. |

| Course Contents & Topics | The course covers various OMICS techniques with special focus on sequence alignment, next generation sequencing, computational modeling, and statistic programming. This course will also provide students hands-on experience in large scale data analysis, and high-throughput methodologies involved in: Genomics - the study of all genes or DNA sequences in a genome Transcriptomics - the study of all mRNA transcripts Proteomics - the study of all proteins Interactomes - the study of all genetic or physical interactions among genes or proteins Systems biology and functional genomics - the study of the interactome/network between components of a biological system, and modeling to discover the integrated function and emergent properties of that system Metabolomics - all genetic materials found in an environment Metabolomics - metabolites & intermediates involved in a biological reaction. |

| Course Learning Outcomes | On successful completion of this course, students should be able to: CLO 1 explain the conceptual differences between 'Omics'/Systems Biology studies and traditional one-gene approach, and discuss the pros and cons of both approaches CLO 2 describe common methodologies used in major 'Omics' studies CLO 3 describe basic analytical methods, and access database resources generated in major 'Omics' studies CLO 4 describe how 'Omics' data are used in Systems Biology to understand the integrated functions of the system CLO 5 identify questions that can be addressed by 'Omics' and Systems Biology studies, appreciate and describe applications in 'Omics' studies. |

| Pre-requisites | Pass in BIOL3601 or BIOL3604 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408 |

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough and complete mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining least most of the course learning outcomes. Evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to more familiar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate limited but limited command of knowledge and skills required for attaining some of the course learning outcomes. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
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<tr>
<td>----------------</td>
<td>------------</td>
</tr>
<tr>
<td>Lecture</td>
<td>Lectures</td>
</tr>
<tr>
<td>Laboratory</td>
<td>24</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
</tr>
</tbody>
</table>
Cetacean behaviour, ecology and conservation: field research experience (6 credits)

**Offering Department**  
Biological Sciences

**Course Co-ordinator**  
Biological Sciences

**Teachers Involved**

This course offers an exciting experiential learning opportunity through hands-on experience in field research into behavioural ecology and conservation of free-ranging cetaceans (whales, dolphins and porpoises). It provides students with a fundamental knowledge, skills, and the appreciation of what it takes to design, implement, and effectively run field studies in cetacean ecology, behaviour and conservation, and similar studies of other large and mobile marine vertebrates.

**Course Contents & Topics**

Field-based studies of cetaceans have been rapidly evolving in recent years. There are many exciting new developments that allow researchers to tackle previously unexplored avenues of research. However, the primary component of cetacean studies, the direct contact with free-ranging animals out at sea, in their natural environment and on their terms remains unchanged, both challenging and fascinating. This course, conducted in a field research site outside Hong Kong, will expose students to various aspects of cetacean field studies, from the definition of a research question to project design, and to various stages of data collection and analyses. Students will learn a suite of research techniques, and will exercise their skills in data processing and interpretation. The emphasis will be on delphinid behavioural ecology and conservation applications; students will be guided through the scientific reasoning and methodology, and will develop an understanding of research design and data collection. Research will be conducted in a field setting, with sea-based research surveys performed daily (weather permitting). Following the field-based activities, students are required to write an independent report describing the learning outcome of the course.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** understand the biodiversity and primary habitats in the ecosystem studied
- **CLO 2** establish the basic skills needed to identify target species associated with the field course
- **CLO 3** be knowledgeable about and able to implement sampling techniques for organisms in the particular ecosystems studied
- **CLO 4** understand the basic ecology of target species and how biotic and abiotic factors shape focal communities

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in at least one of the following courses: BIOL3101, BIOL3301, BIOL3313 or BIOL3320. This experiential field course is primarily for Ecology & Biodiversity Major students. The earliest that a student is allowed to take this experiential course is their 3 year study; and because it is conducted in early June, this course is best suited for year 3 students.

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors (A to F)</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>N Offer in 2020 - 2021: N</td>
<td>--</td>
</tr>
<tr>
<td>Evidence of a thorough grasp of the subject and relevant research techniques. Eagerness and enthusiasm to learn and excellent familiarity with relevant background reading and case studies. Good handling of field data collection and excellent analytical skills. Ample evidence of independent critical thought with excellent use of a broad range of fundamental concepts and broader comparative perspective to draw insightful and logical conclusions. Show outstanding abilities of independent work, effective presentation skills with excellent analytical argumentation. Excellent or outstanding work relative to what is required at degree level.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence of a good grasp of the subject and relevant research techniques. Interest in learning and good-to-moderate familiarity with relevant background reading and case studies. Good handling of field data collection and commendable analytical skills. Good evidence of critical thought (although not always independent), with an appreciable use of fundamental concepts and consideration of broader comparative perspective in drawing logical conclusions. Good abilities of independent work, effective presentation skills with logical and analytical argumentation. More than sufficient for what is required at degree level.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrate an adequate, but incomplete grasp of the subject and relevant research techniques. Moderate familiarity with relevant background reading and case studies, but no interest in learning beyond the adequate average level. Evidence of logical critical thinking (although not always independent), with mostly good use of fundamental concepts to draw logical conclusions. Fair presentation skills, with mostly correct argumentation, but limited (or no) abilities to integrate broader concepts. Work sufficient for what is required for degree level.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrate some grasp of the subject, but only partial and with limited understanding of relevant research concepts and research techniques. Some familiarity with relevant case studies, but insufficient evidence of background reading and limited abilities of critical independent thinking. Ineffective presentation skills with generally weak logical argumentation with restricted ability of drawing appropriate conclusions. Work barely meets what is required at degree level.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fail</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No evidence of basic a minimum grasp of the subject and the minimum relevant research techniques. No evidence of background reading and no familiarity with any relevant examples and case studies. Inadequate evidence of coherent logical thought, ineffective presentation skills with poor argumentation and no abilities to draw meaningful conclusions. Work fails to reach degree level.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Course Type**  
Field camps

**Course Teaching & Learning Activities**

- **Activities**  
  - Lectures  
  - Field work  
  - Presentation  
  - Reading / Self study  
  - Assessment

- **Details**  
  - lectures and tutorials  
  - interactive debates  
  - group projects

- **No. of Hours**  
  - 12  
  - 80  
  - 10  
  - 100  
  - 12

**Assessment Methods and Weighting**

- **Methods**  
  - Assignments  
  - Report

- **Details**  
  - project report (35%), group investigation & presentation (30%)

- **Weighting in final course grade (%)**  
  - 35  
  - 65

- **Assessment Methods to CLO Mapping**  
  - CLO 1,2,3,4

- **CLO Mapping**  
  - CLO 2.3,4,5  
  - CLO 1,2.3,4,5
## BIOL4501: Molecular phylogenetics and evolution (6 credits)

### Course Objectives
The purpose of this course is to provide a comprehensive overview of state-of-the-art molecular systematics and phylogenetic research, focusing on in depth coverage of the latest techniques. The treatment of theoretical issues in formal lectures is coupled with practical workshops.

- Acquisition of the sequences from the databases
- DNA and protein sequence assembly and alignment
- Phylogeny reconstruction using parsimony, distance based, and maximum likelihood approaches
- Introduction to relevant software for phylogenetics
- Methods for the evaluation of phylogenetic trees

### Course Contents & Topics

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 understand the fundamental principles of molecular phylogenetics
- CLO 2 understand the purposes each method is used for and be able to choose the most appropriate method(s) for the analysis of given data
- CLO 3 understand the advantages and disadvantages of the methods
- CLO 4 acquire practical skills for the analysis of molecular data

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL3401 or BIOL3408

### Offer in 2019 - 2020
N

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate comprehensive knowledge and an advanced level of skills sufficient for achieving all the goals and expected learning outcomes of the course. Show deep understanding of the course subject. Excellent ability to efficiently combine and apply the relevant theories, principles, and methods taught in the course. Advanced skills in possession and application of the methods and software for evolutionary analysis of real data. Excellent ability to collect, systematize, analyze and critically evaluate data from various sources and to quote them appropriately. Excellent presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate good knowledge and good level of skills sufficient for accomplishing all of the goals and expected learning outcomes of the course. Demonstrate good understanding of the course subject. Show good ability to combine and to apply theories, principles, and methods taught in the course. Substantial skills in possession and application of the methods and software for molecular evolutionary analysis of real data. Show good ability to collect, systematize, analyze and critically evaluate data from various sources and to quote them appropriately. Good presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate basic knowledge and basic level of skills sufficient for accomplishing most of the goals and expected learning outcomes of the course. Demonstrate general understanding of the subject. Show some ability to combine and to apply theories, principles and methods taught in the course. Basic skills in possession and application of the methods and software for molecular evolutionary analysis of real data. Show general ability to collect, systematize, analyze and evaluate data from various sources and to quote them appropriately. Basic presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate incomplete knowledge and weak skills sufficient for accomplishing only some of the goals and expected learning outcomes of the course. Demonstrate poor understanding of the subject. Show poor ability to combine and to apply theories, principles, and methods taught in the course. Limited skills in possession and application of the methods and software for molecular evolutionary analysis of real data. Show poor ability to collect data from various sources, to systematize, analyze and evaluate them appropriately. Poor presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate poor or no knowledge and skills required for accomplishing the goals and expected learning outcomes of the course. Demonstrate very poor or no understanding of the subject. Show no ability to combine and/or to apply theories, principles, and methods taught in the course. Poor or no skills in possession and application of the methods and software for molecular evolutionary analysis of real data. Show very poor or no ability to collect data from other sources and to systematize, analyze and evaluate them appropriately. Very poor or no presentational skills.</td>
</tr>
</tbody>
</table>

### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>computer laboratory/tutorial/projects</td>
<td>100</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>40</td>
<td>CLO 2.3.4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and

BIOL4505  
Offering Department: Biological Sciences  
Course Co-ordinator: Dr T Vengatesan, Biological Sciences (rajan@hku.hk)  
Teachers Involved: (Dr T Vengatesen,School of Biological Sciences)  

Course Objectives:  
- Introduce oyster biology and hatchery technology and aquaculture business;  
- Provide scientific basis for oyster aquaculture through field demonstrations and laboratory exercises;  
- Enable students to design, construct and maintain oyster hatchery for production of seeds for sustainable aquaculture and restoration of wild oysters;  
- Facilitate transfer of academic knowledge to oyster growers and aquaculture industry for sustainable, healthy and safe sea-food production;  

Course Contents & Topics:  
This experiential learning course is to enhance students' knowledge in one of the applied marine biology fields, i.e. hatchery technology and coastal aquaculture business that will enable them to design, construct, operate and maintain coastal aquaculture facilities and small-scale 'green and environmentally sustainable' business for shellfish production and restoration of wild benthic biodiversity in coastal habitats. This is an interdisciplinary endeavor encompassing larval hatchery technology, seafood quality, and economic dimensions of coastal aquaculture business. After reading about basic oyster biology and oyster aquaculture topics, we will focus on how marine larvae will be useful for human society through hatchery technology and aquaculture business. Environmental issues, legislation pertaining to coastal aquaculture business and community interaction will also be covered using oyster aquaculture in Hong Kong as an example. Students will be exposed to several aquaculture facilities in Hong Kong, Zhanjiang, and Qingdao to learn industrial and business skills of oyster aquaculture. This course is designed to meet the needs of an expanding sustainable aquaculture in Hong Kong and in mainland. Career and small scale business opportunities in aquaculture industry will be discussed.  

Course Learning Outcomes:  
On successful completion of this course, students should be able to:  
CLO 1 gain scientific knowledge required for setting up oyster hatchery, farming and small-scale business, beside understanding biology and ecology of larvae and shellfishes and consider potential environmental effects on hatchery and farming  
CLO 2 acquire skills and experiential learning opportunities (e.g. hands-on experiences at laboratories and farms) in oyster hatchery and aquaculture business, farming and industry  
CLO 3 explain the importance of oyster farming in coastal habitat restoration  
CLO 4 plan and execute a commercially important research project in marine science and coastal aquaculture  
CLO 5 develop novel ideas, and think creatively, about hatchery production in relation to the aquaculture industry  

Pre-requisites:  
Pass in BIOL3109 or BIOL3203 or BIOL3301 or BIOL3303 or ENVS3004 or ENVS3313; and Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Ecology and Biodiversity Major or Environmental Science Major or Biological Science Major.  

Offer in 2019 - 2020: N  
Offer in alternate year from 2017 - 2018: Y  
Examination: ---  

Grade Descriptors:  
(A+ to F)  
A Evidence of original thought during the analysis of larval biology issues. Show evidence of analytical, critical and multidimensional thinking about the study subject. Extensive knowledge and skills required for attaining all the course learning outcomes. Demonstrate excellent ability to apply what you have learned in the class room to critically analyze the larval biology project data. Show highly effective organizational, presentational and field trip skills.  
B Show substantial knowledge and thought during the analysis of marine life science issues. Show some evidence of some analytical, critical and multidimensional thinking about the study subject. Good knowledge and skills required for attaining all the course learning outcomes. Demonstrate good ability to apply what you have learned in the class room to critically analyze the real marine life science issues. Show effective organizational, presentational and field trip skills.  
C Show general but incomplete knowledge and original thought during the analysis of marine life science issues. Fair knowledge and skills required for attaining all the course learning outcomes. Demonstrate fair ability to apply what you have learned in the class room to critically analyze the real marine life science issues. Show considerable organizational, presentational and field trip skills.  
D Evidence to show a minimum knowledge (i.e. knowledge is very incomplete) and thought during the analysis of marine life science issues. Show insufficient knowledge and skills required for attaining all the course learning outcomes. Demonstrate poor ability to apply what you have learned in the class room to critically analyze the real marine life science issues. Show very little organizational, presentational and field trip skills.  
Fail Evidence of meager or inadequate knowledge and understanding of marine life science issues. Show no evidence of knowledge and skills required for attaining all the course learning outcomes. Demonstrate no ability to apply what you have learned in the class room to critically analyze the real marine life science issues. Show no evidence of familiarity with relevant reading material and field trip demonstrations, or any knowledge of organizational and presentational skills.  

Course Type  
Field camping  
Course Teaching & Learning Activities  
Activities  
Details  
No. of Hours  
Lectures  
including tutorial  
40  
Field work  
50  
Laboratory work  
hands on training  
30  

Assessment Methods and Weighting:  
Methods  
Details  
Weighing in final course grade (%)  
Assessment Methods to CLO Mapping:  
Assignments  
Practical  
25  
CLO 3,4  
Report  
Presentation: developing innovative ideas for sustainable and economically viable aquaculture in Hong Kong  
50  
CLO 4,5  
Test  
Written exam.  
25  
CLO 1,2  

Required/recommended reading and online materials:  
Shellfish Aquaculture and the Environment (S.E. Shumway, John Wiley & Sons)  
Molluscan Shellfish Farming (Brian Spencer, John Wiley & Sons)  

Course Website: http://moodle.hku.hk/  
Additional Course Information: Offer in alternate year from 2017 - 2018  
- Tentative duration: May 24 to June, 2019  
- Mainland field trips are compulsory  
- Taught and trained by several teachers, guest lecturers from government and aquaculture business sector
### BIOL4861

**Ecology & biodiversity internship (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr T Vengatesen, Biological Sciences (<a href="mailto:rajan@hku.hk">rajan@hku.hk</a>)</td>
</tr>
</tbody>
</table>

**Course Objectives**

To provide a stimulating experience for all Ecology & Biodiversity Major undergraduates to integrate and apply their knowledge and skills obtained from the Ecology & Biodiversity Major through gaining work experience in the field of Ecology & Biodiversity that are related to the major of study.

**Course Contents & Topics**

Students taking this course will work as an intern for at least 160 hours within the University or outside the University in a company, government department or NGO. The internship may be arranged by the School or obtained by students themselves. In the latter case, the internship must be in a relevant field to the Ecology & Biodiversity Major that the students are taking and prior approval by the course coordinator is required.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 gain first hand work experience in a job placement related to their Ecology & Biodiversity Major.
- CLO 2 apply the knowledge in their Ecology & Biodiversity Major in solving practical problems in the work place.
- CLO 3 acquire an understanding and appreciation of the real world environment.
- CLO 4 extend their network in their field of study.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

- Pass in at least 24 credits of advanced level disciplinary core / elective courses in the Ecology and Biodiversity Major.
- This course is for Ecology & Biodiversity Major students only.
- The earliest that a student is allowed to take this course is their Year 3.

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Y</th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Summer</th>
<th>Offer in 2020 - 2021 : Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Descriptors</td>
<td>Pass</td>
<td>Ability to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleague, and clients for the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Fail</td>
<td>Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.</td>
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</tbody>
</table>

**Course Type**

Internship

**Course Teaching & Learning Activities**

- Activities: Internship work at least 160 hours
- No. of Hours: 160

**Assessment Methods and Weighting**

- Methods: Written report
- Details: written report, supervisor's feedback and oral presentation
- Weighting in final course grade (%): 100
- Assessment Methods to CLO Mapping: CLO 1, 2, 3, 4

**Course Website**

http://moodle.hku.hk

**Additional Course Information**

Students taking this course have to submit a written report of not less than 1,000 words and an oral presentation about their internships, which will be assessed by internal supervisors. Student's supervisor at work i.e. the institution offering the internship will also submit an assessment report to the University.

Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

BIOL4861 E&B internship is not a Capstone Course.

### BIOL4911

**Conservation science in practice (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Biological Sciences</td>
</tr>
</tbody>
</table>

**Course Objectives**

To build on the foundation acquired by students in the Biological Sciences in the fields of ecology, biodiversity and environmental science by using case studies that stimulate them to integrate the principles and concepts learned to produce and successfully debate a topic in conservation science. Case studies will specifically address the use of science in achieving meaningful conservation outcomes taking into account the need for considering social, economic, and political contexts. Students will be expected to present their cases orally using sound practical and scientific reasoning. This course is a capstone course for Ecology & Biodiversity major / Ecology & Biodiversity (Intensive) Major students.

**Course Contents & Topics**

This course will use directed case studies to give students the opportunity to consider and synthesize solutions to specific problems in conservation and the application of conservation science in the modern world, and within the wider context of economic development, political considerations and scientific uncertainty. Projects will be conducted through collaborations with local organizations, such as WWF-Hong Kong and Ocean Park, and address real-life questions and issues. Possible case studies range from ecosystem services, biological footprints, wildlife trade, to assessment of conservation risk, effectiveness of international conservation and biodiversity instruments, and the relationship between biodiversity and human livelihoods. Tutorials by the course coordinator will introduce practical conservation concepts, develop critical thinking and address specific issues of relevance across case studies.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: have an in-depth understanding of the topic studied, the major issues involved and the needs and prospects for further work in the area.
- CLO 2: have developed investigative skills associated with the case study selected which include synthesis, organization and presentation of information and innovative and creative thinking around problem solving.
- CLO 3: understand the importance and complexities of conserving biodiversity.
- CLO 4: be able to identify practical and scientifically defensible initiatives and measures for successful conservation intervention.
## Course Objectives
To provide a broad understanding of the physiological and psychological basis of human sensory perception of food. To develop expertise in the choice and application of sensory techniques, and analysis of sensory data, in food science and consumer research.

## Course Contents & Topics
This course will be offered in alternate year from 2017-2018.

## Pre-requisites
Pass in BIOL3201; and Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Food & Nutritional Science Major / Food & Nutritional Science Major and appropriate electives.

## Assessment Methods
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral presentation</td>
<td>Supervised practical work of at least 80 hours followed by written &amp; oral reports. Tutorials provided by course coordinator</td>
<td>40</td>
</tr>
<tr>
<td>Research report</td>
<td>Project report</td>
<td>60</td>
</tr>
</tbody>
</table>

## Grade Descriptors (A+ to F)
- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Show strong analytical and critical abilities and logical thinking, with strong evidence of ability to integrate and synthesize information across subject areas, including from practical work undertaken, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations and showing consideration of ethical and political dimensions for addressing conservation challenges. Apply highly effective presentational skills. Strong evidence of attention to thoughtful and reflective thinking and consideration of the wider issues of biodiversity conservation and sustainability.
- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, with some integration of materials and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate effective presentational skills. Some evidence of clear attention to thoughtful and reflective thinking and attention to detail. Consideration of practical components in conservation must be demonstrated including the importance of biodiversity conservation in Society.
- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, ability to apply knowledge to most familiar situations and of relevance of biodiversity conservation for Society. Apply moderately effective presentational skills and understanding of the practical challenges of effective conservation initiatives. Little evidence of clear attention to thoughtful and reflective thinking.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities and little attempt at integration. Have basic understanding of importance of biodiversity for Society. Show limited ability to apply knowledge to solve problems or consider the practical challenges of biodiversity conservation. Apply limited effectiveness in presentational skills. Lack of attention to thoughtful and reflective thinking.
- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking or attention to detail. Show very little or no ability to apply knowledge or practical thinking to solve problems. Organization and presenational skills are minimally effective or ineffective.

## Assessment Methods to CLO Mapping
- CLO 1: Understanding of sensory perception of food
- CLO 2: Interpret sensory evaluation reports, and to design and conduct sensory evaluation projects using appropriately chosen methods

## Additional Course Information
- This course will be offered subject to a minimum enrollment number and availability of teachers.

## Course Website
http://www.biosch.hku.hk/ecology/lsc/
### Course Type
Laboratory and workshop course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td></td>
<td>48</td>
</tr>
<tr>
<td>Project work</td>
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<td>48</td>
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<tr>
<td>Tutorials</td>
<td>lectures/tutorials</td>
<td></td>
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<tr>
<td>Reading / Self study</td>
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</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory reports</td>
<td>20</td>
<td>CLO 2,3</td>
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<tr>
<td>Project reports</td>
<td>60</td>
<td>CLO 2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>20</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

#### Required/recommended reading and online materials

### Course Website
http://moodle.hku.hk/

### Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

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### BIOL4913

#### Advanced practicum on food and nutrient analysis (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>Dr. J C Y Lee, Biological Sciences (<a href="mailto:jettylee@hku.hk">jettylee@hku.hk</a>) (Dr El-Nezami Han, School of Biological Sciences) (Dr J C Y Lee, School of Biological Sciences)</td>
</tr>
</tbody>
</table>

#### Course Objectives
Food products are analysed to follow the compliance with legal and labelling requirements, assessment of product quality, determination of nutritive value, research and development. The lectures and laboratory sessions will cover the analytical procedures and techniques used to provide information about the food labelling and toxicology of the products. The purpose of the laboratory classes is to give students experience in direct performance of food analysis and toxicology experiments, analysing data and reporting their findings. The students are to work individually on food products where they will analytically assess components using advanced techniques necessary for basic labelling of food products.

#### Course Contents & Topics
Key lectures on specific techniques and cases studies demonstrating the potential pitfalls on analytical techniques and contaminant assessment for certain class of foods or food components will be discussed. Students will have hands-on experience in analysing food products and will utilise analytical techniques under AOAC or equivalent methods. The students will learn how mycotoxins assays, allergens and genetically modified raw materials are assessed in food products. In-depth learning in the use of different chromatography and mass spectrometry techniques, ELISA and procedures for sample preparations will be provided in the course.

#### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 Be familiar with the food labeling system
- CLO 2 Understand the use of appropriate analytical techniques for food analysis
- CLO 3 Have knowledge of a variety of analytical techniques for evaluation of food products
- CLO 4 Have a detailed knowledge of the state of the art of the most important analytical methods, their possibilities and their application in complex food systems
- CLO 5 Able to perform risk assessment and compare the outcomes with governmental regulated levels

#### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOLXXX or BIOLAXX) included BIOL207 and/or BIOL309 in the Food & Nutritional Science Major. This capstone course is for Food & Nutritional Science Major students only.

The earliest that a student is allowed to take this capstone course is their year 3 study.

#### Offer in 2019 - 2020
N: Offer in 2020 - 2021: N

#### Grade Descriptors (A to F)

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
</tr>
</tbody>
</table>

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>20</td>
<td>CLO 2,3</td>
<td></td>
</tr>
<tr>
<td>Project report</td>
<td>60</td>
<td>CLO 2,3</td>
<td></td>
</tr>
</tbody>
</table>

#### Required/recommended reading and online materials
- Y. Pico, Chemical Analysis of Food Techniques and Applications (2012, Knovel, Science Direct on-line)
Animal behaviour and behavioural ecology: field course (6 credits)

Offering Department
Biological Sciences

Course Co-ordinator
Biological Sciences

Teachers Involved

Course Objectives
This course is offered as a capstone experience and unique experiential learning opportunity. It introduces students to scientific reasoning and conceptual basis of studying animal behaviour and behavioural ecology. It exposes students to "research-in-making" and "day-to-day logistics" of a field research, with all the excitement it generates and all demanding challenges it brings along, with hands-on experience in designing, conducting, analysing, and successfully completing field studies of animal behaviour and behavioural ecology.

Course Contents & Topics
Conducted in a field research site outside Hong Kong, this course teaches students how to think analytically about animal behaviour, how to design a field research protocol, construct a conceptual framework of a research project and how to put this framework into a practice of collecting and analysing data. The course includes lectures, informal discussions, review of research techniques, and extensive field component with daily research activities. It provides experiential learning through (i) direct participation in an ongoing field-based research, (ii) hands-on experience in application of diverse research techniques, (iii) hands-on involvement in collecting and analysing data, and (iv) engagement in scientific debates with researchers and research teams directly in their field study location. Students will be guided through the scientific reasoning and methodology, will learn a suite of research techniques and will exercise their skills in data gathering and interpretation, and will develop an understanding how individual research projects contribute to a greater understanding of behavioural and evolutionary processes and contribute to advancing science at large. The emphasis is placed on independent thinking and thoughtful application of the knowledge acquired previously during relevant classroom courses. Following the field-based component, students are required to give a seminar-type presentation on a selected topic and write a Course Report.

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand of the biodiversity and primary habitats in the ecosystem studied
- CLO 2 establish the basic skills needed to identify target species associated with the field course
- CLO 3 be knowledgeable about and able to implement sampling techniques for organisms in the particular ecosystems studied
- CLO 4 understand the basic ecological goal of target species and how biotic and abiotic factors shape focal communities

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL3101; and
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Ecology & Biodiversity Major.

This capstone course is for Ecology & Biodiversity Major students only.

Offer in 2019 - 2020
N Offer in 2020 - 2021 : N

Grade Descriptors (A+ to F)

Grade Details
A Evidence of a thorough grasp of the subject and relevant research techniques. Eagerness and enthusiasm to learn and excellent familiarity with relevant background reading and case studies. Exemplary handling of field data collection and excellent analytical skills. Ample evidence of independent critical thought with excellent use of a broad range of fundamental concepts and broader comparative perspective to draw insightful and logical conclusions. Shows outstanding abilities of independent work, effective presentation skills with excellent analytical argumentation. Excellent or outstanding work relative to what is required at degree level.

B Evidence of a good grasp of the subject and relevant research techniques. Interest in learning and good-to-moderate familiarity with relevant background reading and case studies. Good handling of field data collection and commendable analytical skills. Good evidence of critical thought (although not always independent), with an appreciable use of fundamental concepts and consideration of broader comparative perspective in drawing logical conclusions. Good abilities of independent work, effective presentation skills with logical and analytical argumentation. Work more than sufficient for what is required at degree level. 

C Demonstrate an adequate, but incomplete grasp of the subject and relevant research techniques. Moderate familiarity with relevant background reading and case studies, but no interest in learning beyond the adequate average level. Evidence of logical critical thinking (although not always independent), with mostly good use of fundamental concepts to draw logical conclusions. Fair presentation skills, with mostly correct argumentation, but limited (or no) abilities to integrate broader concepts. Work sufficient for what is required for degree level.

D Demonstrate some grasp of the subject, but only partial and with limited understanding of relevant research concepts and research techniques. Some familiarity with relevant case studies, but insufficient evidence of background reading and limited abilities of critical independent thinking. Ineffective presentation skills with generally weak logical argumentation with restricted ability of drawing appropriate conclusions. Work barely meets what is required at degree level.

Fail No evidence of basic a minimum grasp of the subject and the minimum relevant research techniques. No evidence of background reading and no familiarity with any relevant examples and case studies. Inadequate evidence of coherent logical thought; ineffective presentation skills with poor argumentation and no abilities to draw meaningful conclusions. Work fails to reach degree level.

Course Type
Field camps

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures lectures and tutorials 10
Field work 72
Presentation interactive debates 10
Reading / Self study 100
Assessment group project 15

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 35 CLO 1,2,3,4
Report project report (35%), group investigation & presentation (30%) 65 CLO 1,2,3,4

Required/recommended reading and online materials
Required/recommended reading and online materials (at most 400 characters)
Course Website
Additional Course Information
http://www.biosch.hku.hk/ecology/lsc/

Enrollment Procedure:
The course is open to enrollment only during the add/drop period of the 2nd semester. Students are required to submit a brief (maximum 1-page) application letter (PDF file) via e-mail to the Course Coordinator (leszek@hku.hk) not later than 10th January. The application shall include the following:

1. Personal and academic details
2. ID photograph
3. Brief description of academic interests
4. GPA
5. Pre-requisite courses taken and grades received (if pre-requisites are not met, a reasoned request for waiver).

All applications will be reviewed prior to the commencement of the 2nd semester and results will be announced within the 1st week of the add/drop period of the 2nd semester.

BIOL4922 Food product development and evaluation (6 credits)

Academic Year: 2019
Quota: 20

Offering Department: Biological Sciences
Course Co-ordinator: Dr M F Wang, Biological Sciences (mfwang@hku.hk)

Teachers Involved:
Dr M F Wang, Biological Sciences

Course Objectives:
To introduce the key concepts and techniques used in food product development. To provide small group experience in the design, development and production of a new food product.

Course Contents & Topics:
History and future of the food industry; industrial product development process; idea generation and prototype development for new food products; quality management and legal protection; marketing strategies; food labeling; food package design; new product development for different food industries.

Course Learning Outcomes:
On successful completion of this course, students should be able to:

CLO 1 understand the food product development cycle
CLO 2 know the key steps in new product development
CLO 3 demonstrate enhanced insight and understanding of current and future trends in the food industry
CLO 4 have professional level practical experience in new product development
CLO 5 know the main characteristics of different sectors of the food industry

Pre-requisites (and Co-requisites and Impermissible combinations):
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) included BIOL203 and / or BIOL4205 in the Food & Nutritional Science Major.

This capstone course is for Food & Nutritional Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study. Not for students who have passed in BIOL4210 Food product development.

Offer in 2019 - 2020: Y
Offer in 2020 - 2021: Y
Examination: Dec

Grade Descriptors (A+ to F):

A
Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.

B
Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.

C
Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentational skills.

D
Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate team-based organizational and presentational skills of limited effectiveness.

Fail
Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Course Type: Laboratory and workshop course

Course Teaching & Learning Activities:

Activities
Details
No. of Hours
Laboratory
48
Group work
80-100 hours group project work
100
Tutorials
6 lectures + 6 tutorials
12

Assessment Methods and Weighting:

Methods
Details
Weighting in final course grade (%)
Assessment Methods to CLO Mapping
Assignments
Assignments assessment of group product development project including food product presentation
100
CLO 1,2,3,4,5

Required/recommended reading and online materials:

Course Website:
http://moodle.hku.hk/

Additional Course Information:
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4962 Food & nutritional science internship (6 credits)

Academic Year: 2019
Quota: ---

Offering Department: Biological Sciences
Course Co-ordinator: Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)
Teachers Involved:
(All academic staff in Food & Nutritional Science Major,Biological Sciences)
Course Objectives:
To provide a stimulating experience for all Food & Nutritional Science Major undergraduates to integrate and apply their knowledge and skills obtained from the Food & Nutritional Science Major through gaining work experience in the field of Food & Nutritional Science that are related to the major of study.

Course Contents:
Students taking this course will work as an intern for at least 160 hours in at least 20 working days within the
& Topics  
University or outside the University in a company, government department or NGO. The internship may be arranged by the School or obtained by students themselves. In the latter case, the internship must be in a relevant field to the Food & Nutritional Science Major that the students are taking and prior approval by the course coordinator is required

Course Learning Outcomes  
On successful completion of this course, students should be able to:
- CLO 1 gain first hand work experience in a job placement related to their Food & Nutritional Science Major
- CLO 2 apply the knowledge in their Food & Nutritional Science Major in solving practical problems in the workplace
- CLO 3 acquire an understanding and appreciation of the real work environment
- CLO 4 extend their network in their field of study

Pre-requisites (and Co-requisites and Impermissible combinations)  
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Food & Nutritional Science Major. This capstone course is for Food & Nutritional Science Major students only.

Offer in 2019 - 2020  
<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>Grade /Pass with distinction</th>
<th>Exam /Fail</th>
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<td>2nd sem</td>
<td>Summer</td>
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<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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</table>

Course Type  
Intership

Course Teaching & Learning Activities  
Activities  
Internship work

Assessment Methods and Weighting  
Methods  
Details  
Weighting in final course grade (%)  
Assessment Methods to CLO Mapping

Course Website  
http://moodle.hku.hk

Additional Course Information  
Students taking this course have to submit a written report of not less than 1,000 words and an oral presentation about their internships, which will be assessed by internal supervisors. Student's supervisor at work i.e. the institution offering the internship will also submit an assessment report to the University.

On successful completion of this course, students should be able to:
- CLO 1 gain first hand work experience in a job placement related to their Food & Nutritional Science Major
- CLO 2 apply the knowledge in their Food & Nutritional Science Major in solving practical problems in the workplace
- CLO 3 acquire an understanding and appreciation of the real work environment
- CLO 4 extend their network in their field of study

Pre-requisites (and Co-requisites and Impermissible combinations)  
Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Molecular Biology & Biotechnology Major. This capstone course is for Molecular Biology & Biotechnology Major students only.

Offer in 2019 - 2020  
<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>Grade /Pass with distinction</th>
<th>Exam /Fail</th>
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<tbody>
<tr>
<td>Y</td>
<td>1st sem</td>
<td>2nd sem</td>
<td>Summer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No Exam</td>
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</table>

Course Type  
Intership

Course Teaching & Learning Activities  
Activities  
Internship work

Assessment Methods and Weighting  
Methods  
Details  
Weighting in final course grade (%)  
Assessment Methods

BIOL4963  
Molecular biology & biotechnology internship (6 credits)

Offering Department  
Biological Sciences

Course Co-ordinator  
Dr A Yan, Biological Sciences (ayans8@hku.hk)

Teachers Involved  
(All academic staff in Molecular Biology & Biotechnology Major, Biological Sciences)

Course Objectives  
To provide a stimulating experience for all Molecular Biology & Biotechnology Major undergraduates to integrate and apply their knowledge and skills obtained from the Molecular Biology & Biotechnology Major through gaining work experience in the field of Molecular Biology & Biotechnology that are related to the major of study.

Course Contents & Topics  
Students taking this course will work as an intern for at least 160 hours in at least 20 working days within the University or outside the University in a company, government department or NGO. The internship may be arranged by the School or obtained by students themselves. In the latter case, the internship must be in a relevant field to the Molecular Biology & Biotechnology Major that the students are taking and prior approval by the course coordinator is required.

Course Learning Outcomes  
On successful completion of this course, students should be able to:
- CLO 1 gain first hand work experience in a job placement related to their Molecular Biology & Biotechnology Major
- CLO 2 apply the knowledge in their Molecular Biology & Biotechnology Major in solving practical problems in the workplace
- CLO 3 acquire an understanding and appreciation of the real work environment
- CLO 4 extend their network in their field of study

Pre-requisites (and Co-requisites and Impermissible combinations)  
Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Molecular Biology & Biotechnology Major. This capstone course is for Molecular Biology & Biotechnology Major students only.

Offer in 2019 - 2020  
<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>Grade /Pass with distinction</th>
<th>Exam /Fail</th>
<th>No Exam</th>
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<tbody>
<tr>
<td>Y</td>
<td>1st sem</td>
<td>2nd sem</td>
<td>Summer</td>
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<td></td>
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<td>Y</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>No Exam</td>
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</table>

Course Type  
Intership

Course Teaching & Learning Activities  
Activities  
Internship work

Assessment Methods and Weighting  
Methods  
Details  
Weighting in final course grade (%)  
Assessment Methods
### BIOL4964: Biological Sciences Internship (6 Credits)

**Offering Department:** Biological Sciences  
**Course Co-ordinator:** Dr S. Cannicci, Biological Sciences (cannicci@hku.hk)  
**Teachers Involved:** (All academic staff in Biological Sciences Major, Biological Sciences)  

**Course Objectives:**
- Students will gain first-hand work experience in a job placement related to their Biological Sciences Major.
- Students will apply the knowledge and skills obtained from the Biological Sciences Major through gaining work experience in the field of Biological Sciences that are related to the major of study.

**Course Contents & Topics:**
- Students will work as an intern for at least 160 hours in at least 20 working days within the University or outside the University in a company, government department or NGO. The internship may be arranged by the School or obtained by students themselves. In the latter case, the internship must be in a relevant field to the Biological Sciences major that the students are taking and prior approval by the course coordinator is required.

**Course Learning Outcomes:**
- On successful completion of this course, students should be able to:
  - CLO 1: gain first-hand work experience in a job placement related to their Biological Sciences Major.
  - CLO 2: apply the knowledge in their Biological Sciences Major in solving practical problems in the workplace.
  - CLO 3: acquire an understanding and appreciation of the real work environment.
  - CLO 4: extend their network in their field of study.

**Pre-requisites:**
- Students must pass at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Biological Sciences Major.

**Course Type:** Internship  
**Course Teaching & Learning Activities:**
- Activities: Internship work  
- Details: at least 160 hours (lunch hour excluded) in at least 20 working days  
- No. of Hours: 160

**Assessment Methods and Weighting:**
- Written report: 100

**Course Website:** [http://moodle.hku.hk](http://moodle.hku.hk)

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### BIOL4991: Ecology & Biodiversity Project (12 Credits)

**Offering Department:** Biological Sciences  
**Course Co-ordinator:** Dr M. Yasuhara, Biological Sciences (yasuhara@hku.hk)  
**Teachers Involved:** (All academic staff in E&B Major / E&B Intensive Major, Biological Sciences)  

**Course Objectives:**
- To provide a stimulating capstone experience for Ecology & Biodiversity Major / Ecology & Biodiversity Major (Intensive) undergraduates to integrate and apply their knowledge and skills obtained from the Ecology & Biodiversity Major / Ecology & Biodiversity (Intensive) through planning and carrying out a research project under the supervision of a member of staff.

**Course Contents & Topics:**
- Students interested to enrol in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

**Course Learning Outcomes:**
- On successful completion of this course, students should be able to:
  - CLO 1: critique and review appropriate scientific literature.
  - CLO 2: use this information to generate a scientifically relevant research question.
  - CLO 3: develop and formulate innovative scientific hypotheses to test this question.

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### CLO Mapping

<table>
<thead>
<tr>
<th>Written report</th>
<th>written report, supervisor's feedback and oral presentation</th>
<th>100</th>
<th>CLO 1,2,3,4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formative assessment</td>
<td>Formative assessment</td>
<td>100</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

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### Evaluation Criteria

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Examination</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of &quot;Distinction&quot;.</td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.</td>
<td></td>
</tr>
</tbody>
</table>

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### Internship Details

**Activities:**
- Written report, supervisor's feedback and oral presentation
**No. of Hours:** 100

---

659 School of Biological Sciences
### Course Objectives

To provide a stimulating capstone experience for Food & Nutritional Science Major undergraduates to integrate and apply their knowledge and skills obtained from the Food & Nutritional Science Major through planning and undertaking practical research work to formalize and undertake practical research work to formally test the hypotheses proposed.

### Pre-requisites

Pass in at least 24 credits of advanced level disciplinary core / elective courses in the Ecology & Biodiversity Major / Ecology & Biodiversity Major (Intensive); and

This capstone course is for Ecology & Biodiversity Major / Ecology & Biodiversity Major (Intensive) students only.

The earliest that a student is allowed to take this capstone course is their year 3 study.

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Evidence of complete or near-complete understanding and a thorough grasp of the subject matter as demonstrated by attainment of all learning outcomes. Excellent critique and knowledge of relevant literature and identification of research hypothesis. Well designed experimental approach to test research hypothesis. Show excellent organizational and analytical skills and laboratory/fieldwork techniques. Demonstrate comprehensive, critical, assessment of results and professional presentation of research work.</td>
</tr>
<tr>
<td>B</td>
<td>Evidence of near-complete understanding and a good grasp of the subject matter as demonstrated by attainment of the majority of learning outcomes. Good critique and knowledge of relevant literature and identification of research hypothesis. Appropriately designed experimental approach to test research hypothesis. Show good organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate effective, critical, assessment of results and good presentation of research work.</td>
</tr>
<tr>
<td>C</td>
<td>Evidence of adequate understanding and grasp of the subject matter as demonstrated by general but incomplete attainment of most of the learning outcomes. Acceptable critique and knowledge of relevant literature and identification of research hypothesis. Adequately designed experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate adequate but not necessarily critical, assessment of results and presentation of research work.</td>
</tr>
<tr>
<td>D</td>
<td>Evidence of limited understanding and grasp of the subject matter as demonstrated by incomplete attainment of many of the learning outcomes. Limited critique and knowledge of relevant literature and identification of research hypothesis. Poorly designed experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate confused and poorly organized assessment of results and limited presentation of research work.</td>
</tr>
<tr>
<td>Fail</td>
<td>Evidence of poor or inadequate understanding and grasp of the subject matter such that most of the learning outcomes are not attained. Poor critique and knowledge of relevant literature and identification of research hypothesis. Badly designed experimental approach to test research hypothesis. Show little evidence of appropriate organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate incorrect interpretation and assessment of results and poor presentation of research work.</td>
</tr>
</tbody>
</table>

### Course Type

Project-based course

### Course Teaching & Learning Activities

Reading / Self study  
formal lectures, seminars & practical work  
144

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Method</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissertation</td>
<td>may be through submission of recorded file 20 CLO 1,2,3,4,5,6,7</td>
<td>80</td>
<td>CLO 1,2,3,4,5,6,7,8</td>
</tr>
<tr>
<td>Oral presentation</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4,5,6,7</td>
</tr>
</tbody>
</table>

### Course Website

http://moodle.hku.hk

### Additional Course Information

A dissertation of maximum 12,000 words (80% weighting) and a research seminar (20% weighting).

### BIOL4992

**Food & nutritional science project (12 credits)**

**Offering Department**  
Biological Sciences

**Course Co-ordinator**  
Dr J C Lee, Biological Sciences (jettylee@hku.hk)

**Teachers Involved**  
(All academic staff in Food & Nutritional Science Major/Biological Sciences)

**Course Objectives**  
To provide a stimulating capstone experience for Food & Nutritional Science Major undergraduates to integrate and apply their knowledge and skills obtained from the Food & Nutritional Science Major through planning and undertaking practical research work under the supervision of a member of staff.

**Course Contents & Topics**  
Students should seek approval from a prospective supervisor prior to selecting this course. After admission to the course is approved by the course coordinator, students will complete their project work under the guidance of their supervisor.

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

- CLO 1 critique and review appropriate scientific literature
- CLO 2 use this information to generate a scientifically relevant research question
- CLO 3 develop and formulate scientific hypotheses to test this question
- CLO 4 design and undertake practical research work to formally test the hypotheses proposed
- CLO 5 analyse and evaluate the data collected to test the hypotheses, present data in a professional manner to illustrate the outcomes
- CLO 6 draw an objective series of conclusions based on the experimental work
- CLO 7 highlight and discuss their research findings and place them into a holistic scientific context

**Pre-requisites**

Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Food & Nutritional Science Major; and

Cumulative GPA of 3.0 or above.

This capstone course is for Food & Nutritional Science Major students only.

The earliest that a student is allowed to take this capstone course is their year 3 study.

**Offer in 2019 - 2020**  
Y Year long  
Offer in 2020 - 2021 : Y  
Examination  
No Exam

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Evidence of complete or near-complete understanding and a thorough grasp of the subject matter as demonstrated by attainment of all learning outcomes. Excellent critique and knowledge of relevant literature and identification of research hypothesis. Well designed experimental approach to test research hypothesis. Show excellent organizational and analytical skills and laboratory/fieldwork techniques. Demonstrate comprehensive, critical, assessment of results and professional presentation of research work.</td>
</tr>
<tr>
<td>B</td>
<td>Evidence of near-complete understanding and a good grasp of the subject matter as demonstrated by attainment of the majority of learning outcomes. Good critique and knowledge of relevant literature and identification of research hypothesis. Appropriately designed experimental approach to test research hypothesis. Show good organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate effective, critical, assessment of results and good presentation of research work.</td>
</tr>
<tr>
<td>C</td>
<td>Evidence of adequate understanding and grasp of the subject matter as demonstrated by general but incomplete attainment of most of the learning outcomes. Acceptable critique and knowledge of relevant literature and identification of research hypothesis. Adequately designed experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate adequate but not necessarily critical, assessment of results and presentation of research work.</td>
</tr>
<tr>
<td>D</td>
<td>Evidence of limited understanding and grasp of the subject matter as demonstrated by incomplete attainment of many of the learning outcomes. Limited critique and knowledge of relevant literature and identification of research hypothesis. Poorly designed experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate confused and poorly organized assessment of results and limited presentation of research work.</td>
</tr>
<tr>
<td>Fail</td>
<td>Evidence of poor or inadequate understanding and grasp of the subject matter such that most of the learning outcomes are not attained. Poor critique and knowledge of relevant literature and identification of research hypothesis. Badly designed experimental approach to test research hypothesis. Show little evidence of appropriate organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate incorrect interpretation and assessment of results and poor presentation of research work.</td>
</tr>
</tbody>
</table>

660
### Course Type
- Project-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading / Self study</td>
<td>formal lectures, seminars &amp; practical work</td>
<td>144</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissertation</td>
<td></td>
<td>80</td>
<td>CLO 1,2,3,4,5,6,7,8</td>
</tr>
<tr>
<td>Oral presentation</td>
<td></td>
<td>20</td>
<td>CLO 5,7</td>
</tr>
</tbody>
</table>

### Course Website
- [http://moodle.hku.hk/](http://moodle.hku.hk/)

### Additional Course Information
- A dissertation of about 9,000 - 12,000 words (80% weighting) and a research seminar (20% weighting).
- As BIOL4992 "FNS project" is a whole year course, students should enrol this course during the course selection period or the add/drop period in the 1st Semester only.

### BIOL4993: Molecular biology & biotechnology project (12 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr A Yan, Biological Sciences (<a href="mailto:ayan8@hku.hk">ayan8@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(All academic staff in MBB Major / MBB Intensive Major, Biological Sciences)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To provide a stimulating capstone experience for all Molecular Biology &amp; Biotechnology Major / Molecular Biology &amp; Biotechnology Major (Intensive) undergraduates to integrate and apply their knowledge and skills obtained from the Molecular Biology &amp; Biotechnology Major / Molecular Biology &amp; Biotechnology Major (Intensive) through planning and carrying out a research project under the supervision of a member of staff.</td>
</tr>
</tbody>
</table>

### Course Contents & Topics
- Students should seek approval from a prospective supervisor prior to selecting this course. After admission to the course is approved by the course coordinator, students will complete their project work under the guidance of their supervisor.

### Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1: critique and review appropriate scientific literature
  - CLO 2: use this information to generate a scientifically relevant research question
  - CLO 3: develop and formulate scientific hypotheses to test this question
  - CLO 4: design and undertake practical research work to formally test the hypotheses proposed
  - CLO 5: analyse and evaluate the data collected to test the hypotheses
  - CLO 6: present data in a professional manner to illustrate the outcomes
  - CLO 7: draw an objective series of conclusions based on the experimental work
  - CLO 8: highlight and discuss their research findings and place them into a holistic scientific context

### Pre-requisites and Co-requisites (and Impermissible combinations)
- Pass in at least 24 credits of advanced level disciplinary core / elective courses in the Molecular Biology & Biotechnology Major / Molecular Biology & Biotechnology Major (Intensive) students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
<th>Offer in 2020 - 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No Exam</td>
<td>Y</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Course Type
- Project-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading / Self study</td>
<td>formal lectures, seminars &amp; practical work</td>
<td>144</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissertation</td>
<td></td>
<td>80</td>
<td>CLO 1,2,3,4,5,6,7,8</td>
</tr>
<tr>
<td>Oral presentation</td>
<td></td>
<td>20</td>
<td>CLO 1,6,7,8</td>
</tr>
</tbody>
</table>
A dissertation of about 9,000 - 12,000 words (80% weighting) and a research seminar (20% weighting).

### BIOL4994

**Biological sciences project (12 credits)**

**Offering Department:** Biological Sciences  
**Course Co-ordinator:** Dr S Cannicci, Biological Sciences (cannicci@hku.hk)  
**Teachers Involved:** (All academic staff in Biological Sciences Major; Biological Sciences)

#### Course Objectives
To provide a stimulating capstone experience for all Biological Sciences Major undergraduates to integrate and apply their knowledge and skills obtained from the Biological Science Major through planning and carrying out a research project under the supervision of a member of staff. After admission to the course is approved by the course coordinator, students will complete their project work under the guidance of their supervisor.

#### Course Contents & Topics
Students should seek approval from a prospective supervisor prior to selecting this course. After admission to the course, students will be exposed to the incredible interrelationships that are basic to ecological principles and the impact biological/ecological principles and concepts of environmental science which are needed for critical discussion and application. Students will be stimulated to think about current life science issues such as biodiversity loss, organisms adaptation and climate change. Similarly, students will be exposed to the incredible interrelationships that are basic to ecological principles and the impact that human development has upon these interrelationships. After learning basics of environmental life science, we then explore experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate adequate but not necessarily critical, assessment of results and presentation of research work.

#### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Biological Sciences Major; and Cumulative GPA of 3.0 or above.

This capstone course is for Biological Sciences Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

#### Offer in 2019 - 2020
- **Grade Descriptors**
  - **A** Evidence of complete or near-complete understanding and a thorough grasp of the subject matter as demonstrated by attainment of all learning outcomes. Excellent critique and knowledge of relevant literature and identification of research hypothesis. Well designed experimental approach to test research hypothesis. Show excellent organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate comprehensive, critical, assessment of results and professional presentation of research work.
  - **B** Evidence of near-complete understanding and a good grasp of the subject matter as demonstrated by attainment of the majority of learning outcomes. Good critique and knowledge of relevant literature and identification of research hypothesis. Appropriately designed experimental approach to test research hypothesis. Good organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate effective, critical, assessment of results and good presentation of research work.
  - **C** Evidence of adequate understanding and grasp of the subject matter as demonstrated by general but incomplete attainment of most of the learning outcomes. Acceptable critique and knowledge of relevant literature and identification of research hypothesis. Adequately designed experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate effective, critical, assessment of results and good presentation of research work.
  - **D** Evidence of limited understanding and grasp of the subject matter as demonstrated by incomplete attainment of many of the learning outcomes. Limited critique and knowledge of relevant literature and identification of research hypothesis. Poorly designed experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate adequate but not necessarily critical, assessment of results and presentation of research work.
  - **Fail** Evidence of poor or inadequate understanding and grasp of the subject matter such that most of the learning outcomes are not attained. Poor critique and knowledge of relevant literature and identification of research hypothesis. Badly designed experimental approach to test research hypothesis. Show little evidence of appropriate organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate incorrect interpretation and assessment of results and poor presentation of research work.

#### Course Type
- Project-based course

#### Course Teaching & Learning Activities
- **Assessment Methods and Weighting**
  - **Dissertation**
    - Details: Writing a dissertation of about 9,000 - 12,000 words (80% weighting) and a research seminar (20% weighting).
  - **Assessment Methods to CLO Mapping**
    - CLO 1: Critique and review appropriate scientific literature.  
    - CLO 2: Use this information to generate a scientifically relevant research question.  
    - CLO 3: Develop and formulate scientific hypotheses to test this question.  
    - CLO 4: Design and undertake practical research work to formally test the hypotheses proposed.  
    - CLO 5: Analyse and evaluate the data collected to test the hypotheses.  
    - CLO 6: Present data in a professional manner to illustrate the outcomes.  
    - CLO 7: Draw an objective series of conclusions based on the experimental work.  
    - CLO 8: Highlight and discuss their research findings and place them into a holistic scientific context.
  - **No. of Hours**
    - Reading / Self study: 144

#### Course Website
- [http://moodle.hku.hk/](http://moodle.hku.hk/)
to climate change, tragedy of commons (human ecology) and applied life science topics such as biomaterial science.

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1: understand life, environment and their interactions
- CLO 2: appreciate species and ecosystem responses to human-induced environmental change
- CLO 3: attain ability to critically think and discuss about current environ-life science issues
- CLO 4: be motivated and equipped: to tackle biological environmental science questions and to choose advanced environmental science courses

Pre-requisites
NIL

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y Examination May

Grade Descriptors (A to F)
A Evidence of original thought during the analysis of environmental life science issues. Show evidence of analytical, critical and multidimensional thinking about the study subject. Extensive knowledge and skills required for attaining all the course learning outcomes. Demonstrate excellent ability to apply what you have learned in the class room to critically analyze the real environmental life science issues. Show highly effective organizational, presentational and field trip skills.
B Show substantial knowledge and thought during the analysis of environmental life science issues. Show some evidence of some analytical, critical and multidimensional thinking about the study subject. Good knowledge and skills required for attaining all the course learning outcomes. Demonstrate good ability to apply what you have learned in the class room to critically analyze the real environmental life science issues. Show effective organizational, presentational and field trip skills.
C Show general but incomplete knowledge and original thought during the analysis of environmental life science issues. Fair knowledge and skills required for attaining all the course learning outcomes. Demonstrate fair ability to apply what you have learned in the class room to critically analyze the real environmental life science issues. Show considerable organizational, presentational and field trip skills.
D Evidence to show a minimum knowledge (i.e. knowledge is very incomplete) and thought during the analysis of environmental life science issues. Show insufficient knowledge and skills required for attaining all the course learning outcomes. Demonstrate poor ability to apply what you have learned in the class room to critically analyze the real environmental life science issues. Show very little organizational, presentational and field trip skills.
Fail Evidence of meager or inadequate knowledge and understanding of environmental life science issues. Show no evidence of knowledge and skills required for attaining all the course learning outcomes. Demonstrate no ability to apply what you have learned in the class room to critically analyze the real environmental life science issues. Show no evidence of familiarity with relevant reading material and field trip demonstrations, or any knowledge of organizational and presentational skills.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Field work</td>
<td>3-12 hours field work</td>
<td>12</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>Examination</td>
<td>100</td>
<td>CLO 1, 3</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>Appropriate reading materials/handouts will be provided during the course.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

ENVS2001 Methods in environmental science (6 credits)

Offering Department
Biological Sciences

Academic Year
2019

Quota
42

Course Co-ordinator
Dr D M Baker, Biological Sciences (dmbaker@hku.hk)

Course Objectives
To introduce students to a broad spectrum of field and laboratory methods for data collection in environmental science. Through exposure to environmental data collection, experimental design, data analysis, interpretation and reporting, students will gain a deeper appreciation of the process that underlies environmental science research and its relevancy to critical thinking and future careers in the sciences.

Course Contents & Topics
This course will involve environmental data collection in both field and laboratory settings. In-class lectures will cover basic principles of specific methodologies and relevant applications in preparation for laboratory and field-based experiential learning. Having an interdisciplinary focus, the course will cover topics relevant to the study of the biosphere, encompassing terrestrial, aquatic, and atmospheric systems. Students will gain hands-on experience with the operation of standard and advanced sampling and analytical equipment, quality control, basic data analysis and reporting.

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1: understand how scientific data is used to address environmental problems
- CLO 2: have a basic understanding of the techniques and methodologies necessary for collecting environmental data
- CLO 3: understand some of the problems inherent in data collection, and how this impacts data interpretation
- CLO 4: understand how data collected in the lab and field can be used to critically evaluate ideas

Pre-requisites
Pass in BIOL309 or EASC1401 or ENV51301 or ENVS1401

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y Examination No Exam

Grade Descriptors (A to F)
A Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective lab / fieldwork skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
B Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Apply effective lab / fieldwork skills and techniques. Correct use of data to results to draw appropriate conclusions. Apply effective organizational and presentational skills.
C Demonstrate general but limited grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective lab / fieldwork skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and
logical thinking, but with limited analytical and critical abilities. Apply partially effective lab / fieldwork skills and techniques.

Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

**Course Objectives**

**Course Type** Laboratory and workshop course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Field work</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Project work</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>10</td>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>20</td>
<td>CLO 1.2.3,4</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>20</td>
<td>CLO 2.3</td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td>50</td>
<td>CLO 1.2.3,4</td>
</tr>
</tbody>
</table>

**Course Website** http://moodle.hku.hk

**ENVS2002** Environmental data analysis (6 credits) Academic Year 2019

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr T C Bonebrake, Biological Sciences (tbone@hku.hk)

**Teachers Involved** Dr M Yasuhara,School of Biological Sciences)

**Course Objectives**

To provide students with the ability to analyze data; especially data which are relevant to issues and questions in environmental science. This course will enable students to accurately interpret, organize, display, test and analyze environmental data. The course will also introduce students to principles of a variety of important advanced approaches in analyzing environmental data including spatial analysis, geographic information systems, remote sensing, risk assessment, and time series analysis.

**Course Contents & Topics**

The course will feature lectures on aspects of sampling, distributions, uncertainty, probability, and hypothesis testing in addition to lectures on advanced analysis topics. Special emphasis will be placed on qualities inherent to most environmental datasets such as large size, multivariate, and spatial. All material will be applied and practiced in environmental science contexts (e.g. chemistry, ecology, geology and oceanography) using a variety of datasets in a computer laboratory setting using the ‘R Project for Statistical Computing’ software (a graphical user interface will be implemented such that prior knowledge of coding or computer science is not required).

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 accurately interpret methods and approaches in the scientific literature
- CLO 2 evaluate critically data analyses in the environmental sciences
- CLO 3 perform standard and appropriate statistical analyses on a variety of data sources
- CLO 4 work comfortably with large datasets using applied software (e.g. R)
- CLO 5 present results of data analyses in a clear and transparent manner

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401

**Offer in 2019 - 2020**

**Grade Descriptors** (A+ to F)

**A** Demonstrate thorough grasp of the subject and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking. Apply a highly effective computational skills and techniques for basic statistical analyses. Be able to critically use data and statistical results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

**B** Demonstrate substantial grasp of the subject and skills required for attaining at least most of the course learning outcomes. Present evidence of analytical and critical abilities and logical thinking. Apply effective computational skills and techniques for basic statistical analyses. Be able to correctly use data and statistical results to draw appropriate conclusions. Apply effective organizational and presentational skills.

**C** Demonstrate general but incomplete grasp of the subject and skills required for attaining some of the course learning outcomes. Present evidence of some analytical and critical abilities and logical thinking. Apply moderately effective computational skills and techniques for basic statistical analyses. Demonstrate mostly correct but some erroneous use of data and statistical results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

**D** Demonstrate partial and limited grasp of the subject and skills required for attaining some of the course learning outcomes. Present evidence of some analytical and critical abilities and logical thinking, but with limited analytical and critical abilities. Apply limited or barely effective computational skills and techniques for basic statistical analyses. Demonstrate limited ability to use data and statistical results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

**Fail** Demonstrate limited or no grasp of the subject and skills required for attaining any of the course learning outcomes. Present evidence of little or lack of analytical and critical abilities, logical or coherent thinking. Apply minimally effective or ineffective computational skills and techniques for basic statistical analyses. Demonstrate misuse of data and statistical results and/or unable to draw appropriate conclusions. Apply minimally effective or ineffective organizational and presentational skills.

**Course Type** Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory problem-based learning/computer laboratory</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>25</td>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>Project report</td>
<td></td>
<td>25</td>
<td>CLO 1.2.3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1.2.3,4,5</td>
</tr>
</tbody>
</table>

**Required/recommended Textbooks:**
**ENVS3019**

**Offering Department:** Biological Sciences

**Course Co-ordinator and Teachers Involved:** Dr T C Bonebrake, Biological Sciences (tbone@hku.hk)

**Course Objectives:**
This course will provide students with an understanding and knowledge of the ecology of urban ecosystems. The course will highlight the role of cities in a world under environmental change and rapid development.

**Course Contents & Topics:**
Ecological systems within cities and cities as ecological systems will both be covered in this course. Ecological concepts unique to or specialized within cities will be covered including sustainability, conservation, health, development, globalization, and restoration. Specific topics will include climate change (e.g. urban heat island effects), invasive species, infectious diseases and pollution. Examples will be taken globally but special emphasis will be placed on Hong Kong.

**Course Learning Outcomes:**
On successful completion of this course, students should be able to:
- CLO 1 describe and evaluate the processes and patterns that characterize urban ecological systems
- CLO 2 understand biodiversity and ecosystem responses to urbanization
- CLO 3 recognize energy flows within urban ecosystems and how energy use and waste improve or deteriorate environmental quality
- CLO 4 critically evaluate management and policy solutions to urban ecological problems

**Pre-requisites (and Co-requisites and Impermissible combinations):**
Pass in BIOL2306 or ENVS2001 or ENVS2002

**Offer in 2019 - 2020:**
Y 1st sem  Offer in 2020 - 2021 : N

**Examination:**
Dec

**Grade Descriptors (A+ to F):**
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, ability to integrate and synthesize information, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective presentational skills. Strong evidence of clear attention to thoughtful and reflective thinking.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, integration of materials and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate effective presentational skills. Evidence of clear attention to thoughtful and reflective thinking.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective presentational skills. Little evidence of clear attention to thoughtful and reflective thinking.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities and little attempt at integration. Show limited ability to apply knowledge to solve problems. Apply limited effectiveness in presentational skills. Lack of attention to thoughtful and reflective thinking.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type:** Lecture-based course

**Course Teaching & Learning Activities:**
Table:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
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<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting:**
Table:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>Mid-term exam (20%), Final exam (30%)</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials:**
Textbooks:

**Course Website:**
http://moodle.hku.hk

**Additional Course Information:**
This course will be offered subject to a minimum enrollment number and availability of teachers. Offer in alternate year from 2013-2014

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**ENVS3020**

**Offering Department:** Biological Sciences

**Course Co-ordinator and Teachers Involved:** Dr C Dingle, Biological Sciences (cdingle@hku.hk)

**Course Objectives:**
The main goal of this course is to introduce students to the ways in which global environmental change affects biodiversity from organisms to ecosystems. This course will explore the contributions that human population growth and globalization have made to increases in greenhouse gases and associated climate change, biological invasions, land degradation, disease, and, ultimately, impacts on biological systems.

**Course Contents & Topics:**
Environmental change is a natural phenomenon, with ecosystems continually shifting, rearranging, emerging, and disappearing through geologic time with changes in climatic conditions. The activities of humans have added to this

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**References:**
natural variation, increasing the magnitude and speed with which environmental change occurs. This course will focus principally on the effects of climate change on organisms and ecosystems but will also investigate other topics registering on a global scale including land use change, biological invasions, and pollution, as well as synergetic interactions between all of the environmental stressors. We will explore (1) what climate change is and how it is manifested including climate warming, sea level rise, and ocean acidification; (2) types and extents of land use change; (3) how globalization has contributed to the spread of alien species and disease. The course will investigate how these human-caused stressors affect the morphology, phenology, distribution, and evolution of organisms and their impacts on ecosystem functioning and biodiversity in freshwater, marine, and terrestrial ecosystems.

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 develop a basic understanding of climate change and other human-associated impacts, such as land use change, and how they are manifested on a global scale
- CLO 2 explain the ways that global change affects organisms' traits and distributions, and biodiversity at the ecosystem level
- CLO 3 understand the differences between climate change on a geologic time scale and recent climate change
- CLO 4 be aware of the relationships between humans and global change

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2306 or ENVS2001 or ENVS2002

Offer in 2019 - 2020

Offer in 2020 - 2021: Y

Grade Descriptors (A+ to F)

- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, ability to integrate and synthesize information, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective presentational skills. Strong evidence of clear attention to thoughtful and reflective thinking.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, integration of materials and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate effective presentational skills. Evidence of clear attention to thoughtful and reflective thinking.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective presentational skills. Little evidence of clear attention to thoughtful and reflective thinking.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities and little attempt at integration. Show limited ability to apply knowledge to solve problems. Apply limited effectiveness in presentational skills. Lack of attention to thoughtful and reflective thinking.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type

Lecture-based course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>problem-based exercises (10%), continuous assessment (10%)</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Essay</td>
<td>Essay and presentation</td>
<td>30</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td>Mid-term test</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Recommended books:

Required articles:

Course Website

http://moodle.hku.hk

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers. Offer in alternate year from 2016-2017

ENVS3022 Environmental science field course (6 credits)

Academic Year 2019

Offering Department Biological Sciences

Teachers Involved Dr M Yasuhara, Biological Sciences (yasuhara@hku.hk)

Course Objectives

To provide students experiential learning experience in the field of environmental science. The course is primarily based on an array of experiential studies covering essential areas of environmental science during a residential fieldtrip.

Course Contents & Topics

Students to attend a residential field trip outside Hong Kong to learn about environmental science in practice. The residential field trip may include marine environmental survey, sediment core sampling, practical learning of ecological, paleoecology and environmental problems, environmental geology/paleontology excursions, and other activities. Students are required to write an independent report on the learning outcome of the field trip.

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 recognize ways of environmental science in practice
- CLO 2 gain knowledge of current environmental problems and solutions
- CLO 3 present and communicate their field observations and findings

Pre-requisites

Pass in ENV60201 or
ENVS3028 Coastal Sustainability (6 credits)  Academic Year 2019
Offering Department Biological Sciences  Quota 8
Course Co-ordinator Dr T Vengatesen, Biological Sciences (rajan@hku.hk)
Teachers Involved Dr T Vengatesen,School of Biological Sciences)
(Prof G A Williams,School of Biological Sciences)
Course Objectives
- Understand the primary drivers of biodiversity and ecosystem function in rocky intertidal, mangrove and coral reef ecosystems in USA and SE Asia.
- Gain an appreciation for how urban ecosystems in this region are being affected by climate change, development and stress from pollution.
- Better understand how history and governance structures of Hong Kong, Malaysia and New England constrain and/or facilitate coastal adaptation strategies.
- Appreciate how cultural practices such as seafood preferences and traditional medicine affect harvesting of marine species, and how this impacts coastal biodiversity.
Course Contents & Topics
The majority of the Earth’s population now lives in coastal cities, where people not only depend on ocean resources, but are also experiencing ever increasing threats from the ocean environment. This program will explore the mechanisms by which coastal communities in the US and SE Asia are facing these expanding challenges, including their impacts on coastal ecosystems. Using a comparative approach, students will explore the diverse challenges facing coastal societies, and will gain an in-depth understanding of coupled human-natural systems on the coasts of New England and Southeast Asia (Hong Kong and Malaysia).
By comparing and contrasting both ecosystems and societies, students will develop an appreciation for both the commonalities of challenges facing the world’s coasts, as well as differences that occur due to local ecology. A major emphasis of the program will be on solutions, and how by taking a global perspective we can accelerate methods for climate change adaptation that span traditional cultural barriers. We will blend studies of threats facing both human and natural systems in Hong Kong, Malaysia and the Gulf of Maine with an in-depth exploration of how those societies have (or have not) enacted solutions to those challenges.
Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 Articulating similarities and differences between how coupled human-natural systems operate in SE Asia and in comparable habitats in the U.S.A.
- CLO 2 Reading and synthesizing review articles in the primary literature in marine science and social science literature, and explain the connections among these diverse approaches.
- CLO 3 Articulating arguments about how traditional Chinese, Malaysian and American culture affect human impacts on the environment, and to develop potential solutions to these issues based on conversations with peers.
- CLO 4 Becoming comfortable collaborating with peers from U.S.A, and gain a greater understanding of the culture of the region.
### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2306 or BIOL3301 or BIOL3305 or BIOL3318 or ENVS2001 or ENVS2002 or EASC3020

### Course Objectives

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<thead>
<tr>
<th>Grade Description</th>
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<tbody>
<tr>
<td>A</td>
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<td>B</td>
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<tr>
<td>C</td>
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<tr>
<td>D</td>
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<tr>
<td>Fail</td>
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</tbody>
</table>

### Course Teaching & Learning Activities

**Outcomes**

- CLO 1: Critically evaluate studies using social science and/or qualitative approaches.
- CLO 2: Design a study appropriate for the research question using those approaches and techniques.
- CLO 3: Discuss the philosophical and epistemological background of different approaches to environmental sciences.
- CLO 4: Critically evaluate studies using social science and/or qualitative approaches.

### Course Website

[http://moodle.hku.hk/](http://moodle.hku.hk/)

### Additional Course Information

- **Duration:** July 9, 2019 to August 10, 2019
- **All field trips, including the overseas trip to Malaysia and USA, are compulsory**
- **Course fee - plase contact the course coordinator**

1. **1st week:** Lectures, practicals and field trips in the University of Hong Kong, Hong Kong
2. **2nd week:** Lectures and field trips in University Sains Malaysia, Penang (Malaysia)
3. **3rd and 4th weeks:** Lectures and field trips in Northeastern University, New England (Boston, USA)

This is an introductory overseas experiential learning course designed for all science students as free elective. It is especially suitable for students aiming to major in environmental science, ecology & biodiversity or biological sciences.

*Note: Field trips in New England (Boston, USA) will NOT be considered for assessment and, therefore, those field trips in USA are only exploratory in nature and are NOT part of any HKU's credit bearing course*.

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Write ups form the field trips</td>
<td>20</td>
<td>CLO 1</td>
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<tr>
<td>Report</td>
<td>Final lab notebook and associated materials</td>
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<td>CLO 2,3,4</td>
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<tr>
<td>Test</td>
<td></td>
<td>30</td>
<td>CLO 2,3,4</td>
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### Course Learning Outcomes

- CLO 1: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a complex issue of sustainable coastal management in economically and socially developed and developing places.
- CLO 2: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to a complex issue of sustainable coastal management in economically and socially developed and developing places.
- CLO 3: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to a complex issue of sustainable coastal management in economically and socially developed and developing places.
- CLO 4: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems.

### Course Grade

- A: Demonstrate thorough mastery of the course material. Show strong ability for analytical, critical and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate highly effective organizational and presentational skills.
- B: Demonstrate substantial command of the course material and an ability to apply knowledge to familiar and some unfamiliar situations. Show evidence of analytical, critical thought to some complex issues. Apply effective organizational and
<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
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<tr>
<td>Course Teaching &amp; Learning Activities</td>
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<tr>
<td>Activities</td>
<td>Details</td>
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<td>Lectures</td>
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<td>Tutorials</td>
<td></td>
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<tr>
<td>Reading / Self study</td>
<td>Lab sessions</td>
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<td>Assessment Methods and Weighting</td>
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<tr>
<td>Methods</td>
<td>Details</td>
</tr>
<tr>
<td>Assignments</td>
<td></td>
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<tr>
<td>Examination</td>
<td></td>
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<tr>
<td>Required/recommended reading and online materials</td>
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</tr>
<tr>
<td>Course Objectives</td>
<td>To introduce students with the environmental fate information of different pollutants/contaminants in the environment. To understand the technologies available for environmental remediation of pollutants in soils and water, and the characteristics of each technologies relevant to the pollutants of concern. To learn the fundamental physical, chemical and biochemical reactions involved in the remediation process. To obtain skills for critical analysis of the recent technological development and the proposed applications.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Understanding the types of different pollutants and their fate in the environments including both terrestrial and aquatic; and relevant strategy of pollution control and treatment; advanced oxidation, microbiological treatment and phytoremediation; mechanisms of biochemical transformation of polyaromatic hydrocarbon, polychlorinated biphenols, agrichemicals and phthalate esters as well as both metals and metalloids; biochemical pathways and the specific genes involved in detoxification; chemotaxis and engineering the degradation pathways in bacteria; transport of microorganisms and monitoring in subsurface environment; survival of introduced organisms; evolution of the degradative genes in bacteria; in situ and ex situ remediation techniques; green technologies.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to: CLO 1 explain the remediation technologies available to the type of pollutants of concern in remediation practice. CLO 2 propose remediation strategies for polluted sites with the best technologies available considering the type of pollutants and the cost involved. CLO 3 differentiate the technologies available for the specific pollutants and the fundamental process involved in terms of the catalysts and the effectiveness. CLO 4 describe several key chemical and biochemical processes used in environmental remediation with adequate background information on their history and development.</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in BIOL3109 or BIOL3110 or BIOL3401 or ENVS3042</td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Grade Descriptors</td>
</tr>
<tr>
<td>Grade (A+ to F)</td>
<td>Details</td>
</tr>
<tr>
<td>A</td>
<td>Thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Thorough grasp of the subject matter. Show very strong analytical and critical abilities and high logical thinking, with evidence of original thought. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Substantial grasp of the subject. Show evidence of analytical and critical abilities and logical thinking. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>General but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. General but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
<tr>
<td>Assignments</td>
<td>10</td>
</tr>
<tr>
<td>Essay</td>
<td>25</td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
</tr>
<tr>
<td>Presentation</td>
<td>10</td>
</tr>
<tr>
<td>Test</td>
<td>5</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

### Course Website
http://moodle.hku.hk/

### Additional Course Information
The course will be offered subject to a minimum enrollment number and availability of teachers. Offer in alternative year from 2011-2012
The Core University English (CUE) course aims to enhance first-year students’ academic English language proficiency in the university context. CUE focuses on developing students’ academic English language skills for the Common Core Curriculum. These include the language skills needed to understand and produce spoken and written academic texts, express academic ideas and concepts clearly and in a well-structured manner and search for and use academic sources of information in their writing and speaking. Four online-learning modules through the Moodle platform on academic speaking, academic grammar, academic vocabulary, citation and referencing skills and avoiding plagiarism will be offered to students to support their English learning. This course will help students to participate more effectively in their first-year university studies in English, thereby enriching their first-year experience.

**Course Contents & Topics**

The CUE course focuses on developing students’ academic English language skills for the Common Core Curriculum. These include the language skills needed to understand and produce spoken and written academic texts, express academic ideas and concepts clearly and in a well-structured manner and search for and use academic sources of information in their writing and speaking. Four online-learning modules through the Moodle platform on academic speaking, academic grammar, academic vocabulary, citation and referencing skills and avoiding plagiarism will be offered to students to support their English learning. This course will help students to participate more effectively in their first-year university studies in English, thereby enriching their first-year experience.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 identify and distinguish between main ideas and supporting details in lectures and written texts and demonstrate an understanding of the arguments / facts expressed
- CLO 2 form and express personal opinions through critical reading and listening
- CLO 3 argue for and defend a position in a clear and structured way using academic sources, through writing and speaking
- CLO 4 demonstrate control of grammatical accuracy and lexical appropriacy in academic communication

**Course Objectives**

- To develop students’ academic English language skills for the Common Core Curriculum
- To enhance students’ ability to understand and produce spoken and written academic texts
- To enable students to express academic ideas and concepts clearly and in a well-structured manner
- To develop students’ ability to search for and use academic sources of information in their writing and speaking

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Method</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>35</td>
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</table>

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
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<tbody>
<tr>
<td>Lectures</td>
<td>30</td>
<td></td>
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<tr>
<td>Tutorials</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>84</td>
<td></td>
</tr>
</tbody>
</table>

**Grade Descriptors**

- **A** Excellent to outstanding result. Students are able to produce spoken and written academic texts which are at all times appropriately structured. Students can clearly and concisely explain academic concepts and critically argue for a detailed position. Students always use appropriate academic sources to support their ideas in writing and speaking. They cite and reference correctly at all times. Students can comprehensively and fluently.
- **B** Good to very good result. Students are able to produce spoken and written academic texts which are appropriately structured with only minor errors. Students can almost always clearly and concisely explain academic concepts and almost always critically argue for a detailed position. Students almost always use appropriate academic sources to support their ideas in writing and speaking. They cite and reference correctly with only a few non-systematic errors. Students can comprehend and interpret texts with ease, although they may miss some implied meanings and opinions. Written language is mostly accurate but contains a few systematic errors in complex grammar and vocabulary. Spoken language is mostly comprehensible and fluent.
- **C** Satisfactory to reasonably good result. Spoken and written academic texts produced by students are sometimes not-well structured but there is some evidence of this ability. Students are sometimes unable to clearly and concisely explain academic concepts. While they can argue for a position, it is not very detailed and tend to be simplistic rather than critical. Students sometimes use sources which are nonacademic and/or not appropriate to support their ideas in writing and speaking. There are some systematic errors in citation and referencing but also evidence of correct systematic use. Students have some difficulty comprehending and critically interpreting texts. They can almost always understand the main ideas but may miss some of the writer's views and attitudes. Written language is sometimes inaccurate, although errors, when they occur, are more often in complex grammar and vocabulary. Spoken language is generally comprehensible and fluent but at times places strain on the listener.
- **D** Barely satisfactory result. Spoken and written academic texts produced by students are often inappropriately structured but there may be some evidence of this ability. Students are often unable to clearly and concisely explain academic concepts and argue for a position. There is some evidence of an ability to explain academic concepts but not to critically argue for a position. Students often use sources which are nonacademic and/or not appropriate to support their ideas in writing and speaking. There are many systematic errors in citation and referencing however there is evidence of an understanding of some of the conventions of citation and referencing. Students often have difficulty comprehending and interpreting texts, sometimes failing to understand the main ideas and writer’s views and attitudes. Written language is often inaccurate containing errors in a range of simple and complex grammar and vocabulary. Spoken language is generally comprehensible and fluent, and strain is frequently placed on the listener.

- **Fail** Un satisfactory result. Productive skills are too limited to be able to successfully carry out spoken and written assessments. Texts are unstrucutred and unclear. Students are unable to follow and interpret texts. There are language errors in almost every sentence. Spoken language is often incomprehensible. Assessments may not have been attempted or contain plagiarism.

**Offering Department**

English

**Teachers Involved**

Dr P Wong, English (pmtw2@hku.hk)

**Course Co-ordinator**

(Dr P Wong, Centre for Applied English Studies)

**Offer in 2019 - 2020**

Y 1st sem 2nd sem Offer in 2020 - 2021 : Y

**Pre-requisites (and Co-requisites and Impermissible combinations)**

NIL

**Examinations**

Dec May
CAES9820 | Academic English for science students (6 credits) | Academic Year | 2019
---|---|---|---
Offering Department | English | Quota | ---
Course Co-ordinator | Dr E Law, English (ellielaw@hku.hk) | (Dr E Law, Centre for Applied English Studies)
Teachers Involved | | |
Course Objectives | This six credit English-in-the-Discipline course will be offered to second year students studying in the Science Faculty. This course will help students develop the necessary skills to use both written and spoken English within their studies. Students will learn to better communicate and spontaneously discuss general and scientific concepts within their division, with other scientists as well as to a larger audience. Particular emphasis will be placed on enabling students to identify their own language needs and develop appropriate self-learning strategies to improve their proficiency.

Course Contents & Topics | Topics covered in the course will be:
- Finding, evaluating and using appropriate academic source materials;
- Compiling an academic bibliography;
- Contrasting academic and popular genres of Science;
- Writing for a specific audience, including stance, shared knowledge, levels of formality; and
- Organizing and articulating ideas in an academically suitable format including appropriate vocabulary and grammar; and
- Critically examine their own language proficiency and analyze how that relates to their ability to perform successfully within their discipline. Developing self-directed learning strategies.

Course Learning Outcomes | On successful completion of this course, students should be able to:
CLO 1 identify and summarize disciplinary sources related to a specified topic
CLO 2 produce texts (written and spoken) appropriate for a cross-disciplinary audience based on their disciplinary knowledge
CLO 3 identify their own language learning needs and implement a plan to meet those needs

Pre-requisites (and Co-requisites and Impermissible combinations) | NIL
Offer in 2019 - 2020 | Y | 1st sem | 2nd sem | Offer in 2020 - 2021 | Y | Examination | No Exam
Grade Descriptors (A+ to F) | A | Excellent result. Consistently demonstrates ability to summarize salient points accurately from appropriate and reliable sources using original language. Text uses sources appropriately and demonstrates accurate and appropriate grammatical, lexical and organizational characteristics. Language learning needs are clearly identified and aligned with evidence of planning, self-study and reflection.
B | Good to very good result. Usually demonstrates ability to summarize salient points accurately using mostly original language. Text mostly uses sources appropriately and demonstrates mostly accurate and appropriate grammatical, lexical and organizational characteristics. Language learning needs are stated with some reference to evidence of planning and reflection although there is some misalignment between goals and self-study completed.
C | Satisfactory to reasonably good result. Demonstrates some ability to summarize salient points using mostly original language although some inaccuracies are present. Text uses some sources appropriately and demonstrates appropriate but simple grammatical and lexical characteristics with some organizational flaws. Language learning needs are stated with some limited evidence of planning and reflection but goals and self-study are misaligned.
D | Barely satisfactory result. Demonstrates a limited ability to summarize salient points from sources with inaccuracies and little original language. Text uses sources inappropriately and demonstrates grammatical inaccuracy, inappropriate lexical choices and organizational flaws. There is a minimal statement of language learning needs, planning and reflection with little or no apparent alignment between goals and self-study.
Fail | Unsatisfactory result. Does not demonstrate ability to summarize salient points identify, interpret or appropriately paraphrase reliable sources. Text uses no sources and demonstrates serious grammatical, lexical and/or organizational errors. Does not demonstrate any meaningful attempt to identify language learning needs or implement a plan.

Course Type | Lecture-based course

Course Teaching & Learning Activities | Activities | Details | No. of Hours
---|---|---|---
Tutorials | seminars | 36
Reading / Self study | independent learning work | 120
Assessment | independent learning work | 84

Assessment Methods and Weighting | Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
---|---|---|---|---
Assignments | independent learning work | 20 | |
Essay | other genres of writing | 55 | |
Test | | 25 | |

Required/recommended reading and online materials | Course materials to be provided electronically through course website.

Course Website | http://caes.hku.hk/caes9820/

Additional Course Information | This a compulsory course for all students studying undergraduate degrees in the Faculty of Science.
# CAES9821: Professional and technical communication for mathematical sciences (6 credits)

**Offering Department:** English  
**Academic Year:** 2019  
**Offer in 2019 - 2020:** Y  
**Offer in 2020 - 2021:** Y  
**No Exam:** Y

## Course Objectives
The course aims to develop students’ professional and technical communication skills for disciplinary studies in mathematical sciences.

### Course Contents & Topics
1. Case study report writing skills (report structure, language features, present and explain statistical data and trends, justify analyses and recommendations, etc.)
2. Oral presentation skills (understanding of audience and purpose, effective delivery, etc.)
3. Independent language learning (language learning goals setting, evaluating learning progress, reflecting on independent learning experience, etc.)

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- **CLO 1**: Present and explain mathematical and statistical data and trends using appropriate rhetorical skills.
- **CLO 2**: Organize and articulate coherent ideas with appropriate language devices in a case study report and an oral presentation.
- **CLO 3**: Justify analyses and recommendations convincingly in a case study report and an oral presentation.
- **CLO 4**: Identify their own language learning needs, develop independent learning strategies to address those needs, and reflect on their own independent language learning experience.

### Pre-requisites
NIL

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Descriptors</th>
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</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Wholly appropriate productive skills displaying a complete awareness of audience, purpose and structure across all disciplinary work. Students are able to critically analyse a case scenario, convincingly justify analyses and recommendations, and discuss data limitations when relevant. Students are able to successfully evaluate their language performance in all areas and propose specific and relevant future language learning plans. Spoken language is fully comprehensible and fluent. Written language contains a sophisticated range of grammar and vocabulary, with very few systematic errors.</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Mostly appropriate productive skills displaying good awareness of audience, purpose and structure, although there are occasional lapses in areas. Students are able to analyse a case scenario, justify analyses and recommendations, and discuss data limitations when relevant. Students are able to evaluate their language performance in most areas and propose relevant future language learning plans. Spoken language is comprehensible and fluent. Written language contains a good range of grammar and vocabulary, making some systematic errors of language which generally do not impede understanding.</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Productive skills are generally appropriate for the intended audience. There is an overall sense that the work is communicating successfully. Purposes are generally clear and tone is generally suitable. Students are generally able to analyse a case scenario and make recommendations, but the analysis and recommendations need more justification. Students are able to evaluate their language performance in a limited number of areas and proposed future language learning plans are rather vague. Spoken language is generally comprehensible and fluent. Written language contains inaccuracies when complex grammar and vocabulary are used.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Productive skills display weaknesses in awareness of purpose and audience. Tone is at times unsuitable. Students superficially analyse a case scenario, and the analyses and recommendations are vague. The structure is generally appropriate although links between sections may be lacking. Students are able to evaluate their language performance only in few areas and the proposed future language learning plans may not be relevant. Written language contains frequent errors in complex grammar and vocabulary, but the written work can still be followed by a patient and sympathetic audience. Spoken language is comprehensible and quite fluent, but stilt is at times placed on the listener.</td>
</tr>
<tr>
<td><strong>Fail</strong></td>
<td>Productive skills show little or no awareness of audience or are too limited to be able to successfully carry out tasks. Students are unable to analyse a case scenario and make reasonable recommendations. Ideas are incoherent, vague and unstructured. Students are not able to evaluate their language performance and propose future language learning plans. There are frequent language errors in both simple and complex grammar in written work, which impede successful comprehension of ideas and points. Spoken language places considerable strain on the listener throughout. Assessments may not have been attempted or contain plagiarism.</td>
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### Course Type
Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>seminars</td>
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<tr>
<td>Tutorials</td>
<td>small group tutorials</td>
<td>6</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>120</td>
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<tr>
<td>Assessment</td>
<td>independent learning work</td>
<td>84</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>30</td>
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<tr>
<td>Project reports</td>
<td>30</td>
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CHEM1041  
*Foundations of chemistry (6 credits)*

**Offering Department**  Chemistry  
**Course Co-ordinator**  Dr A P L Tong, Chemistry (apltong@hku.hk)  
**Teachers Involved**  (Dr A P L Tong, Chemistry)

**Course Objectives**  
The course aims to provide students who do not have HKDSE Chemistry or an equivalent background but are interested in exploring Chemistry further, with an understanding of the essential fundamental principles and concepts of chemistry.

**Course Contents & Topics**  
Topic 1: Gases: Their Properties and Behaviour (6 hours)  Gas pressure; the gas laws; the ideal gas law and reaction stoichiometry; the kinetic-molecular theory of gases.

Topic 2: Chemical Bonding and Structures (7 hours)  Covalent, ionic and metallic bonds; bond energy and chemical change; electronegativity and bond polarity; Lewis structures of molecules and ions; VSEPR Theory and molecular shape.

Topic 3: Intermolecular Forces: Liquids, Solids, and Phase Changes (8 hours)  Physical states and phase changes; types of intermolecular forces; properties of liquid state; the solid state: structure, properties, and bonding.

Topic 4: Chemical Equilibrium (5 hours)  The equilibrium state and the equilibrium constant; the equilibrium law: calculation of equilibrium constants and reaction quotient; Le Chatelier’s Principle.

Topic 5: Structures of Organic Compounds (10 hours)  An overview of organic compounds and structures; organic nomenclature; stereoisomerism in organic compounds.

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge and understanding in relation to some chemical vocabulary, terminology and conventions
- CLO 2 demonstrate knowledge and understanding of chemical stoichiometry, the properties of liquids and solids, the nature of gases, phase changes, chemical bonding and structures, and the nature of chemical equilibria
- CLO 3 demonstrate a basic knowledge of organic compounds and structures, nomenclature, and isomerism in organic compounds
- CLO 4 apply the theories and concepts introduced in the course to solve problems, perform calculations, make predictions and rationalize trends
- CLO 5 organize and present chemical ideas in a clear, logical and coherent way
- CLO 6 demonstrate awareness and appreciation of the relevant applications of chemistry in society and in everyday life

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Level 3 or above in HKDSE Combined Science with Chemistry component or Integrated Science, or equivalent. Students without such background but keen on taking this foundation chemistry course may approach the course coordinator for consideration.

Not for students with Level 3 or above in HKDSE Chemistry or having taken any level 1 Chemistry course or above or any equivalent Chemistry course.

**Offer in 2019 - 2020**  
- Y 1st sem  Offer in 2020 - 2021 : Y  
- Examination  Dec

**Grade Descriptors (A+ to F)**  
- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show thorough grasp of the subject. Demonstrate strong analytical and critical abilities and logical thinking, with ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

- **B** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show substantial grasp of the subject. Demonstrate evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

- **C** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show general but incomplete grasp of the subject. Demonstrate evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

- **D** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show partial but limited grasp, with retention of some relevant information, of the subject. Demonstrate evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- **Fail** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Show evidence of little or no grasp of the knowledge and understanding of the subject. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**  
Lecture-based course

**Course Teaching & Learning Activities**  
- **Activities**  
  - Lectures 36
  - Tutorials 12
  - Reading / Self study

- **No. of Hours**  
  - 100

**Assessment Methods and Weighting**  
- **Methods**  
  - Assignments 20
  - Examination 65
  - Test 15

- **Weighting in final course grade (%)**  
  - CLO 1 2.3, 4.5
  - CLO 1 2.3, 4.5, 6

**Required/recommended reading and online materials**  
1) Petrucci; Herring; Madura; Bissonnette: General Chemistry: Principles and Modern Applications, latest edition, Pearson  
3) Zumdahl; Zumdahl: Chemistry, latest edition, Brookes/Cole

**Additional Course Information**  
Suggested follow-up course: CHEM1042 General Chemistry I

**CHEM1042**  
*General chemistry I (6 credits)*

**Offering Department**  Chemistry  
**Course Co-ordinator**  Dr A P L Tong, Chemistry (apltong@hku.hk)  
**Teachers Involved**  (Dr A P L Tong, Chemistry)

**Course Objectives**  
The course aims to provide students with a solid foundation of the basic principles and concepts of chemistry. It
also provides students with hands-on training of basic laboratory skills and techniques including volumetric analysis, preparation, purification and characterization of chemical substances and some basic instrumental methods. Students will be equipped with a good foundation of theoretical and practical knowledge and skills for further studies in Chemistry.

### Course Contents & Topics

1. Chemistry: its nature and method
   - Physical properties; chemical changes and chemical properties; elements and compounds; measuring mass, length, volume and temperature; atomic structure and subatomic particles; the mole concept and stoichiometry; solutions and concentrations; uncertainty in measurement and significant figures.

2. Atoms: the quantum world
   - Electromagnetic radiation and matter; Planck's quantum theory; the Bohr model of the hydrogen atom; the quantum mechanical model of the atom; quantum numbers, energy levels, and atomic orbitals; shapes of atomic orbitals; electron configurations; periodic trends: atomic radii, ionic radii, ionization energies, and electron affinities.

3. Chemical bonding and structures

4. Energetics and kinetics of reactions
   - Heat and work; the first law of thermodynamics; heat of reactions; spontaneity of changes. Reaction rate; factors that influence reaction rate; rate laws: differential and integrated rate laws; temperature and reaction rate; reaction mechanisms.

5. Acid-Base equilibria
   - Acid-base concepts; equilibria in solutions of weak acids and in weak bases; ionization constants; molecular properties and acid strength; acid-base properties of salt solutions; buffer solutions; acid-base titrations.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 demonstrate a basic knowledge and understanding of the microscopic nature of atomic structure and concepts of chemical bonding and their relationships with the bulk properties of matter.
- CLO 2 demonstrate knowledge and understanding in relation to thermodynamics and kinetics of reactions as well as aqueous equilibria including acid-base equilibria.
- CLO 3 apply the theories and concepts introduced in the course to problems, perform calculations, make predictions and rationalize trends.
- CLO 4 carry out chemical experiments with proper procedures, record experimental observations accurately, and interpret and evaluate the experimental data.
- CLO 5 organize and present chemical ideas in a clear, logical and coherent way.
- CLO 6 demonstrate awareness and appreciation of the relevant applications of chemistry in society and in everyday life.

### Pre-requisites

Level 3 or above in HKDSE Chemistry or equivalent or a pass in CHEM1041. Not for students having taken any level 1 Chemistry course (except for CHEM1041) or above or any equivalent Chemistry course.

### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th></th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Dec, May</td>
</tr>
</tbody>
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### Assessment Methods & Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>20</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
</tbody>
</table>

### Assessment Methods

- CLO 1: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show thorough grasp of the subject. Demonstrate strong analytical and critical abilities and logical thinking, with ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Show highly effective lab skills and techniques. Apply highly effective organizational and presentational skills.
- CLO 2: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show substantial grasp of the subject. Demonstrate evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Show effective lab skills and techniques. Apply effective organizational and presentational skills.
- CLO 3: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show general but incomplete grasp of the subject. Demonstrate evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Show moderately effective lab skills and techniques. Apply moderately effective organizational and presentational skills.
- CLO 4: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show partial but limited grasp, with retention of some relevant information, of the subject. Demonstrate evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Demonstrate partial effective lab skills and techniques. Apply limited or barely effective organizational and presentational skills.
- CLO 5: Demonstrate partial effective lab skills and techniques. Organization and presentational skills are minimally effective or ineffective.
- CLO 6: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Show evidence of little or no grasp of the knowledge and understanding of the subject. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Demonstrate minimally effective or ineffective lab skills and techniques. Organization and presentational skills are minimally effective or ineffective.

### Additional Course Information

Chemical laboratory classes are mandatory. Students must complete all experiments and laboratory reports to pass this course.

- CHEM1043
- General chemistry II (6 credits)

### Academic Year

- 2019

### Required/recommended reading and online materials

1. Petrucci; Herring; Madura; Bissonnette: General Chemistry: Principles and Modern Applications, latest edition, Pearson
Course Contents & Topics

1. Gases
   Simple gas laws; ideal gas equation; gases in chemical reactions; mixture of gases; kinetic-molecular theory of gases; diffusion and effusion; non-ideal gases.
2. Structure and Bonding: The Delocalized Approach: Molecular Orbital Theory
   Bonding in homonuclear and heteronuclear diatomic molecules of first and second period of elements; bonding in some simple polyatomic molecules; bonding in metals (band theory).
3. Solutions and their Properties
   Types of solutions; intermolecular forces and the solution process; solution formation and equilibrium; solubilities of gases; vapor pressures of solutions; osmotic pressure; freezing-point depression and boiling-point elevation of nonelectrolyte solutions; solutions of electrolytes; collодial mixtures.
4. Solubility and Complex-Ion Equilibria
   Solubility product constant; relationship between solubility and Ksp; common-ion effect in solubility equilibria; limitations of the Ksp concept; precipitation; solubility and pH; equilibria involving complex ions; qualitative cation analysis.
5. Entropy & Gibbs Energy
   A quick review on entropy and the second & third laws of thermodynamics. Standard Gibbs energy change; Gibbs energy change and equilibrium; coupled reactions.
6. Electrochemistry
   Electrode potentials and their measurement; standard electrode potentials; Ecell, delta G, and K; Ecell as a functions of concentrations; batteries; corrosion; electrolysis; industrial electrolysis processes.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 demonstrate a knowledge and understanding of the properties and behavior of gases and apply gas laws and kinetic-molecular theory to processes involving gases
CLO 2 demonstrate a knowledge and understanding in relation to solutions and their properties, solubility and complex-ion equilibria, and also electrochemistry
CLO 3 apply molecular orbital theory to explain the formation and properties of diatomic molecules of first and second period of elements and of some simple polyatomic molecules
CLO 4 demonstrate a knowledge and understanding of the relationship between free energy and spontaneity of reaction
CLO 5 apply the theories and concepts introduced in the course to solve problems, perform calculations, make predictions and rationalize trends
CLO 6 organize and present chemical ideas in a clear, logical and coherent way
CLO 7 demonstrate awareness of the relevant applications of chemistry in society and in everyday life

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM1042; and
Not for students in 2014-15 cohort or before having taken CHEM2541.

Offer in 2019 - 2020
Y 1st sem 2nd sem Offer in 2020 - 2021 : Y Examination Dec May

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show thorough grasp of the subject. Demonstrate strong analytical and critical abilities and logical thinking, with ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show substantial grasp of the subject. Demonstrate evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show general but incomplete grasp of the subject. Demonstrate evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show partial but limited grasp, with retention of some relevant information, of the subject. Demonstrate evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Show evidence of little or no grasp of the knowledge and understanding of the subject. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 30 CLO 1,2,3,4,5,6,7
Examination 70 CLO 1,2,3,4,5,6,7

Required/recommended reading and online materials
1) Petrucci; Herring; Madura; Bissonnette: General Chemistry: Principles and Modern Applications, latest edition, Pearson
3) Zumdahl; Zumdahl: Chemistry, latest edition, Brookes/Cole

CHEM1044
Mathematics in chemistry (6 credits) Academic Year 2019

Offering Department Chemistry
Quota 80

Course Co-ordinator Prof C M Che, Chemistry (cmche@hku.hk)
Teachers Involved (Dr A M Y Yuen,Chemistry) (Dr J Yang,Chemistry)

Course Objectives
Mathematical calculations are necessary to explore important concepts in chemistry. This course aims to equip students with a basic knowledge of some of the mathematics that will be used in courses covered in the Chemistry major curriculum to enable them to apply the mathematical skills to problems in chemistry. Students taking this
course are expected to already have achieved level 2 or above in Module 1 or Module 2 of HKDSE Mathematics or equivalent, or a pass in MATH1011 University Mathematics I. As far as possible, the mathematical concepts covered in this course will be put in the context of chemical problems.

**Course Contents & Topics**

Applying mathematical tools, such as Algebra, Trigonometry, Calculus, Complex number, Vector, Matrix, Linear equation, Differential equation, in solving chemistry problems.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

CLO 1. Demonstrate knowledge and understanding of the essential mathematics used in chemistry

CLO 2. Apply mathematical skills to solve basic problems in chemistry

CLO 3. Be more capable of coping with a higher level of mathematics required in relevant courses for chemistry major, in particular, in physical chemistry courses

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in CHEM1042 or already enrolled in this course; and Level 2 or above in Module 1 or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1011

**Offer in 2019 - 2020 Grade Descriptors**

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<tr>
<th>Offer in 2019 - 2020</th>
<th>May</th>
</tr>
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<td>A</td>
<td>Examination</td>
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<tr>
<td>B</td>
<td>-</td>
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<td>C</td>
<td>-</td>
</tr>
<tr>
<td>D</td>
<td>-</td>
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<tr>
<td>Fail</td>
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**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

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<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<tbody>
<tr>
<td>Lectures</td>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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**Assessment Methods and Weighting**

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<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>20</td>
<td>CLO 1.2.3</td>
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<tr>
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<td>60</td>
<td>CLO 1.2.3</td>
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<tr>
<td>Test (online)</td>
<td>20</td>
<td>CLO 1.2.3</td>
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**Required/recommended reading and online materials**

Graham Doggett, Martin Cockett: Maths for Chemists, 2nd Edition, RSC

**CHEM2041 Course Objectives**

This course is designed for non-chemistry major students covering basic principles of chemistry.

**Course Contents & Topics**

Gas Laws and the Kinetic Theory of Gases
Thermodynamics: work, heat, the zeroth and first law of thermodynamics, internal energy, enthalpy, heat capacities, thermochemistry. Hess’s Law, Kirchhoff’s Law, the second and third laws of thermodynamics, entropy, Gibb’s free energy, spontaneity, equilibrium, coupled reaction;
Transport Phenomena: diffusion, viscosity of gases, diffusion in liquids and viscosity of liquids, ionic conduction;
Chemical Kinetics: rate of reactions, orders of reactions, reaction mechanism, experimental measurement of reaction rates, enzyme kinetics, enzyme inhibition, temperature effect on rates;
Chemical Equilibrium;
Equilibria in single-, and two component systems: phase transitions, phase diagrams and the phase rule, chemical potential, liquid/liquid systems;
Introduction to acids and bases: calculation on concentration of different chemical species in a solution, diprotic and polyprotic acids, activity;

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

CLO 1. Explain the principles of the thermochromy, chemical kinetics, chemical equilibrium, physical properties of solutions and gases

CLO 2. Explain the principles of the spectroscopy, and spectrometry

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in CHEM1042; and
Not for students who have passed in CHEM2341, or have already enrolled in this course; and
Not for students who have passed in CHEM2441, or have already enrolled in this course; and
Not for students who have passed in CHEM2541, or have already enrolled in this course; and
Not for Chemistry major students.

**Offer in 2019 - 2020 Grade Descriptors**

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Examination</td>
</tr>
<tr>
<td>B</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
</tr>
</tbody>
</table>

**Grade Descriptors (A+ to F)**

A. Demonstrate thorough knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemistry, instrumentation and applications of spectrometry and spectroscopy for chemical analysis. Show strong ability to apply and integrate knowledge and theory, and strong ability to analyze problems related to general chemistry and spectroscopy.

B. Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemistry, instrumentation and applications of spectrometry and spectroscopy for chemical analysis. Show evidence to apply and integrate knowledge and theory, and ability to analyze problems related to general chemistry and spectroscopy.

C. Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemistry, instrumentation and applications of spectrometry and spectroscopy for chemical analysis. Show evidence of some abilities to apply and integrate knowledge and theory, and to analyze problems to most familiar
Chemistry Course

Dr E C M Tse (1st sem); Dr I K Chu (2nd sem), Chemistry

Course Co-ordinator

(Ecmtse@hku.hk; ivankchu@hku.hk)

Course Objectives

The course aims to introduce the basic principles of chemical analysis. The principles of chemical measurement, including error analysis, quality assurance and calibration, data acquisition and processing, will be discussed with reference to methods of chemical analysis that are based on chemical equilibrium and stoichiometric reactions. The laboratory classes will include experiments demonstrating modern approaches of data acquisition and processing as well as chemical analysis based on chemical equilibrium.

Course Contents & Topics

Measurement: analog and digital measurement, accuracy and precision, comparing means and deviations, calibration curves and least square method for linear plots

Quality assurance: validation of analytical procedures

Chemical equilibrium and chemical analysis: aqueous solution and chemical equilibrium; analysis by acid-base reactivity, complexation reactivity, precipitation reactivity

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM1042 (for students admitted in 2014-15 or before); Pass in CHEM1042; and Pass in CHEM1043, or already enrolled in this course (for students admitted in 2015-16 or thereafter)

Offer in 2019 - 2020

Y 1st sem 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F)

A Demonstrate thorough grasp of the subject. Show evidence of strong analytical abilities, logical and independent thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate highly proficient lab skills and techniques and critical use of data and results to draw appropriate and insightful conclusions. Demonstrate highly effective organization and presentation skills.

B Demonstrate substantial grasp of the subject. Show evidence of analytical abilities and logical thinking, some evidence of independent thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate proficient lab skills and techniques and correct use of data and results to draw appropriate conclusions. Demonstrate effective organization and presentation skills.

C Demonstrate general but incomplete grasp of the subject. Show evidence of some analytical abilities and logical thinking, little evidence of independent thinking, and ability to apply knowledge to most familiar situations. Demonstrate adequate lab skills and techniques and mostly correct but some erroneous use of data and results to draw appropriate conclusions. Demonstrate moderately effective organization and presentation skills.

D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Show evidence of limited analytical abilities, little or no evidence of independent thinking, and limited ability to apply knowledge to solve problems. Demonstrate partially effective lab skills and techniques and limited ability to use data and results to draw appropriate conclusions. Demonstrate limited or barely effective organization and presentation skills.

Fail Demonstrate little or no grasp of the knowledge and understanding of the subject. Show little or no evidence of analytical abilities, logical and independent thinking, and very little or no ability to apply knowledge to solve problems. Demonstrate minimally effective or ineffective lab skills and techniques and misuse of data and results and/or unable to draw appropriate conclusions. Demonstrate inherent organization and poor presentation skills.

Course Type

Lecture with laboratory component course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>25</td>
<td>CLO 1,2</td>
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<tr>
<td>Examination</td>
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<td>75</td>
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</table>

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments 25 CLO 1,2

Examination 75 CLO 1,2

Required/recommended reading and online materials


Academic Year 2019

Required/recommended reading and online materials


Grade Descriptors

A+ to F

Course Type

Lecture-based course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Tutorials</td>
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<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Course Objectives

To provide students with the basic principles and knowledge of inorganic chemistry and to introduce their relevance to biological processes and materials science. This course provides the foundation for further studies in inorganic chemistry.

Course Contents & Topics

Acid-base concept; structure and bonding of transition metal complexes and main group compounds; electronic absorption and magnetic properties of metal complexes; chemical reactions of metal complexes: redox and substitution; chemistry of selected main group elements and transition metal complexes and their relevance to biology and materials.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand the basic principles and concepts of inorganic chemistry and appreciate their relevance to selected examples of biological processes and materials science

CLO 2 demonstrate knowledge and understanding of the acid-base concept and definition

CLO 3 demonstrate knowledge and understanding of the structure and bonding of main group compounds and transition metal complexes and their relevance to the electronic absorption and magnetic properties of transition metal complexes

CLO 4 demonstrate knowledge and understanding of the thermodynamic stability of metal complex formation and the thermodynamic and kinetic aspects of substitution and redox reactions

CLO 5 demonstrate knowledge and understanding of the role of main group elements and transition metal complexes in bioinorganic chemistry

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM1042; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before); Pass in CHEM1042; and Pass in CHEM1043, or already enrolled in this course; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)

Grade Descriptors (A+ to F)

A  Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of inorganic chemistry, especially those related to acid-base concept; structure and bonding of main group compounds and metal complexes; electronic absorption spectroscopy, magnetic properties as well as thermodynamic and kinetic aspects of metal complexes and their reactions; and their relevance to biological processes and materials science. Show strong ability to apply and integrate knowledge and theory relating to the basic foundation knowledge of inorganic chemistry. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to the basic principles and knowledge of inorganic chemistry. Demonstrate highly effective basic laboratory skills and techniques, especially in the synthesis and characterization of inorganic compounds and metal complexes.

B  Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of inorganic chemistry, especially those related to acid-base concept; structure and bonding of main group compounds and metal complexes; electronic absorption spectroscopy, magnetic properties as well as thermodynamic and kinetic aspects of metal complexes and their reactions; and their relevance to biological processes and materials science. Show evidence to apply and integrate knowledge and theory relating to the basic foundation knowledge of inorganic chemistry. Show evidence to analyze novel problems and correct use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of inorganic chemistry. Demonstrate effective basic laboratory skills and techniques, especially in the synthesis and characterization of inorganic compounds and metal complexes.

C  Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of inorganic chemistry, especially those related to acid-base concept; structure and bonding of main group compounds and metal complexes; electronic absorption spectroscopy, magnetic properties as well as thermodynamic and kinetic aspects of metal complexes and their reactions; and their relevance to biological processes and materials science. Show evidence of some abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of inorganic chemistry. Show ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of inorganic chemistry. Demonstrate moderately effective basic laboratory skills and techniques, especially in the synthesis and characterization of inorganic compounds and metal complexes.

D  Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of inorganic chemistry, especially those related to acid-base concept; structure and bonding of main group compounds and metal complexes; electronic absorption spectroscopy, magnetic properties as well as thermodynamic and kinetic aspects of metal complexes and their reactions; and their relevance to biological processes and materials science. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of inorganic chemistry. Show limited ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of inorganic chemistry. Demonstrate partially effective basic laboratory skills and techniques, especially in the synthesis and characterization of inorganic compounds and metal complexes.

Fail  Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of inorganic chemistry, especially those related to acid-base concept; structure and bonding of main group compounds and metal complexes; electronic absorption spectroscopy, magnetic properties as well as thermodynamic and kinetic aspects of metal complexes and their reactions; and their relevance to biological processes and materials science. Show little or no evidence of abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of inorganic chemistry. Show little or no ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of inorganic chemistry. Demonstrate minimally effective basic laboratory skills and techniques, especially in the synthesis and characterization of inorganic compounds and metal complexes.

Course Type

Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Laboratory</td>
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<td>24</td>
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<tr>
<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
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Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>15</td>
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<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>65</td>
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<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Laboratory reports</td>
<td>7</td>
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<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td>13</td>
<td></td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Required/recommended

Course Objectives

To provide students with the basic principles to understand the structure and reactivity of organic molecules, with examples illustrating the role of organic chemistry in daily life and industry. This course serves as the first part of the complete program on fundamental organic chemistry, to be followed up by CHEM3441 Organic Chemistry II.

Course Contents & Topics


Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand basic concepts and employ the vocabulary of organic chemistry
CLO 2 visualize and draw three-dimensional, stereochemically correct representations of organic molecules
CLO 3 recognize, discriminate and name chiral stereoisomers and diastereomers
CLO 4 understand the reactivity of the functional groups
CLO 5 understand reaction mechanisms and apply mechanistic knowledge to solve chemistry problems
CLO 6 apply reactions to the synthesis of target molecules
CLO 7 appreciate the relevance of organic chemistry in biological processes and daily life

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM1042, and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before); Pass in CHEM1042, and Pass in CHEM1043, or already enrolled in this course; and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)

Offer in 2019 - 2020

Grade Descriptors (A+ to F)

A Demonstrate a thorough mastery at an advanced level of knowledge and understanding of facts and concepts pertaining to the chemical properties, reactions and mechanisms of organic chemistry. Show a strong ability to integrate knowledge and theory, and a strong ability to analyze and solve novel organic chemistry problems. Demonstrate highly effective organization, understanding, and execution of lab skills and techniques in organic chemistry experiments.
B Demonstrate substantial command of knowledge and understanding of essential facts and concepts pertaining to the chemical properties, reactions and mechanisms of organic chemistry. Show evidence of ability to integrate knowledge and theory, and evidence of ability to analyze and solve novel organic chemistry problems. Demonstrate effective organization, understanding, and execution of lab skills and techniques in organic chemistry experiments.
C Demonstrate a general but incomplete command of knowledge and understanding of essential facts and concepts pertaining to the chemical properties, reactions and mechanisms of organic chemistry. Show evidence of some ability to integrate knowledge and theory, and evidence of some ability to analyze novel problems. Show a mostly correct use of knowledge to solve most familiar problems. Demonstrate adequately effective organization, understanding, and execution of lab skills and techniques in organic chemistry experiments.
D Demonstrate partial but limited command of knowledge and understanding of essential facts and concepts pertaining to the chemical properties, reactions and mechanisms of organic chemistry. Show evidence of limited ability to integrate knowledge and theory, and a limited ability to analyze novel problems. Show some correct but also erroneous use of knowledge to solve most familiar problems. Demonstrate a partially effective organization, understanding and application of lab skills and techniques in organic chemistry experiments.
Fail Demonstrate little or no evidence of command of knowledge and understanding of essential facts and concepts pertaining to the chemical properties, reactions and mechanisms of organic chemistry. Show little or no evidence of ability to integrate and apply knowledge and theory, and little or no ability to analyze novel problems. Show little or no evidence of ability to solve most familiar problems. Demonstrate minimal or no organization, understanding and application of lab skills and techniques in organic chemistry experiments.

Course Type

Lecture-based course

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 15 CLO 1,2,3,4,5,6,7
Examination 2 hrs written examination 75 CLO 1,2,3,4,5,6
(open book midterm 5% and regular midterm 5%)
Test 10 CLO 1,2,3,4,5,6

Required/recommended reading and online materials

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1**: Demonstrate thorough mastery at an advanced level of extensive organic chemistry knowledge, and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar problems.

- **CLO 2**: Demonstrate substantial command of organic chemistry with a broad range of knowledge, and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar problems.

- **CLO 3**: Demonstrate partial but limited command of organic chemistry knowledge, and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

- Pass in CHEM1042; and
- Not for students who have passed CHEM2441, or have already enrolled in this course.

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
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<tbody>
<tr>
<td>A</td>
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<td>B</td>
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<td>C</td>
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<tr>
<td>D</td>
<td></td>
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<tr>
<td>Fail</td>
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</tbody>
</table>

**Course Type**

Lecture with laboratory component course

**Course Teaching & Learning Activities**

- **Activities**
  - Lectures: 24
  - Laboratory: 20
  - Tutorials: 5
  - Reading / Self study: 100

**Assessment Methods and Weighting**

- **Methods**
  - Examination: 60
  - Test: 40

- **Details**
  - Weighting in final course grade (%)
    - CLO 1: 2,3
    - CLO 2: 1,2,3

**CHEM2443**

**Course Contents & Topics**

The chemistry of organic functional groups such as alkenes, alkynes, alkyl halides, alcohols, aldehydes, ketones, carboxylic acids and their derivatives, and amines will discussed, as will the general concepts of molecular structure, conformation and stereochemistry.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1**: Demonstrate basic understanding of the structure of organic molecules
- **CLO 2**: Demonstrate basic understanding of the reactivity of organic molecules
- **CLO 3**: Appreciate how organic chemistry plays an important role in everyday life

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in CHEM1042; and
Not for students who have passed CHEM2442, or already enrolled in this course.

**Grade Descriptors (A+ to F)**

- **A**: Demonstrate thorough mastery at an advanced level of extensive organic chemistry knowledge, and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar problems.
- **B**: Demonstrate substantial command of organic chemistry with a broad range of knowledge, and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar problems.
- **C**: Demonstrate partial but limited command of organic chemistry knowledge, and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems.
- **D**: Demonstrate partial but limited command of organic chemistry knowledge, and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems.
- **Fail**: Demonstrate little or no evidence of command of organic chemistry knowledge, and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems.

**Additional Course Information**

Students who are planning to take CHEM3441 should take CHEM2441. Laboratory classes are mandatory. Students must complete all experiments and take a written laboratory test in order to pass this course.

**CHEM2443**

**Offering Department**

Chemistry

**Course Co-ordinator**

Dr P H Toy, Chemistry (phtoy@hku.hk)

**Teachers Involved**

Dr P H Toy, Chemistry

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
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<td>D</td>
<td></td>
<td></td>
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<tr>
<td>Fail</td>
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</table>

**Course Type**

Lecture with laboratory component course

**Course Teaching & Learning Activities**

- **Activities**
  - Lectures: 24
  - Laboratory: 20
  - Tutorials: 5
  - Reading / Self study: 100

**Assessment Methods**

- **Details**
  - Weighting in final course grade (%)
    - CLO 1: 2,3
    - CLO 2: 1,2,3

**Examination**

---
### Course Contents & Topics

#### Properties of Gases
- States of gases and the gas laws with applications.
- The First Law of Thermodynamics
- Basic concepts of work, heat, energy, expansion work, heat transactions, enthalpy and adiabatic changes and examples in relation to biochemistry and materials science.

#### The Second and Third Laws of Thermodynamics
- Direction of spontaneous change, entropy and the Third Law of Thermodynamics.
- Simple Mixtures
- Thermodynamic description of mixtures, partial molar quantities, and chemical potentials of liquids. Activities of solvent, solute, regular solutions and ions in solution.

#### Chemical Equilibrium
- Spontaneous chemical reactions, the Gibbs energy minimum and equilibrium. Response of equilibria to pressure, temperature.
- Electrochemistry
- Electrochemical cell, relationship of electrochemical potential to thermodynamic functions. Applications of electrochemistry in energy, material science, sensing.

#### Molecules in Motion
- Molecular motion in gases and liquids, kinetic model, collisions with surfaces, the rate of effusion and transport properties, conductivities of electrolyte solutions.

#### Rates of Chemical Reactions
- Empirical chemical kinetics including experimental methods, rates of reactions, integrated rate laws and temperature dependence of reactions and Reaction mechanism

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1** demonstrate knowledge and understanding of the properties of gases, molecules in motion and the rates of chemical reactions
- **CLO 2** understand and demonstrate knowledge of the three laws of thermodynamics
- **CLO 3** understand and apply the concepts of chemical equilibrium and the response of chemical equilibria to temperature and pressure
- **CLO 4** understand and demonstrate knowledge of electrochemistry and its relationship to thermodynamics, can build electrochemical cell and calculate thermodynamic functions from electrochemical reactions
- **CLO 5** demonstrate knowledge and understanding of basic reaction dynamics including reaction mechanism and how mechanism determines reaction rate law

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM1042; and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before); Pass in CHEM1042 and CHEM1043; and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Examination</td>
<td>Test</td>
<td>Test/Quiz</td>
<td>60</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Examination</td>
<td>Test</td>
<td>Test/Quiz</td>
<td>40</td>
<td>CLO 1,2,3</td>
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</tbody>
</table>

### Required/recommended reading and online materials

Bruce, P.Y.; Essential Organic Chemistry (Pearson, 2016, 3rd edition)

### Additional Course Information

Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

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**Department of Chemistry**

**Offering Department**

Chemistry

**Quota**

100

**Course Objectives**

The course aims to provide a rigorous understanding of equilibrium thermodynamics and chemical kinetics. Students are required to apply mathematical skills (derivations and integrations) and basic physics to understand chemical reactions and related processes. Topics include the three laws of thermodynamics, thermodynamic properties of mixtures, solutions, chemical equilibrium, electrochemistry, rates of chemical reactions and reaction dynamics. Students will gain a good foundation of knowledge and skills for further study in Physical Chemistry.

**Offer in 2019 - 2020**

Academic Year: 2019

Y 2nd sem

**Offer in 2020 - 2021:** Y

**Grade Descriptors (A* to F)**

A
- Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show thorough grasp of the subject. Demonstrate strong analytical and critical abilities and logical thinking, with ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations.

B
- Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show substantial grasp of the subject. Demonstrate evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations.

C
- Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show general but incomplete grasp of the subject. Demonstrate evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations.

D
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show partial but limited grasp, with retention of some relevant information, of the subject. Demonstrate evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems.

Fail
- Demonstrate little or no command of knowledge and skills required for attaining the course learning outcomes. Show evidence of little or no grasp of the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems.

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

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682
### CHEM3141

**Environmental chemistry (6 credits)**

**Offering Department:** Chemistry  
**Academic Year:** 2019  
**Quota:** 100

#### Course Objectives
This course introduces students to Environmental Chemistry and enables them to understand the chemical principles involved in various environmental phenomena and processes.

#### Course Contents & Topics
- Atmosphere chemistry: atmospheric composition and behavior, ozone in the stratosphere, chemistry of the troposphere, air pollution
- Water Chemistry: property of water, water resources and cycle, chemical quality of natural water, acid-base chemistry, oxidation-reduction chemistry, water purification
- Organic pollutants: persistent organic pollutants, pesticides, toxicology
- Energy: energy resources, fossil fuels, solar energy, nuclear energy, energy conversion (heat engine, fuel cells)
- Waste treatment: domestic and hazardous waste treatment (landfill, incineration, air stripping, adsorption, oxidation)

#### Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1 demonstrate knowledge on chemical principles of the various environmental phenomena and processes.
  - CLO 2 describe the practical processes of chemistry in atmospheric, water purification, waste treatment, and energy production.
  - CLO 3 critically discuss local and global environmental issues based on scientific principles and data.
  - CLO 4 apply knowledge to analyze chemical processes involved in various environmental problems.

#### Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in CHEM2041 or CHEM2341 or CHEM2441 or CHEM2442 or CHEM2541

#### Offer in 2019 - 2020
- Offer in 2020 - 2021: Y

#### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>- Demonstrate thorough grasp of the subject. - Demonstrate integration of the full range of appropriate theories, principles, and evidence. - Show evidence of strong analytical abilities, logical and independent thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. - Demonstrate highly effective organization and presentation skills.</td>
</tr>
<tr>
<td>B</td>
<td>- Demonstrate substantial grasp of the subject. - Demonstrate general integration of theories, principles, and evidence. - Show evidence of analytical abilities and logical thinking, some evidence of independent thinking, and ability to apply knowledge to familiar and some unfamiliar situations. - Demonstrate effective organization and presentation skills.</td>
</tr>
<tr>
<td>C</td>
<td>- Demonstrate general but incomplete grasp of the subject. - Demonstrate some partial integration of theories, principles, and evidence. - Show evidence of some analytical abilities and logical thinking, little evidence of independent thinking, and ability to apply knowledge to most familiar situations. - Demonstrate moderately effective organization and presentation skills.</td>
</tr>
<tr>
<td>D</td>
<td>- Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. - Demonstrate limited integration of theories, principles, and evidence. - Show evidence of limited analytical abilities, little or no evidence of independent thinking, and limited ability to apply knowledge to solve problems. - Demonstrate limited or barely effective organization and presentation skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>- Demonstrate little or no grasp of the knowledge and understanding of the subject. - Demonstrate little or inapt integration of theories, principles, and evidence. - Show little or no evidence of analytical abilities, logical and independent thinking, and very little or no ability to apply knowledge to solve problems. - Demonstrate incoherent organization and poor presentation skills.</td>
</tr>
</tbody>
</table>

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments including tests</td>
<td></td>
<td></td>
<td>30</td>
<td>CLO 1.2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td>70</td>
<td>CLO 1.2,3,4</td>
</tr>
</tbody>
</table>

#### Reading / Self study
- "Physical Chemistry" by P. W. Atkins, latest edition

#### Online Materials
- "Physical Chemistry" by P. W. Atkins, latest edition

**Required/recommended reading and online materials**
This course provides an introduction to materials chemistry. The goal is to present the fundamental knowledge of various types of materials including their structure, synthesis, and properties. This course is essential for students who wish to take advanced materials courses.

### Course Objectives

On successful completion of this course, students should be able to:

- **CLO 1:** Demonstrate thorough knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show extensive knowledge in synthesis, characterization and applications of common polymers. Demonstrate strong ability to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show strong ability to analyze novel problems and critical use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.

- **CLO 2:** Explain different structures and phases, phase transformation in solid materials.

- **CLO 3:** Understand defects in crystalline solid materials and relate them with mechanical properties.

- **CLO 4:** Appreciate soft materials and some examples and characteristics.

- **CLO 5:** Understand the concept of molecular weight distribution in polymers, and explain the effect of polymerization kinetics to their properties.

- **CLO 6:** Identify examples of some important materials, and explain their structure-property relationship.

- **CLO 7:** Demonstrate knowledge in materials characterization.

### Pre-requisites

- Pass in CHEM2441 or CHEM23441 or CHEM2441 or CHEM2442 or CHEM2541

### Course Content & Topics

Classification of materials; structure of crystalline solids; phases and phase transformation; defects and mechanical properties; alloys and ceramics; introduction to soft matter; structure, synthesis, and properties of polymers; colloids; liquid crystals; viscoelasticity; applications of materials; characterization techniques.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1:** Demonstrate thorough knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show extensive knowledge in synthesis, characterization and applications of common polymers. Demonstrate strong ability to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show strong ability to analyze novel problems and critical use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.

- **CLO 2:** Demonstrate thorough knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show extensive knowledge in synthesis, characterization and applications of common polymers. Demonstrate evidence to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show evidence to analyze novel problems and critical use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.

- **CLO 3:** Demonstrate general but incomplete knowledge of industrial chemical processes and command of mass and energy balance skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to solve problems in familiar and some unfamiliar situations. Correct use of data and sourcing of references. Apply effective organizational and presentational skills.

### Course Type

Lecture with laboratory component course

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments continuous assessment (assignments+tests)</td>
<td>40</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Additional Course Information

Laboratory courses are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

### Course Tutorials & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory computational laboratory</td>
<td></td>
<td>12</td>
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<tr>
<td>Field work</td>
<td></td>
<td>1 - 2 plant visits</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### Course Teaching & Learning Activities

| Field work | | 1 - 2 plant visits |
| Reading / Self study | | 100 |

### Required/recommended reading and online materials

- Felder and Rousseau: Elementary Principles of Chemical Processes

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### CHEM3143

**Introduction to materials chemistry (6 credits)**

#### Academic Year

- **2019**

#### Offering Department

- Chemistry

#### Teachers Involved

- Dr Y F Wang, Chemistry (wanglab@thu.hk)

#### Course Objectives

This course provides an introduction to materials chemistry. The goal is to present the fundamental knowledge of various types of materials including their structure, synthesis, and properties. This course is essential for students who wish to take advanced materials course.

#### Course Contents & Topics

Classification of materials; structure of crystalline solids; phases and phase transformation; defects and mechanical properties; alloys and ceramics; introduction to soft matter; structure, synthesis, and properties of polymers; colloids; liquid crystals; viscoelasticity; applications of materials; characterization techniques.

#### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1:** Demonstrate thorough knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show extensive knowledge in synthesis, characterization and applications of common polymers. Demonstrate strong ability to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show strong ability to analyze novel problems and critical use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.

- **CLO 2:** Demonstrate thorough knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show extensive knowledge in synthesis, characterization and applications of common polymers. Demonstrate evidence to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show evidence to analyze novel problems and critical use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.

- **CLO 3:** Demonstrate general but incomplete knowledge of industrial chemical processes and command of mass and energy balance skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to solve problems in familiar and some unfamiliar situations. Correct use of data and sourcing of references. Apply effective organizational and presentational skills.

### Course Tutorials & Learning Activities

<table>
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<tr>
<td>Lectures</td>
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</tr>
<tr>
<td>Laboratory computational laboratory</td>
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<td>12</td>
</tr>
<tr>
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<td>Reading / Self study</td>
<td></td>
<td>100</td>
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### Assessment Methods and Weighting

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<tr>
<td>Assignments continuous assessment (assignments+tests)</td>
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<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1,2,3</td>
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</table>

### Additional Course Information

Laboratory courses are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

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### CHEM2241

**Introduction to materials chemistry (3 credits)**

#### Academic Year

- **2019**

#### Offering Department

- Chemistry

#### Teachers Involved

- Dr Y F Wang, Chemistry (wanglab@thu.hk)

#### Course Objectives

This course provides an introduction to materials chemistry. The goal is to present the fundamental knowledge of various types of materials including their structure, synthesis, and properties. This course is essential for students who wish to take advanced materials course.

#### Course Contents & Topics

Classification of materials; structure of crystalline solids; phases and phase transformation; defects and mechanical properties; alloys and ceramics; introduction to soft matter; structure, synthesis, and properties of polymers; colloids; liquid crystals; viscoelasticity; applications of materials; characterization techniques.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1:** Demonstrate thorough knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show extensive knowledge in synthesis, characterization and applications of common polymers. Demonstrate strong ability to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show strong ability to analyze novel problems and critical use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.

- **CLO 2:** Demonstrate thorough knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show extensive knowledge in synthesis, characterization and applications of common polymers. Demonstrate evidence to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show evidence to analyze novel problems and critical use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.

- **CLO 3:** Demonstrate general but incomplete knowledge of industrial chemical processes and command of mass and energy balance skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to solve problems in familiar and some unfamiliar situations. Correct use of data and sourcing of references. Apply effective organizational and presentational skills.

### Course Tutorials & Learning Activities

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<td>Lectures</td>
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<tr>
<td>Laboratory computational laboratory</td>
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<td>12</td>
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<tr>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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### Assessment Methods and Weighting

<table>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments continuous assessment (assignments+tests)</td>
<td>40</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Additional Course Information

Laboratory courses are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.
Demonstrate partial but limited command of knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show deep understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show limited knowledge in synthesis, characterization and applications of common polymers. Demonstrate evidence but limited ability to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show limited ability to analyze problems to most familiar situations and mostly correct but erroneous use of data/experimental results to draw appropriate conclusions related to materials synthesis/characterization.

Fail

Demonstrate little or no evidence of command of knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show little or no understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show little or no knowledge in synthesis, characterization and applications of common polymers. Demonstrate limited or no evidence of ability to apply/integrate knowledge and theory related to the synthesis and applications of materials. Show little or no ability to analyze novel problems and use of data/experimental results to draw appropriate and insightful conclusions related to materials synthesis/characterization.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 70 CLO 1,2,3,4,5,6,7
Test (continuous assessment) 30 CLO 1,2,3,4,5,6,7

Required/recommended reading and online materials
W. D. Callister: Materials Science and Engineering: An Introduction (8th or 9th edition)
F. W. Billmeyer: Textbook of Polymer Science (John Wiley and Sons, 1984)
M. P. Stevens: Polymer Chemistry: An Introduction (Oxford University Press, 1999)

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 70 CLO 1,2,3,4,5,6,7
Test (continuous assessment) 30 CLO 1,2,3,4,5,6,7

Required/recommended reading and online materials
W. D. Callister: Materials Science and Engineering: An Introduction (8th or 9th edition)
F. W. Billmeyer: Textbook of Polymer Science (John Wiley and Sons, 1984)
M. P. Stevens: Polymer Chemistry: An Introduction (Oxford University Press, 1999)

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 70 CLO 1,2,3,4,5,6,7
Test (continuous assessment) 30 CLO 1,2,3,4,5,6,7

Required/recommended reading and online materials
W. D. Callister: Materials Science and Engineering: An Introduction (8th or 9th edition)
F. W. Billmeyer: Textbook of Polymer Science (John Wiley and Sons, 1984)
M. P. Stevens: Polymer Chemistry: An Introduction (Oxford University Press, 1999)

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 70 CLO 1,2,3,4,5,6,7
Test (continuous assessment) 30 CLO 1,2,3,4,5,6,7

Required/recommended reading and online materials
W. D. Callister: Materials Science and Engineering: An Introduction (8th or 9th edition)
F. W. Billmeyer: Textbook of Polymer Science (John Wiley and Sons, 1984)
M. P. Stevens: Polymer Chemistry: An Introduction (Oxford University Press, 1999)
Course Objectives
To cover the basic principles and applications of chemical instrumentation. This course aims to provide working knowledge, in addition to the principles, of instruments that are commonly used in chemical laboratories.

Course Contents & Topics
Optical methods: Beer’s Law; UV-visible, infrared, and atomic spectrometry; fluorescence; atomic mass spectrometry; grating spectrometer; photon detectors and thermal detectors.
Separation methods: partition; chromatography theories; high performance liquid chromatography (HPLC) and gas chromatography (GC); instrumental set up of HPLC and GC.
Mass spectrometry: fundamental concepts; mass spectrometry; electrospray ionization (ESI) and matrix-assisted laser desorption ionization (MALDI); time-of-flight (TOF) and quadrupole (Q) mass analyzers.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 explain the principles of the optical methods, separation methods, and mass spectrometry
CLO 2 describe the basic experimental set up and the properties of the basic components of the instruments used in the laboratory classes
CLO 3 apply experimental skills in chemical analysis including sample preparation, standard solution preparation, instrument calibration, and matrix effects correction (standard additions)

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM2241

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>- Demonstrate thorough grasp of the subject. - Show evidence of strong analytical abilities, logical and independent thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. - Demonstrate highly proficient lab skills and techniques and critical use of data and results to draw appropriate and insightful conclusions. - Demonstrate highly effective organization and presentation skills</td>
</tr>
<tr>
<td>B</td>
<td>- Demonstrate substantial grasp of the subject. - Show evidence of analytical abilities and logical thinking, some evidence of independent thinking, and ability to apply knowledge to familiar and some unfamiliar situations. - Demonstrate proficient lab skills and techniques and correct use of data and results to draw appropriate conclusions. - Demonstrate effective organization and presentation skills.</td>
</tr>
<tr>
<td>C</td>
<td>- Demonstrate general but incomplete grasp of the subject. - Show evidence of some analytical abilities and logical thinking, little evidence of independent thinking, and ability to apply knowledge to most familiar situations. - Demonstrate adequate lab skills and techniques and reasonably correct but some erroneous use of data and results to draw appropriate conclusions. - Demonstrate moderately effective organization and presentation skills.</td>
</tr>
<tr>
<td>D</td>
<td>- Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. - Show evidence of limited analytical abilities, little or no evidence of independent thinking, and limited ability to apply knowledge to solve problems. - Demonstrate partially effective lab skills and techniques and limited ability to use data and results to draw appropriate conclusions. - Demonstrate limited or barely effective organization and presentation skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>- Demonstrate little or no grasp of the knowledge and understanding of the subject. - Show little or no evidence of analytical abilities, logical and independent thinking, and very little or no ability to apply knowledge to solve problems. - Demonstrate minimally effective or ineffective lab skills and techniques and misuse of data and results and/or unable to draw appropriate conclusions. - Demonstrate incoherent organization and poor presentation skills.</td>
</tr>
</tbody>
</table>

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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<td>24</td>
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<tr>
<td>Laboratory</td>
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<td>28</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>65</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>including an oral examination</td>
<td>25</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

CHEM3242
Food and water analysis (6 credits)

Academic Year 2019

Offering Department Chemistry
Quota 50

Course Co-ordinator Dr W T Chan, Chemistry (wtchan@hku.hk)
Teachers Involved (Dr W T Chan,Chemistry)

Course Objectives
To cover areas in the application and new methodology development in analytical chemistry with focus on food and water analysis.

Course Contents & Topics
Chemical Analysis in Practicing Laboratories: Use of standard methods, guidelines and standards for food and water analysis; good laboratory practice; reliability and quality issues in chemical analysis.
Food Analysis: Requirement of nutritional labeling; determination of food nutritional value (e.g. total protein content, sodium content); detection of food adulteration and contamination (e.g. presence of banned additives, toxins, undeclared components); recent issues and case studies in food analysis.
Water Analysis: Water quality standards; sampling, pretreatment, storage of water samples; theory and technologies for field, laboratory and automated analysis of selected types of water (e.g. drinking water, recreational water, waste water).
Analytical Method Development: Selection, application and combination of analytical (e.g. sample digestion, solid phase extraction) and instrumental (e.g. GC, LC, MS) techniques for food and water analysis; method validation (e.g. recovery analysis, analysis of certified reference materials)

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 identify and determine errors and uncertainty of analytical results
CLO 2 apply measures taken to control quality and ensure reliability of analytical results
CLO 3 demonstrate a general knowledge in food and water analysis
CLO 4 understand issues in public health protection related to chemical analysis
CLO 5 carry out analytical techniques used in practicing food and water laboratories
This course is designed for non-chemistry major students covering basic principles of separation and spectroscopy. Optical methods: Beer’s Law; UV-visible, infrared, and atomic spectrometry; fluorescence; atomic mass spectrometry; grating spectrometer; photon detectors and thermal detectors. Separation methods: partition; chromatography theories; high performance liquid chromatography (HPLC) and gas chromatography (GC); instrumental set up of HPLC and GC. On successful completion of this course, students should be able to:

- Demonstrate thorough grasp of the subject. - Show evidence of strong analytical abilities, logical and independent thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. - Demonstrate highly proficient lab skills and techniques and critical use of data and results to draw appropriate and insightful conclusions. - Demonstrate highly effective organization and presentation skills.
- Demonstrate substantial grasp of the subject. - Show evidence of analytical abilities and logical thinking, some evidence of independent thinking, and ability to apply knowledge to familiar and some unfamiliar situations. - Demonstrate proficient lab skills and techniques and correct use of data and results to draw appropriate conclusions. - Demonstrate effective organization and presentation skills.
- Demonstrate general but incomplete grasp of the subject. - Show evidence of some analytical abilities and logical thinking, little evidence of independent thinking, and ability to apply knowledge to most familiar situations. - Demonstrate adequate lab skills and techniques and mostly correct but some erroneous use of data and results to draw appropriate conclusions. - Demonstrate moderately effective organization and presentation skills.
- Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. - Show evidence of limited analytical abilities, little or no evidence of independent thinking, and limited ability to apply knowledge to solve problems. - Demonstrate partially effective lab skills and techniques and limited ability to use data and results to draw appropriate conclusions. - Demonstrate limited or barely effective organization and presentation skills.
- Demonstrate little or no grasp of the knowledge and understanding of the subject. - Show little or no evidence of analytical abilities, little or no evidence of independent thinking, and limited or no ability to apply knowledge to solve problems related to the analysis of food and water. Organization and presentation skills are minimally effective or ineffective as shown in class work.

### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities
<table>
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<tr>
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<td>Lectures</td>
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<td>24</td>
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<tr>
<td>Laboratory</td>
<td></td>
<td>16</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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<tr>
<td>Assignments</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
<td></td>
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<tr>
<td>Examination</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>15</td>
<td>CLO 2,5</td>
<td></td>
</tr>
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</table>

### Required/recommended reading and online materials

### Additional Course Information
References to specialist texts and other published material will be made throughout the course. Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

### Assessment
- Examination
  - Course grade (%): 70

### CLOs
- CLO 1: Explain the principles of the optical methods, separation methods, mass spectrometry, and NMR
- CLO 2: Describe the basic experimental set up and the properties of the basic components of the instruments used in the laboratory classes
- CLO 3: Demonstrate thorough grasp of the subject. - Show evidence of strong analytical abilities, logical and independent thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations.
- CLO 4: Demonstrate substantial grasp of the subject. - Show evidence of analytical abilities and logical thinking, some evidence of independent thinking, and ability to apply knowledge to familiar and some unfamiliar situations.
- CLO 5: Demonstrate general but incomplete grasp of the subject. - Show evidence of some analytical abilities and logical thinking, little evidence of independent thinking, and ability to apply knowledge to most familiar situations.
- CLO 6: Demonstrate partial but limited grasp, with retention of some relevant information, of the subject.
- CLO 7: Demonstrate little or no grasp of the knowledge and understanding of the subject.

### Pre-requisites
Pass in CHEM2041 or CHEM2241; and Not for students who have passed CHEM3241, or have already enrolled in this course.

### Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

### Additional Course Information
- Demonstrate thorough grasp of the knowledge and understanding of the subject.
- Show little or no evidence of analytical abilities, little or no evidence of independent thinking, and limited or no ability to apply knowledge to solve problems related to the analysis of food and water. Organization and presentation skills are minimally effective or ineffective as shown in class work.
- Demonstrate little or no grasp of the knowledge and understanding of the subject.
- Show little or no evidence of analytical abilities, little or no evidence of independent thinking, and limited or no ability to apply knowledge to solve problems related to the analysis of food and water. Organization and presentation skills are minimally effective or ineffective as shown in class work.
- Demonstrate partial but limited grasp, with retention of some relevant information, of the subject.
- Show evidence of limited analytical abilities, little or no evidence of independent thinking, and limited ability to apply knowledge to solve problems.
- Demonstrate partially effective lab skills and techniques and limited ability to use data and results to draw appropriate conclusions.
- Demonstrate limited or barely effective organization and presentation skills.
- Demonstrate little or no grasp of the knowledge and understanding of the subject.
- Show little or no evidence of analytical abilities, little or no evidence of independent thinking, and limited or no ability to apply knowledge to solve problems related to the analysis of food and water. Organization and presentation skills are minimally effective or ineffective as shown in class work.
- Demonstrate little or no grasp of the knowledge and understanding of the subject.
- Show little or no evidence of analytical abilities, little or no evidence of independent thinking, and limited or no ability to apply knowledge to solve problems related to the analysis of food and water. Organization and presentation skills are minimally effective or ineffective as shown in class work.
- Demonstrate partial but limited grasp, with retention of some relevant information, of the subject.
- Show evidence of limited analytical abilities, little or no evidence of independent thinking, and limited ability to apply knowledge to solve problems.
### CHEM3244

**Analytical techniques for pharmacy students (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Co-ordinator</strong></td>
<td>Dr X Li, Chemistry (<a href="mailto:xiangli@hku.hk">xiangli@hku.hk</a>)</td>
</tr>
<tr>
<td><strong>Teachers Involved</strong></td>
<td>(Dr K C J Wong, Pharmacology and Pharmacy)</td>
</tr>
<tr>
<td>(Dr X Li, Chemistry)</td>
<td></td>
</tr>
<tr>
<td><strong>Course Objectives</strong></td>
<td>The course covers theories and practicals on various analytical techniques used in pharmaceutical industry. Sampling and data analysis, method validation with respect to regulatory guidelines, ultraviolet/visible, infrared, fluorescence, atomic spectrophotometry, separation techniques such as gas chromatography and liquid chromatography, and modern mass spectrometry with its applications in protein sequencing will be covered in this course.</td>
</tr>
<tr>
<td><strong>Course Contents &amp; Topics</strong></td>
<td>Principles and applications of different analytical and measurement techniques in pharmaceutical sciences. Analysis and quality assurance: method validation, sampling, statistics, hypothesis tests</td>
</tr>
<tr>
<td>(Optical spectroscopy: Beer's law, UV/Vis, infrared, fluorescence, atomic spectroscopy)</td>
<td></td>
</tr>
<tr>
<td>(Separation and purification: gas chromatography and liquid chromatography)</td>
<td></td>
</tr>
<tr>
<td>(Modern mass spectrometry: ionization techniques (ESI, MALDI), mass analysis techniques (TOF, quadrupole), protein sequencing.)</td>
<td></td>
</tr>
<tr>
<td><strong>Course Learning Outcomes</strong></td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td>CLO 1 demonstrate knowledge and understanding of principles of data analysis, optical spectroscopic methods, separation techniques, and modern mass spectrometry</td>
<td></td>
</tr>
<tr>
<td>CLO 2 describe the basic experimental setup and the properties of the basic components of the instruments used in the laboratory classes</td>
<td></td>
</tr>
<tr>
<td>CLO 3 apply experimental skills in experiments including sample preparation, standard solution preparation, instrument calibration, and matrix effect correction</td>
<td></td>
</tr>
<tr>
<td><strong>Pre-requisites (and Co-requisites and Impermissible combinations)</strong></td>
<td>Pass in BPHM2136</td>
</tr>
<tr>
<td>(This course is for BPharm students only)</td>
<td></td>
</tr>
<tr>
<td><strong>Offer in 2019 - 2020</strong></td>
<td>Y</td>
</tr>
<tr>
<td><strong>Grade Descriptors (A+ to F)</strong></td>
<td>Examination</td>
</tr>
<tr>
<td><strong>Academic Year</strong></td>
<td>2019</td>
</tr>
<tr>
<td><strong>Methods</strong></td>
<td>May</td>
</tr>
<tr>
<td><strong>Details</strong></td>
<td><strong>Weighting in final course grade (%)</strong></td>
</tr>
<tr>
<td>A</td>
<td>- Demonstrate thorough grasp of the subject. - Show evidence of strong analytical abilities, logical and independent thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. - Demonstrate highly proficient lab skills and techniques and critical use of data and results to draw appropriate and insightful conclusions. - Demonstrate highly effective organization and presentation skills.</td>
</tr>
<tr>
<td>B</td>
<td>- Demonstrate substantial grasp of the subject. - Show evidence of analytical abilities and logical thinking, some evidence of independent thinking, and ability to apply knowledge to familiar and some unfamiliar situations. - Demonstrate proficient lab skills and techniques and correct use of data and results to draw appropriate conclusions. - Demonstrate effective organization and presentation skills.</td>
</tr>
<tr>
<td>C</td>
<td>- Demonstrate general but incomplete grasp of the subject. - Show evidence of some analytical abilities and logical thinking, little evidence of independent thinking, and ability to apply knowledge to most familiar situations. - Demonstrate adequate lab skills and techniques and moderately correct but some erroneous use of data and results to draw appropriate conclusions. - Demonstrate moderately effective organization and presentation skills.</td>
</tr>
<tr>
<td>D</td>
<td>- Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. - Show evidence of limited analytical abilities, little or no evidence of independent thinking, and limited ability to apply knowledge to solve problems. - Demonstrate partially effective lab skills and techniques and limited ability to use data and results to draw appropriate conclusions. - Demonstrate limited or barely effective organization and presentation skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>- Demonstrate little or no grasp of the knowledge and understanding of the subject. - Show little or no evidence of analytical abilities, logical and independent thinking, and very little or no ability to apply knowledge to solve problems. - Demonstrate minimally effective or ineffective lab skills and techniques and misuse of data and results and/or unable to draw appropriate conclusions. - Demonstrate incoherent organization and poor presentation skills.</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**Additional Course Information**

Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

This course is for Pharmacy students ONLY.
Information: Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3341</td>
<td>Inorganic chemistry II (6 credits)</td>
<td>2019</td>
<td>90</td>
</tr>
</tbody>
</table>

Offering Department: Chemistry

Course Co-ordinator: Prof V W W Yam, Chemistry (wwyam@hku.hk)

Teachers Involved: Dr A M Y Yuen, Chemistry (Prof V W W Yam, Chemistry)

Course Objectives

This course is a continuation from CHEM2341 Inorganic Chemistry I, with a more detailed treatment of general inorganic chemistry, with examples relevance to biological processes and material science, suited to the needs of those intending to extend their studies in chemistry.

Course Contents & Topics

Chemistry of selected classes of inorganic, coordination and organometallic compounds including mechanisms of their reaction where appropriate.

Structure, bonding, magnetism and spectral properties of inorganic systems including examples in bioinorganic systems.

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge of chemistry of selected classes of inorganic, coordination and organometallic compounds
- CLO 2 understand structure, bonding, magnetism and spectral properties of inorganic systems
- CLO 3 understand mechanisms of selected chemical reactions that are essential to coordination and organometallic compounds
- CLO 4 gain appropriate knowledge of coordination compounds in biological systems

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM2341

Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>Fail</td>
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</table>

Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>including lab report &amp; test</td>
<td>30</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:

- Catherine, Housecroft & Sharpe, Inorganic Chemistry (3rd Ed.), Prentice Hall, 2008

Additional Course Information:

Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.
Course Objectives
This course is a continuation from Basic Inorganic Chemistry and Basic Organic Chemistry, giving further and more details of inorganic chemistry in biological system, with examples relevance to biological processes and medical science, suited to the needs of those intending to extend their studies in (bio)chemistry and biomedical science.

Course Contents & Topics
Bioinorganic Chemistry of selected topics of interest. Examples include the inorganic chemistry (and biochemistry) behind the requirement of biological cells for metals such as zinc, iron and copper; and metals in medicine such as mechanisms by which organisms obtain required metal ions from their environment, and use of metal-containing compounds in treating diseases such as cancer.

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand the principles and concepts of inorganic/organic chemistry in biological system
- CLO 2 understand structure, bonding, and spectral properties of selected metals in proteins and nucleic acids
- CLO 3 understand chemical mechanisms of selected metal homeostasis (i.e. uptake, transport and storage)
- CLO 4 understand the role of metal complexes medicine

Pre-requisites (and Co-requisites and impermissible combinations)
Pass in CHEM2341

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F)
A Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show strong ability to analyze and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate highly effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.

B Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show evidence to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show evidence to analyze novel problems and correct use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.

C Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate moderately effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.

D Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show limited ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate partially effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.

Fail Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show little or no evidence of abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show little or no ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate minimally effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.

Course Type
Lecture-based course

Activities Details No. of Hours
Lectures 36
Tutorials including literature survey & presentation 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments (continuous assessment of assignments and presentation) 25 CLO 1,2,3,4
Examination 75 CLO 1,2,3,4

Required/recommended reading and online materials
Lippard, S. J. and Berg, J. M. Principles of Bioinorganic Chemistry (University Science Books; Mill Valley, CA, 1994)

Additional Course Information
Course Objectives
As a continuation from CHEM2441 Organic Chemistry I, this course aims to provide a solid foundation of organic chemistry together with CHEM2441. It focuses primarily on the basic principles to understand the structure and reactivity of organic molecules, with examples illustrating the role of organic chemistry in daily life and industry.

Course Contents & Topics
Chemistry of common organic functional groups: ketones and aldehydes; carboxylic acids and their derivatives; amines; aromatic compounds. Principles of organic synthesis. Detailed considerations of reaction mechanisms. Spectroscopic tools (UV-Vis, IR, NMR, and MS) for characterization and identification of organic compounds.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: Draw correct structural representations of organic molecules
- CLO 2: Understand the basic principles of structure and reactivity of organic molecules
- CLO 3: Determine structures of organic compounds based on spectroscopic data
- CLO 4: Write reasonable mechanisms for transformations of common functional groups (alcohols, ethers, carbonyl compounds, aldehydes, ketones, carboxylic acids, acyl halides, anhydrides, esters, amides, nitriles, and amines)
- CLO 5: Appreciate the importance of organic chemistry in daily life

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM2441

Remarks: CHEM3441 has been changed to lecture-based course from semester 2, 2015-16. For Chemistry students who admitted in 2014-15 or before, they must enroll also CHEM3443 for enrolling CHEM3441 (new version without lab component) to meet the Chemistry Major requirements.

Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations.</td>
<td>CLO 1,2,3,4,5,6</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations.</td>
<td>CLO 1,2,3,4,5,6</td>
<td>70</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrates general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations.</td>
<td>CLO 1,2,3,4,5,6</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrates partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrates little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td></td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Examination</td>
<td>1 x 3 hr written examination</td>
<td>70</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Test</td>
<td>20</td>
<td></td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

Course Type
Lecture-based course

CHEM3442
Organic chemistry of biomolecules (6 credits)

Offering Department: Chemistry
Offering Quota: 50

Course Objectives
The major objective of this course is to give the students an understanding and appreciation of the role of organic chemistry in biology and biochemistry.

Course Contents & Topics
The chemistry of organic molecule groups such as carbohydrates, amino acids, peptides, coenzymes, nucleotides and lipids will be discussed. Enzyme catalysis, cofactors and inhibitors will also be presented.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: Have a basic understanding of biologically important organic molecules
- CLO 2: Have a basic understanding of enzyme catalysis
- CLO 3: Appreciate how organic chemistry plays an important role in biology and biochemistry

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM2442 or CHEM3441

Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrates thorough mastery at an advanced level of extensive biomolecule organic chemistry knowledge, and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar, and unfamiliar problems. Apply highly effective organizational and presentational skills.</td>
<td>CLO 1,2,3,4,5,6</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrates substantial command of biomolecule organic chemistry with a broad range of knowledge, and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar problems. Apply effective organizational and presentational skills.</td>
<td>CLO 1,2,3,4,5,6</td>
<td>70</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrates general but incomplete command of biomolecule organic chemistry knowledge, and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar problems. Apply moderately effective organizational and presentational skills.</td>
<td>CLO 1,2,3,4,5,6</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrates partial but limited command of biomolecule organic chemistry knowledge, and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrates little or no evidence of command of biomolecule organic chemistry knowledge, and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Course Type
Lecture-based course
Department of Chemistry

CHEM3443

Organic chemistry laboratory (6 credits)

Offering Department
Chemistry

Course Co-ordinator
Dr A M Y Yuen, Chemistry (mayyan@hku.hk)

Course Objectives
To provide students with intensive hands-on training of experimental chemistry techniques on organic reactions; and the opportunity to develop analytical and critical thinking skills through scientific investigations in organic chemistry experiments. The course focuses on the practical aspects of a variety of organic reactions, including and multistep syntheses. Chromatographic, instrumental, and spectroscopic techniques are also discussed to give a holistic training of experimental organic chemistry.

Course Contents & Topics
The course will include the following laboratory skills and practices: laboratory safety practice; preparation, purification, and characterization of organic compounds; gas and liquid chromatography; ultraviolet-visible spectrophotometry; infrared spectroscopy; NMR spectroscopy and melting point determination.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 demonstrate a good practice of laboratory safety and exercise proper procedures for safe handling and usage of chemicals.
- CLO 2 carry out, record and analyze the results of chemical experiments.
- CLO 3 apply modern instrumentation techniques to characterize organic compounds and draw conclusions from the results.
- CLO 4 communicate the results of their work to others.
- CLO 5 demonstrate problem-solving skills, critical thinking and analytical reasoning.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM2441; and pass in CHEM3441, or already enrolled in this course.

Offer in 2019 - 2020
Y 1st sem 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors
(A+ to F)

A
Demonstrate extensive knowledge and thorough command of concepts and principles which are required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Competently conduct experiment with efficient lab skills and techniques. Critically appraise data to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

B
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show substantial grasp and mastery of the subject knowledge. Demonstrate evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Show effective lab skills and techniques and critical analysis of experimental data. Apply effective organizational and presentational skills.

C
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show general but incomplete grasp of the subject knowledge. Demonstrate evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Show moderately effective lab skills and techniques. Demonstrated some ability to analyze experimental data critically. Apply moderately effective organizational and presentational skills.

D
Demonstrate partial but limited command of knowledge and skills required for attaining course learning outcomes. Ability to recall some of factual information of the subject. Show a partial comprehension of basic concepts and principles and weak ability to apply them. Demonstrate evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate partially effective lab skills and techniques. Apply limited or barely effective organizational and presentational skills. Demonstrate limited or ineffective lab skills and techniques. Organization and presentational skills are minimally effective or ineffective.

Fail
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Show evidence of little or no grasp of the knowledge and understanding of the subject. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Demonstrate minimally effective or ineffective lab skills and techniques. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities Details No. of Hours
Laboratory 12 x 4-hr lab sessions 48
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 10 CLO 1,2,3,4,5
Examination (10% practical exam and 40% 2-hr written exam) 50 CLO 1,2,3,4,5
Laboratory reports (Include Lab Quiz 15%, Lab Report and Notebook 20% and Lab Performance 5%) 40 CLO 1,2,3,4,5

Required/recommended reading and online materials
John W. Lehman: Operational Organic Chemistry - A Problem-Solving Approach to the Laboratory Course (Pearson, latest edition)

Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.
CHEM3445  Integrated laboratory (6 credits)  Academic Year 2019
Offering Department Chemistry  Quota 20
Course Co-ordinator Dr A M Y Yuen, Chemistry (maiyan@hku.hk)
Teachers Involved (Dr A M Y Yuen, Chemistry)

Course Objectives
This course aims to provide students with experience using techniques employed in synthetic organic and organometallic chemistry. This advanced synthesis course covering a variety of synthetic methods, including vacuum and inert atmosphere techniques to prepare organic and organometallic compounds; methods for separation of mixtures and isolation of products by use of column and thin-layer chromatography, sublimation and extraction techniques. Experiments on characterization and identification by chemical and spectroscopic methods form an important part of the course. The use of the chemical literature in molecular design and synthesis planning is also included.

Course Contents & Topics
The course will include the following laboratory skills and practices: laboratory safety practice; molecular design, synthesis planning, experimental set up, purification, and characterization of organic compounds using modern instrumentation techniques.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 Demonstrate a good practice of laboratory safety and exercise proper procedures for safe handling and usage of chemicals
- CLO 2 Demonstrate proficiency in synthetic chemical laboratory techniques
- CLO 3 Apply modern instrumentation techniques to characterize organic compounds and draw conclusions from the results
- CLO 4 Analyze the influence of chemical structure on the physical and chemical properties of organic molecules
- CLO 5 Demonstrate problem-solving skills, critical thinking and analytical reasoning

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3443 or already enrolled in this course

Offer in 2019 - 2020 Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Summer Offer in 2020 - 2021: Y</th>
<th>Examination</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>Examination</td>
<td>No Exam</td>
</tr>
<tr>
<td>B</td>
<td>Y</td>
<td>Examination</td>
<td>No Exam</td>
</tr>
<tr>
<td>C</td>
<td>Y</td>
<td>Examination</td>
<td>No Exam</td>
</tr>
<tr>
<td>D</td>
<td>Y</td>
<td>Examination</td>
<td>No Exam</td>
</tr>
</tbody>
</table>

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities Details No. of Hours
Laboratory 48
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Laboratory reports (Practical Examination 25%; Lab report 10%; Lab performance 10%) 45 CLO 1,2,3,4,5
Presentation 20 CLO 3,4,5
Test/ Quiz 35 CLO 1,2,3,4,5

Required/recommended reading and online materials
John W. Lehman: Operational Organic Chemistry - A Problem-Solving Approach to the Laboratory Course (Pearson, latest edition)

Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

CHEM3541  Physical chemistry: Introduction to quantum chemistry (6 credits)  Academic Year 2019
Offering Department Chemistry  Quota 100
Course Co-ordinator Prof G H Chen, Chemistry (ghchen@hku.hk)
Teachers Involved (Prof G H Chen, Chemistry)

Course Objectives
The course presents fundamental principles and topics on quantum chemistry in order to provide a solid foundation for students intending to further their studies in chemistry.

Course Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 understand and use the terminology and nomenclature in quantum chemistry and topics discussed in the course
CLO 2 demonstrate knowledge and understanding of basic concepts in quantum mechanics, atomic and molecular structure.

CLO 3 understand elementary numerical procedures and the basic relationships of quantum mechanics and molecular systems.

CLO 4 hands-on experience of the application of the Hartree-Fock method to molecules.

<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Pass in CHEM2541</th>
</tr>
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<table>
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<th>Y 1st sem Offer in 2020 - 2021 : Y</th>
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<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with thorough grasp of the subject, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and substantial grasp of the subject, ability to apply knowledge to familiar and some unfamiliar situations. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and general but incomplete grasp of the subject, ability to apply knowledge to most familiar situations. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show partial but limited grasp of the subject, retention of some relevant information of the subject, ability to apply knowledge to solve problems. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show little or no grasp of the knowledge and understanding of the subject, very little or no ability to apply knowledge to solve problems. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.</td>
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</table>

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<td>Lectures</td>
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<tr>
<td>Laboratory</td>
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</tr>
<tr>
<td>Tutorials</td>
<td>Reading / Self study</td>
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<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td>70</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Laboratory reports</td>
<td>Experiment &amp; Lab report</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test/Quiz</td>
<td></td>
<td></td>
<td>10</td>
<td>CLO 1,2,3</td>
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</table>

<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
<th>D. A. McQuarrie: Quantum Chemistry (2nd Edition, 2007)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Additional Course Information</th>
<th>Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.</th>
</tr>
</thead>
</table>

**CHEM3542**

**Physical chemistry: statistical thermodynamics and kinetics theory (6 credits)**

**Offering Department** Chemistry

**Course Co-ordinator** Dr. J. Yang, Chemistry (juny@hku.hk)

**Teachers Involved** (Dr. J. Yang, Chemistry)

**Course Objectives**

The course presents fundamental principles and topics on statistical thermodynamics and kinetic theory in order to provide a solid foundation for students intending to further their studies in physical chemistry and related fields.

**Course Contents & Topics**

- Principles of Statistical Thermodynamics
  - Thermodynamic laws
  - Ensembles and partition functions: microcanonical, canonical and grand-canonical
  - Systems of independent molecules: ideal gas
  - Molecular degrees of freedom: translation, rotation, vibration, and electronic
  - Ideal gas mixture: chemical equilibrium, binding, and titration
  - Quantum statistics
  - Chemical equilibrium and kinetics theory
  - Rate theory: collision theory, transition state theory, electron transfer

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

CLO 1 understand and use the terminology and nomenclature in statistical thermodynamics and topics discussed in the course.

CLO 2 demonstrate knowledge and understanding of basic concepts in statistical thermodynamics.

CLO 3 understand correlation between macroscopic observables and microscopic statistical model systems.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

*Pass in CHEM2541*

<table>
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<th>Offer in 2019 - 2020</th>
<th>Y 2nd sem Offer in 2020 - 2021 : Y</th>
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<table>
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<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thorough mastery at an advanced level of extensive knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of strong analytical / critical abilities and logical thinking. Can apply the knowledge to practical questions in Physical Chemistry.</td>
<td>Substantial command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of analytical / critical abilities and logical thinking. Understand the scope of Physical Chemistry questions that can be applied with the knowledge.</td>
<td>General but incomplete command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of analytical thinking. Can apply the knowledge to familiar situations.</td>
<td>Partial but limited command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate limited evidence of analytical thinking. Understand the question to be solved with knowledge.</td>
<td></td>
</tr>
</tbody>
</table>
This course is designed for third year students who would like to take an early experience on research. It offers students an opportunity to carry out small scale chemical projects by themselves. Students interested in taking this course should contact their prospective supervisors in May to determine the contents and the nature of their project in the coming academic year. Prior approval from both the prospective supervisor and the course coordinator is required. The course may involve Laboratory component as Course Teaching & Learning Activities.

This course is designed for Chemistry Major/ Chemistry Major (Intensive) students only. This capstone course is for Chemistry Major/ Chemistry Major (Intensive) students only. Students are strongly recommended to take CHEM3541 Physical Chemistry: Introduction to Quantum Chemistry before taking this course.

References: KA Dill, Molecular driving forces: statistical thermodynamics in biology, chemistry, physics and nanoscience; T. L. Hill, An introduction to Statistical Thermodynamics

CHEM3999

Directed studies in chemistry (6 credits)

Academic Year 2019

Offering Department Chemistry

Course Co-ordinator Prof D L Phillips, Chemistry (phillips@hku.hk)

Course Objectives

This course is designed for third year students who would like to take an early experience on research. It offers students an opportunity to carry out small scale chemical projects by themselves. Students interested in taking this course should contact their prospective supervisors in May to determine the contents and the nature of their project in the coming academic year. Prior approval from both the prospective supervisor and the course coordinator is required. This course is designed for third year students who would like to take an early experience on research. The earliest that a student is allowed to take this capstone course is their year 3 study.

Course Contents & Topics

On successful completion of this course, students should be able to:

CLO 1 understand the terminology and nomenclature associated with the small scale chemical project they worked on in the course

CLO 2 demonstrate knowledge and understanding of basic concepts involved in their chemical project

CLO 3 understand the relationships of their particular chemical project to the wider area of chemistry

Pre-requisites

Students must complete ALL experiments and laboratory reports to pass this course. Students are strongly recommended to take CHEM3541 Physical Chemistry: Introduction to Quantum Chemistry before taking this course.

References: KA Dill, Molecular driving forces: statistical thermodynamics in biology, chemistry, physics and nanoscience; T. L. Hill, An introduction to Statistical Thermodynamics

Grade Descriptors (A+ to F)

A Show an extensive comprehension of the subject. Demonstrate very able analytical and critical thought with presence of some originality. Illuminating utilization and critical analysis / evaluation of information acquired from a wide range of high quality sources. Critical employment of data and results to synthesize appropriate and illuminating conclusions. Demonstrate integration of a wide range of appropriate theories, principles, data and methods. Employ very effective organizational and presentational skills. (Work of A+ should demonstrate substantial additional work beyond that is required in wider areas relevant to the topic.)

B Show a substantial comprehension of the subject. Demonstrate able analytical and critical thinking with use of relevant information from sources. Demonstrate ability to compose meaningful comparisons between different secondary interpretations. Correct utilization of data and results to form appropriate conclusions. Compose general integration of theories, principles, data and methods. Perform moderately effective organizational and presentational skills.

C Show a general but incomplete comprehension of the subject. Presence of some analytical and critical thinking with use of relevant information from sources. Demonstrate ability to compose comparisons between different interpretations. Mainly correct but some incorrect utilization of data and results to form appropriate conclusions. Demonstrate some partial integration of theories, principles, data and methods. Perform moderately effective organizational and presentational skills.

D Show a partial but limited comprehension, with knowledge of some relevant information, of the subject. Presence of some coherent and logical thinking, but with limited analytical and critical abilities. Show utilization and reference of several sources, but mostly via summary instead of by analysis and comparison. Limited ability to employ data and results to form appropriate conclusions. Demonstrate limited integration of theories, principles, data and methods. Perform limited or marginally effective organizational and presentational skills.

Fail Show little or no comprehension of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited employment of secondary sources and no critical comparison of them. Incorrectly utilize data and results and/or unable to form appropriate conclusions. Demonstrate little or no integration of theories, principles, data and methods. Organization and presentational skills are of very limited use or ineffective.

Course Type Project-based course

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments continuous assessment of on class quizzes & assignments 40 CLO 1,2,3

Examination 60 CLO 1,2,3

Required/recommended reading and online materials

P. Atkins, Physical Chemistry (10th edition)

Course Website Nil

Additional Course Information

Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course. Students are strongly recommended to take CHEM3541 Physical Chemistry: Introduction to Quantum Chemistry before taking this course.

References: KA Dill, Molecular driving forces: statistical thermodynamics in biology, chemistry, physics and nanoscience; T. L. Hill, An introduction to Statistical Thermodynamics

Department of Chemistry

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| Course Objectives | To introduce the concepts of symmetry and group theory and to apply them in solving chemical problems. This course also provides an introductory treatment of bonding theories, inorganic electronic and vibrational spectroscopy. This course is essential for students who wish to take advanced courses in inorganic chemistry and all types of spectroscopy. |
| Course Contents & Topics | Symmetry elements and symmetry operations; symmetry point groups; reducible and irreducible representations; character tables; direct products; symmetry-adapted linear combinations; projection operators; hybrid orbitals; molecular orbital theory for organic, inorganic and organometallic systems; selected applications in electronic and vibrational spectroscopy. |
| Course Learning Outcomes | On successful completion of this course, students should be able to: CLO 1 understand the basic principles and concepts of symmetry and group theory and to apply them in solving chemical problems. CLO 2 demonstrate knowledge and understanding in the use of character tables and projection operator techniques. CLO 3 demonstrate knowledge and understanding of bonding theories involving hybrid orbitals and molecular orbitals for organic, inorganic and organometallic systems. CLO 4 demonstrate knowledge and understanding in the application of symmetry and group theory in electronic and vibrational spectroscopy. |
| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in CHEM3341 |
| Course Type | Lecture-based course |
| Course Teaching & Learning Activities | Activities | Details | No. of Hours |
| | Lectures | | 36 |
| | Tutorials | or discussion | 12 |
| | Reading / Self study | | |
| Assessment Methods and Weighting | Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
| | Assignments | (continuous assessment) | 25 | CLO 1, 2, 3, 4 |
| | Examination | | 75 | CLO 1, 2, 3, 4 |
| Additional Course Information | This course is also offered to RgP students, and the course code for RgP students is CHEM6116. |
### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate thorough knowledge of interfacial science and technology, and mastery of skills required for attaining all of the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to solve problems in a wide range of complex, familiar and unfamiliar situations. Critical use of data and sourcing of references. Apply highly effective organizational and presentational skills.</td>
<td></td>
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</tr>
<tr>
<td>Demonstrate substantial knowledge of interfacial science and technology and command of skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to solve problems in familiar and some unfamiliar situations. Correct use of data and sourcing of references. Apply effective organizational and presentational skills.</td>
<td></td>
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</tr>
<tr>
<td>Demonstrate general but incomplete knowledge of interfacial science and technology and command of skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge solve problems to most familiar situations. Mostly correct but some erroneous use of data and references. Apply moderately effective organizational and presentational skills.</td>
<td></td>
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</tr>
<tr>
<td>Demonstrate partial but limited knowledge of interfacial science and technology and command of skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited ability to use data and source references. Apply limited or barely effective organizational and presentational skills.</td>
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</tr>
<tr>
<td>Demonstrate little or no evidence of knowledge of interfacial science and technology, and command of skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Misuse of data and references. Organization and presentational skills are minimally effective or ineffective.</td>
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### Course Type
Lecture-based course

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>(continuous assessment)</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td>test/quiz</td>
<td>25</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Course Contents & Topics
Advanced polymerization methods: copolymerization and applications of copolymers, coordination polymerization, control of stereochemistry in polymers; ionic and radical living polymerization. Materials for specialty applications: high strength materials; high temperature polymers, polyelectrolytes, conducting polymers, optical information storage, sensors, photonics, electronics, nanotechnology. Advanced materials characterization techniques.

### Course Objectives
To understand the science and technology of interfacial phenomena and processes often appeared in high value added products and modern technologies.

### Course Learning Outcomes
- **CLO 1**: Understand interfacial phenomena and their origin from molecular details
- **CLO 2**: Solve problems in interfacial science and technology by applying knowledge of general chemistry, thermodynamics, and kinetics
- **CLO 3**: Be familiarized with technologies that require application of interfacial science, including nanomaterials, nanotechnology, detergency, composite polymers, and porosimetry

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3143 or CHEM3541 or CHEM3542

### Grade Descriptors

- **A**: Demonstrates thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to frontier approach in polymer synthesis, properties, application, and characterization of materials for advanced technology. Show strong ability to apply and integrate knowledge and theory relating to the synthesis and applications of advanced materials. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions.
- **B**: Demonstrates general but incomplete knowledge of interfacial science and technology and command of skills required for attaining most of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited ability to use data and source references. Apply limited or barely effective organizational and presentational skills.
- **C**: Demonstrates partial but limited knowledge of interfacial science and technology and command of skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited ability to use data and source references. Apply limited or barely effective organizational and presentational skills.
- **D**: Demonstrates little or no evidence of knowledge of interfacial science and technology, and command of skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Misuse of data and references. Organization and presentational skills are minimally effective or ineffective.
- **F**: Demonstrates little or no evidence of knowledge of interfacial science and technology, and command of skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Misuse of data and references. Organization and presentational skills are minimally effective or ineffective.

### Course Information
This course is offered every other year.

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### CHEM4144

#### Advanced materials (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr J Y Tang, Chemistry (<a href="mailto:jinyao@hku.hk">jinyao@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr J Y Tang, Chemistry)</td>
</tr>
</tbody>
</table>

#### Course Objectives
This course is a continuation from Introduction to Materials Chemistry. It provides a more comprehensive overview on materials chemistry and application of materials in advanced technology. The most recent development in materials chemistry will also be discussed.

#### Course Contents & Topics
Advanced polymerization methods: copolymerization and applications of copolymers, coordination polymerization, control of stereochemistry in polymers; ionic and radical living polymerization. Materials for specialty applications: high strength materials; high temperature polymers, polyelectrolytes, conducting polymers, optical information storage, sensors, photonics, electronics, nanotechnology. Advanced materials characterization techniques.

#### Course Learning Outcomes
On successful completion of this course, students should be able to:
- **CLO 1**: Describe the mechanisms and kinetics of copolymerizations, coordination polymerizations, and living polymerizations
- **CLO 2**: Identify examples of some engineering polymers for high temperature/high strength applications, and how are their properties affected by the molecular structures
- **CLO 3**: Demonstrate knowledge in advanced materials characterization techniques
- **CLO 4**: Understand the working principles of materials for information storage and opto-electronic applications

#### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3143

#### Grade Descriptors

- **A**: Demonstrates thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to frontier approach in polymer synthesis, properties, application, and characterization of materials for advanced technology. Show strong ability to apply and integrate knowledge and theory relating to the synthesis and applications of advanced materials. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions.
Department of Chemistry

Course Type: Lecture-based course

Course Teaching & Learning Activities:

<table>
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<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials or discussion</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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Assessment Methods and Weighting:

<table>
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<tr>
<th>Methods</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments (continuous assessment)</td>
<td>20</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Examination</td>
<td>80</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
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</table>

Required/recommended reading and online materials:

Specialist references will be given throughout the course.

CHEM4145

Medicinal chemistry (6 credits)

Offering Department: Chemistry

Course Co-ordinator: Prof H Z Sun, Chemistry (h sun@h ku.hk)

Teachers Involved: (Dr X Li, Chemistry) (Prof H Z Sun, Chemistry) (Prof X C Li, Chemistry)

Course Objectives:

This course covers the chemical principles of drug design and drug action and uses as an introduction to research in areas of bioorganic chemistry, bioorganic chemistry, medicinal chemistry, pharmaceutical chemistry, and biotechnology.

Course Contents & Topics:

- Drug discovery, design, and development: lead discovery, pharmacophore, structure-activity relationships (SAR), computer-aided drug design, combinational chemotherapy and high-throughput drug screening
- Drug-receptor interactions
- Proteins (and enzymes) and nucleic acids as drug targets
- Metals in medicine
- DNA-Drug interactions
- Drug metabolism and prodrugs and drug delivery

Course Learning Outcomes:

On successful completion of this course, students should be able to:

CLO 1: demonstrate knowledge of drug discovery, design and development
CLO 2: understand drug-biomolecule interactions where appropriate
CLO 3: gain appropriate knowledge of drug metabolism and drug delivery

Pre-requisites (and Co-requisites and Impermissible combinations):

Pass in CHEM3441 or CHEM3442; and Not for students who have passed in BPHM3133, or already enrolled in this course.

Grade Descriptors (A+ to F):

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of medicinal chemistry, especially those related to drug discovery, design and development; drug targets; drug lead optimization; structure activity relationship; pharmacokinetiks; drug delivery and its relevance to toxicity. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate conclusions relating to the basic foundation knowledge of medicinal chemistry. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate conclusions relating to the basic foundation knowledge of medicinal chemistry. Demonstrate highly effective basic techniques for medicinal chemistry, especially in drug discovery and metabolism.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of medicinal chemistry, especially those related to drug discovery, design and development; drug targets; drug lead optimization; structure activity relationship; pharmacokinetiks; drug delivery and its relevance to toxicity. Show evidence of some abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal chemistry. Demonstrate moderately effective basic techniques, basic techniques for medicinal chemistry, especially in drug discovery and metabolism.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of medicinal chemistry, especially those related to drug discovery, design and development; drug targets; drug lead optimization; structure activity relationship; pharmacokinetics; drug delivery and its relevance to toxicity. Show evidence of some abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal chemistry. Show ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of medicinal chemistry. Demonstrate effective basic techniques for medicinal chemistry, especially in drug discovery and metabolism.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of medicinal chemistry, especially those related to drug discovery, design and development; drug targets; drug lead optimization; structure activity relationship; pharmacokinetics; drug delivery and its relevance to toxicity. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal chemistry. Demonstrate moderate effective basic techniques, basic techniques for medicinal chemistry, especially in drug discovery and metabolism.</td>
</tr>
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Academic Year: 2019

Quota: 70

Offer in 2019 - 2020: Y

2nd sem

Examination: May

Offer in 2020 - 2021: Y
Assignments 20 CLO 1,2,3
Dr H Y Au-Yeung, Chemistry
May

Department of Chemistry

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
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<tr>
<td>Tutorials</td>
<td>or discussion</td>
<td>12</td>
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<td>100</td>
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Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Assignments</td>
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<td>25</td>
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<tr>
<td>Examination</td>
<td></td>
<td>75</td>
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</tbody>
</table>

Required/recommended reading and online materials

An Introduction to Medicinal Chemistry (3/e), G.L. Patrick, Oxford University Press, 2005

Additional Course Information
This course is also offered to RPg students, and the course code for RPg students is CHEM6113.

CHEM4147
Supramolecular chemistry (6 credits)

Offering Department
Chemistry

Course Co-ordinator
Dr H Y Au-Yeung, Chemistry (hoyuay@hku.hk)
(Dr H Y Au-Yeung, Chemistry) (Dr Y F Wang, Chemistry)

Course Objectives
Supramolecular chemistry concerns the chemistry beyond that of molecules. This course aims at introducing students to concepts and techniques in supramolecular chemistry, demonstrating how molecular assembly and supramolecular structures leads to functions and properties, and their relevance to material and biological science.

Course Contents & Topics
Basic concepts in molecular recognition and self-assembly; non-covalent interactions and common supramolecular building blocks; methods in supramolecular chemistry. Selected topics in modern supramolecular chemistry, such as macrocycles and cages, molecular capsule and container molecules, synthetic receptors, interlocked structures, supramolecular polymers and supramolecular chemistry of biomolecules and biomaterials, will also be discussed.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 Understand important principles and concepts in supramolecular chemistry
- CLO 2 Demonstrate knowledge and understanding in the nature of non-covalent interactions and to apply these concepts in the design and explanation of the structures, properties and functions of different supramolecular systems
- CLO 3 Interpret and analyse physical characterization data of supramolecular systems and extract relevant chemical information to explain the properties of the supramolecular systems

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3341 and CHEM3441

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y

Academic Year
2019

Quota
40

Grade Descriptors (A to F)

A
Demonstrate thorough knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show strong ability to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show strong ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

B
Demonstrate substantial knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show evidence to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show evidence to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

C
Demonstrate general but incomplete amount of knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show some ability to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show some ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

D
Demonstrate partial but incomplete command of knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show evidence of limited ability to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show limited ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

Fail
Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show little or no ability to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show little or no ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
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<tbody>
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<td>Lectures</td>
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<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
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Assessment Methods and Weighting

<table>
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Examination</td>
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<td>65</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Presentation</td>
<td></td>
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<tr>
<td>Test</td>
<td>Assignments</td>
<td>20</td>
<td>CLO 1,2,3</td>
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</tbody>
</table>

Methods Details

- Examination
- Presentation
- Test
- Assignments

Assessment Methods to CLO Mapping

- CLO 1,2,3

Grade Descriptors

A
Demonstrate thorough knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show strong ability to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show strong ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

B
Demonstrate substantial knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show evidence to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show evidence to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

C
Demonstrate general but incomplete amount of knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show some ability to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show some ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

D
Demonstrate partial but incomplete command of knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show evidence of limited ability to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show limited ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

Fail
Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts and principles in supramolecular chemistry, especially those relating to non-covalent interactions, molecular recognition and self-assembly. Show little or no ability to apply and integrate knowledge in supramolecular chemistry in explaining the formation and properties of, and in designing different supramolecular systems. Show little or no ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.
Modern chemistry is thought to be the "central science" as it plays a critical role in related biological, physical, medical, and engineering disciplines. This course aims to introduce students to the newest concepts and technological breakthroughs in chemical sciences. Throughout the course, students will be introduced to how the interplay among molecules, materials, and interfaces leads to unprecedented functionalities that contribute to innovations in biology and medicine, smart materials, and sustainable energy schemes.

Course Contents & Topics
Current topics focus on the interdisciplinary area of chemistry with biology, and material sciences. Covered topics include chemical genetics, epigenetics and proteomics; chemical biology for drug discovery and development; stimuli-responsive nanomaterials; autonomous macromolecular motion; future power landscape; renewable energy conversion and utilization. Examples in protein posttranslational modifications, active colloidal, thermoelectric materials, molecular machines, advanced rechargeable batteries, and next-generation fuel cells and electrolysers will be discussed.

Course Objectives
CLO 1 understand important principles and topical trends in chemical sciences
CLO 2 demonstrate understanding of future directions in biomedical chemistry, nanomaterials, and energy sciences and applying this knowledge in comparing and contrasting various emergent technologies
CLO 3 interpret and analyse recent published research data in the field of chemistry and extract relevant chemical information to explain the observed properties and phenomena associated to the chemical systems.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand important principles and topical trends in chemical sciences
CLO 2 demonstrate understanding of future directions in biomedical chemistry, nanomaterials, and energy sciences and applying this knowledge in comparing and contrasting various emergent technologies
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Course Assessment
Assessments include chemical genetics, epigenetics and proteomics; chemical biology for drug discovery and development; stimuli-responsive nanomaterials; autonomous macromolecular motion; future power landscape; renewable energy conversion and utilization. Examples in protein posttranslational modifications, active colloidal, thermoelectric materials, molecular machines, advanced rechargeable batteries, and next-generation fuel cells and electrolysers will be discussed.

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Course Assessment
Assessments include chemical genetics, epigenetics and proteomics; chemical biology for drug discovery and development; stimuli-responsive nanomaterials; autonomous macromolecular motion; future power landscape; renewable energy conversion and utiliza...
Course Contents & Topics

Metabolomics.
Laser Spectroscopy: Principle of laser; three-level and four-level lasers; laser instrumentation (Q-switching and frequency conversion); laser-induced fluorescence; laser atomic spectrometry; laser remote sensing; signal-to-noise enhancement by boxcar integration and photon counting.
Atomic Plasma Spectrometry: Inductively couple plasma-atomic emission spectrometry (ICP-AES) and mass spectrometry (ICP-MS); signal-production processes in ICP spectrometry; Echelle grating spectrometer; array detectors; interferences in ICP-AES and ICP-MS.
Atomic X-ray Spectrometry: X-ray fluorescence; wavelength-dispersive (WDXRF) and energy-dispersive (EDXRF) X-ray fluorescence spectrometers.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 explain the principles of the modern mass spectrometric methods for proteins and metabolites identification and quantification

CLO 2 explain how proteins are identified and sequenced experimentally and how data is generated in proteomics experiments

CLO 3 use the database searching techniques and software tools to analyze high-throughput proteomics data

CLO 4 apply LC/MS/MS method for target quantitative analysis of small molecules

CLO 5 explain the principles of the laser spectroscopy, atomic plasma spectrometry, and atomic X-ray spectrometry

CLO 6 describe the basic experimental set up and the properties of the basic components of the instruments used in the laboratory classes

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM5241

Offer in 2019 - 2020

Grade Descriptors (A+ to F)

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<th>Grade Descriptors</th>
<th>No. of Hours</th>
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<td>A</td>
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<td>B</td>
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<td>C</td>
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<tr>
<td>D</td>
<td>100</td>
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Examination 65

CLO 1, 2, 3, 4, 5, 6

Assessment Methods to CLO Mapping

Laboratory reports

1. CLO 1, 2, 3, 4, 5, 6

Additional Course Information

This course is also offered to RPg students, and the course code for RPg students is CHEM6117.

CHEM4242

Course Type

Lecture with laboratory component course

Course Teaching & Learning Activities

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<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<td>Tutorials</td>
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<td>12</td>
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<td>Reading / Self study</td>
<td></td>
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Chemical Education

Chemical Science

Analytical chemistry (6 credits)

Offering Department

Chemistry

Course Co-ordinator

Dr W T Chan, Chemistry (wtchan@hku.hk)

Teachers Involved

Dr W T Chan, Chemistry

Course Objectives

This course emphasizes on the integration of analytical concepts and technologies to solve practical analytical and bioanalytical problems. This course will be particularly useful for students who plan to pursue their career related to analytical and bioanalytical chemistry.

Course Contents & Topics

Analytical measurement concepts: Statistical treatment & evaluation of chemical measurement data; Figures of merits of analytical methods; Validation of analytical methods; Quality assurance in chemical analysis and testing laboratories

Theoretical background and practical techniques of sample preparation, separation and detection: Sample preparation and enrichment techniques for biomedical, pharmaceutical and forensic chemical analysis; Advanced separation technologies for complex mixture analysis (e.g. multidimensional LC); Derivatization methods for chromatographic analysis and spectroscopic detection; Analytes characterization and detection techniques based on mass spectrometry

Problem-based design of analytical strategy for chemical & biochemical analysis: Expert sharing of practical knowledge and experience related to selected fields of research; Case study and review of analytical chemistry

Academic Year

2019

Quota

50
| Course Learning Outcomes | A. demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities, logical thinking and capability to apply knowledge learnt to solve a wide range of complex issues and problems related to chemical analysis. Apply highly effective organization and presentation skills as shown in class work. | B. demonstrate a substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities, logical thinking, and capability to apply knowledge learnt to solve a wide range of complex issues and problems related to chemical analysis. Apply effective organization and presentation skills as shown in class work. | C. demonstrate a general command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities, logical thinking, and ability to apply knowledge learnt to solve a wide range of complex issues and problems related to chemical analysis. Apply effective organization and presentation skills as shown in class work. | D. demonstrate a partial but limited command of knowledge and skills required for attaining some of the course learning outcomes in Food and Water Analysis. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems related to chemical analysis. Organization and presentation skills are minimally effective or ineffective as shown in class work. | Fail | Demonstrate little or no evidence for the command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems related to chemical analysis organization. Organization and presentation skills are minimally effective or ineffective as shown in class work. |
| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in CHEM3241 or CHEM3242 | | | | | |
| Offer in 2019 - 2020 | Y | 2nd sem | Offer in 2020 - 2021 : Y | | Examination | May | |
| Course Teaching & Learning Activities | Activities | Details | No. of Hours | | | |
| | Lectures | | 24 | |
| | Laboratory | 6 x 4-hour of laboratory practical | 24 | |
| | Tutorials | | 6 | |
| | Reading / Self study | | 100 | |
| Assessment Methods and Weighting | Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping | |
| | Assignments | (small project) | 15 | CLO 1.3 | |
| | Examination | | 70 | CLO 1.2,3 | |
| | Laboratory reports | Experiment & Lab report | 15 | CLO 1.2,3 | |
| | A. Manz, P. S. Dittrich, N. Pamme, D. Lossidifis: Bioanalytical Chemistry (Imperial College Press, latest edition) | | | |
| Additional Course Information | References to specialist texts and other published materials will be made throughout the course. | | | |
| | Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course. | | | |

| CHEM4341 Advanced inorganic chemistry (6 credits) | Academic Year | 2019 | |
| Offering Department | Chemistry | | |
| Course Co-ordinator | Prof C M Che, Chemistry (cmche@hku.hk) | | |
| Teachers Involved | (Prof C M Che,Chemistry) | (Prof H Z Sun,Chemistry) | (Prof V W W Yam,Chemistry) | |
| Course Objectives | This course is a continuation from Intermediate Inorganic Chemistry, giving further and more detailed treatment to topics in Inorganic Chemistry and new areas of interest. Problem based learning on selected advance topics will be introduced in the later part of the course. This course also aims to prepare students for graduate work. | | |
| Course Contents & Topics | Selected advanced topics of current interest. Examples include metal-metal bonds and metal-ligand multiple bonds, inorganic and supramolecular photochemistry, lanthanide chemistry, bio-inorganic and medicinal chemistry, and activation of small molecules by metal complexes. | | |
| Course Learning Outcomes | On successful completion of this course, students should be able to: | | |
| | CLO 1 understand the principles and concepts of inorganic and supramolecular photochemistry. | | |
| | CLO 2 understand the electronic structure and bondings of novel metal-metal and metal-ligand multiple bonded metal complexes. | | |
| | CLO 3 understand and realize the activation of small molecules by transition metal complexes and realize the importance of such activation in chemical catalysis of global interest, green chemistry and energy saving reactions. | | |
| | CLO 4 understand the role of metal complexes in bio-inorganic and medicinal chemistry. | | |
| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in CHEM3341 | | | |
| Offer in 2019 - 2020 | Y | 1st sem | Offer in 2020 - 2021 : Y | | Examination | Dec | |
| Grade Descriptors (A+ to F) | A. demonstrate thorough mastery at an advanced level of extensive knowledge and understanding of essential facts, concepts, principles and theories relating to the frontiers in inorganic chemistry. Show strong ability to apply and integrate knowledge and theory, and strong ability to analyze novel problems in inorganic chemistry. Apply highly effective organization and presentational skills. | B. demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles and theories relating to the more advanced knowledge in inorganic chemistry. Show evidence to apply and integrate knowledge and theory, and ability to analyze novel problems of inorganic chemistry. Apply effective organization and presentational skills. | C. demonstrate a general but incomplete command of knowledge and understanding of essential facts, concepts, principles and theories relating to the more advanced knowledge in inorganic chemistry. Show evidence of some abilities to apply and integrate knowledge and theory, and to analyze problems to most familiar situations in inorganic chemistry. Apply moderately effective organization and presentational skills. | | |
Course Type: Lecture-based course

Course Teaching & Learning Activities

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<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
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<tr>
<td>Tutorials</td>
<td>including literature survey &amp; presentation</td>
<td>12</td>
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<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
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Assessment Methods and Weighting

<table>
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
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<tr>
<td>Assignments</td>
<td>(continuous assessment)</td>
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<td>CLO 1.2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
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Required/recommended reading and online materials


Additional Course Information

References to specialist texts and other published materials will be made throughout the course. (Students are strongly recommended to take CHEM4142 Symmetry, group theory and applications if they wish to take this course.) This course is also offered to RPg students, and the course code for RPg students is CHEM6115.

CHEM4342 Organometallic chemistry (6 credits)

Offering Department: Chemistry

Course Co-ordinator: Prof V W W Yam, Chemistry (wwyam@hku.hk)

Teachers Involved: (Dr H Y Au-Yeung, Chemistry) (Prof V W W Yam, Chemistry)

Course Objectives

To give further, more detailed, treatment to organometallic chemistry mentioned in CHEM3341 Inorganic Chemistry II. The course also aims to introduce and familiarize students with advanced laboratory techniques, and to prepare students for graduate work in inorganic and organometallic chemistry.

Course Contents & Topics


Laboratory: To introduce and familiarize students with advanced laboratory techniques which include the synthesis and manipulation of air- and moisture-sensitive compounds, and their characterization by various spectroscopic methods.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand the advanced principles and concepts in organometallic chemistry

CLO 2 demonstrate knowledge and understanding in the bonding, structure and reactivities of main group and transition metal organometallics, especially in transition metal clusters, metal alkyls, metal alkylidenes and metal alkylidyynes.

CLO 3 demonstrate knowledge and understanding in the application of organometallics in organic synthesis, polymerization and catalysis.

CLO 4 demonstrate ability in advanced laboratory techniques including the synthesis and manipulation of air- and moisture-sensitive compounds, and their characterization by various spectroscopic methods.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM3341

Offer in 2019 - 2020 Grade Descriptors (A+ to F)

Y 1st sem Offer in 2020 - 2021 Y Examination Dec

A Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the advanced principles and concepts of organometallic chemistry. Demonstrate partial effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.

B Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the advanced principles and concepts of organometallic chemistry. Demonstrate partial effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.

C Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show evidence of some abilities to apply and integrate knowledge and theory relating to the advanced principles and concepts of organometallic chemistry. Show ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the advanced principles and applications of organometallic chemistry. Demonstrate moderately effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.

D Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the advanced principles and concepts of organometallic chemistry. Demonstrate partially effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.
Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show little or no ability to solve problems to most familiar situations and erroneous use of data and experimental results to draw appropriate conclusions relating to the advanced principles and applications of organometallic chemistry. Demonstrate minimal effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
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<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
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<tr>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Lectures</td>
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<td>Laboratory</td>
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<td>Tutorials</td>
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<td>Assessment Methods and Weighting</td>
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<td>Methods</td>
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<tr>
<td>Assignments</td>
<td>(continuous assessment)</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td></td>
</tr>
<tr>
<td>Additional Course Information</td>
<td></td>
</tr>
<tr>
<td>Reference to specialist texts and other published materials will be made throughout the course. Laboratory classes are mandatory. Students must complete all experiments and laboratory reports to pass this course.</td>
<td></td>
</tr>
</tbody>
</table>

CHEM4441

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof D Yang. Chemistry (<a href="mailto:yangdan@hku.hk">yangdan@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Prof D Yang, Chemistry) (Prof X C Li, Chemistry)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To provide students with knowledge in organic chemistry reaction mechanisms and organic compound structure determination.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>The course covers chemical bonding, advanced stereochemistry, conformational analyses, techniques for investigating reaction mechanisms, reactive intermediates, rearrangement reactions, and pericyclic reactions.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td>CLO 1</td>
<td>describe, analyze and interpret the structure and reactivity relationship of organic molecules</td>
</tr>
<tr>
<td>CLO 2</td>
<td>identify and predict the selectivities (chemoselectivity, regioselectivity and steroeselectivity) in organic reactions</td>
</tr>
<tr>
<td>CLO 3</td>
<td>describe the general approaches to study organic mechanisms</td>
</tr>
<tr>
<td>CLO 4</td>
<td>have a general understanding and working knowledge of pericyclic reactions, reactive intermediates (radicals, carbenes and nitrenes), and polar rearrangements</td>
</tr>
<tr>
<td>CLO 5</td>
<td>suggest reasonable mechanistic pathways for some types of organic reactions</td>
</tr>
<tr>
<td>CLO 6</td>
<td>apply the knowledge of reaction mechanisms in design of synthetic routes for organic compounds</td>
</tr>
</tbody>
</table>

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM3441

Grade Descriptors (A+ to F)

| A | Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. |
| B | Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. |
| C | Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. |
| D | Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. |
| F | Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. |

CHEM44443

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof P Chiu, Chemistry (<a href="mailto:pchiu@hku.hk">pchiu@hku.hk</a>)</td>
</tr>
</tbody>
</table>

704
Course Objectives
To introduce aspects of modern organic reactions with relevance to and in the context of the synthesis of natural products, drugs and medicinal chemistry to provide an integrated approach to the subject, and to provide training in advanced organic laboratory skills, and further hands-on experience in synthesis and characterization, as preparation for graduate studies or research in organic chemistry.

Course Contents & Topics
Building on the organic chemistry covered in the foundational courses CHEM1003 and CHEM2402, this course will present modern synthetic methods and synthetic planning. The course is organized into units based on target drug molecules. In each unit, the chemical biology of these compounds are briefly presented and the syntheses of these molecules are introduced, accompanied by in-depth discussions of the reactions involved with emphasis on their mechanisms, selectivity, stereochemistry, scope and limitations. Concept of synthetic design including retrosynthetic analysis, stereoselectivity and enantioselective control elements will be emphasized. A laboratory section provides training in the practical skills of synthesis.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the rationale, selectivities, and mechanisms of various reactions and reagents in organic chemistry.

CLO 2 able to solve mechanistic and synthetic chemistry problems.

CLO 3 perform organic synthesis experiments at an increased level of technical difficulty, using additional skills in experimental design and execution, spectroscopic analysis, and reporting of results.

CLO 4 integrate lecture material and literature search, to learn chemistry independently.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3441; or Pass in CHEM3441 (without lab component) and CHEM3443

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021: Y

Grade Descriptors (A+ to F)
A Demonstrate a thorough mastery at an advanced level of knowledge and understanding of concepts, principles, reactions and mechanisms related to synthetic organic chemistry. Show a strong ability to analyze novel synthetic organic chemistry situations and problems. Show a critical use of knowledge and data to apply to the solution of novel and complex synthetic problems. Demonstrate highly effective organization and application of lab skills and techniques in synthetic experiments.

B Demonstrate a substantial command of knowledge and understanding of concepts, principles, reactions and mechanisms related to synthetic organic chemistry. Show evidence of ability to integrate knowledge and theory, and a strong ability to analyze synthetic organic chemistry situations and problems. Show a correct use of knowledge and data to apply to the solution of some novel and most familiar synthetic problems. Demonstrate effective organization and application of lab skills and techniques in synthetic experiments.

C Demonstrate a general but incomplete command of knowledge and understanding of concepts, principles, reactions and mechanisms related to synthetic organic chemistry. Show evidence of ability to integrate knowledge and theory, and evidence of some ability to analyze synthetic organic chemistry situations and problems. Show a correct use of knowledge to apply to the solution of most familiar problems. Demonstrate moderately effective organization and application of lab skills and techniques in synthetic experiments.

D Demonstrate a partial but limited command of knowledge and understanding of concepts, principles, reactions and mechanisms related to synthetic organic chemistry. Show evidence of a limited ability to integrate knowledge and theory, and a limited ability to analyze familiar situations and problems. Show some correct but erroneous use of knowledge to apply to the solution of most familiar problems. Demonstrate partially effective organization and application of lab skills and techniques in synthetic experiments.

Fail Demonstrate little or no evidence of command of knowledge and understanding of concepts, principles, reactions and mechanisms related to synthetic organic chemistry. Show little or no evidence of ability to integrate knowledge and theory in synthetic organic chemistry, and little or no ability to analyze most familiar situations and problems. Show mostly erroneous use of knowledge to apply to the solution of familiar problems. Demonstrate minimally effective organization and application of lab skills and techniques in synthetic experiments.

Course Type
Lecture with laboratory component course.

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>65</td>
<td>CLO 1.2</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>(lab practical 15% and lab test 10%)</td>
<td>25</td>
<td>CLO 1.2</td>
</tr>
<tr>
<td>Test</td>
<td>(open book midterm)</td>
<td>10</td>
<td>CLO 3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Top drugs, top synthetic routes, J. Saunders, Oxford Science Publications

Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

This course is also offered to RPg students, and the course code for RPg students is CHEM6111.

CHEM4444
Chemical biology (6 credits)
Academic Year 2019

Offering Department
Chemistry
Quota 50

Course Co-ordinator
Prof X C Li, Chemistry (xuechenl@hku.hk)

Teachers Involved
(Prof X C Li, Chemistry)

Course Objectives
To understand how to use chemical approaches to emulate biological systems to study natural molecules and generate new functional molecules. Useful as an introduction to research in areas of chemical biology, medicinal chemistry and biotechnology.

Course Contents & Topics
Chemical biology of nucleic acids, protein chemistry, protein posttranslational modifications, carbohydrate chemistry, chemical glycobiology and tools and techniques in chemical biology.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand chemical biology approaches in studying biology.

CLO 2 give examples of how to use chemical methods to produce natural biomolecules and new biomolecules with altered functions.

CLO 3 compare chemical biology and traditional biology approaches in drug discovery.

Pre-requisites (and Co-requisites)
Pass in BIOL3601 or CHEM3441
### Course Content & Topics

**Principles of Statistical Thermodynamics**
- Thermodynamic laws
- Ensembles and partition functions: microcanonical, canonical and grand-canonical
- Systems of independent molecules: Ideal gas
- Molecular degrees of freedom: translation, rotation, vibration, and electronic
- Ideal gas mixture: chemical equilibrium, binding, and fritration
- Lattice statistics: Ising model and phase transition
- Quantum statistics

Chemical equilibrium and kinetics theory
- Rate theory: collision theory, transition state theory

### Course Learning Outcomes

On successful completion of the course, students should be able to:

**CLO 1**
Understand and use the terminology and nomenclature in statistical thermodynamics and topics discussed in the course.

**CLO 2**
Demonstrate knowledge and understanding of basic concepts in statistical thermodynamics.

**CLO 3**
Understand correlation between macroscopic observables and microscopic statistical model systems.

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM3541

### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2019 - 2020</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
<th>Grade Descriptors</th>
<th>Grade Descriptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>2nd sem</td>
<td>Examination</td>
<td>May</td>
<td></td>
</tr>
<tr>
<td>CLO 1,2,3</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking. Can apply the knowledge to practical questions in Physical Chemistry.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>Thorough mastery at an advanced level of extensive knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of strong analytical / critical abilities and logical thinking. Can apply the knowledge to practical questions in Physical Chemistry.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Substantial command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of analytical / critical abilities and logical thinking. Understand the scope of Physical Chemistry questions that can be applied with the knowledge.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>General but incomplete command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of analytical thinking. Can apply the knowledge to familiar situations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Partial but limited command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate limited evidence of analytical thinking. Understand the question to be solved with knowledge.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fail</strong></td>
<td>Little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presenational skills are minimally effective or ineffective. Limited use of secondary sources and no critical comparison of them.</td>
<td></td>
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</table>

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td>tutorials/discussion</td>
<td>12</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Examination</td>
<td>Test</td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Offer in 2020 - 2021

<table>
<thead>
<tr>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
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</table>

### Grade Descriptors

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>Examination</td>
</tr>
<tr>
<td>CLO 1,2,3</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking. Can apply the knowledge to practical questions in Physical Chemistry.</td>
<td></td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>Thorough mastery at an advanced level of extensive knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of strong analytical / critical abilities and logical thinking. Can apply the knowledge to practical questions in Physical Chemistry.</td>
<td></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Substantial command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of analytical / critical abilities and logical thinking. Understand the scope of Physical Chemistry questions that can be applied with the knowledge.</td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>General but incomplete command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of analytical thinking. Can apply the knowledge to familiar situations.</td>
<td></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Partial but limited command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate limited evidence of analytical thinking. Understand the question to be solved with knowledge.</td>
<td></td>
</tr>
<tr>
<td><strong>Fail</strong></td>
<td>Little or no evidence of command of knowledge of statistical thermodynamics and reaction dynamics.</td>
<td></td>
</tr>
</tbody>
</table>
This course covers topics in computational chemistry including first-principles methods and molecular dynamics methods. It is offered to undergraduate and postgraduate students interested in computational chemistry, computational physics and computational biology.

Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

CHEM4542
Computational chemistry (6 credits)
Offering Department Chemistry
Course Co-ordinator Prof G H Chen, Chemistry (ghc@yangtze.hku.hk)
Course Objectives
On successful completion of this course, students should be able to:
CLO 1 understand the basic concepts of density-functional theory
CLO 2 understand the basic numerical techniques of molecular mechanics method and quantum mechanics/molecular mechanics method
CLO 3 employ the existing computational software to calculate the chemical, physical properties of various molecular systems include organic molecules, inorganic materials and biomolecules

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3541 or PHYS3351

Offer in 2019 - 2020
N Offer in 2020 - 2021 : Y

Grade Descriptors
(A+ to F)
A Mastery of advanced knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Strong analytical and critical abilities and logical thinking, with strong ability to apply knowledge to practical problems in physical chemistry.
B Substantial command of a broad range of knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Evidence of analytical and critical abilities and logical thinking, with ability to apply knowledge to practical problems in physical chemistry.
C Command of knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Evidence of some coherent analytical and critical abilities and logical thinking, with limited ability to apply knowledge to practical problems in physical chemistry.
D Partial but limited command of knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Evidence of some coherent analytical and critical abilities and logical thinking, with limited ability to apply knowledge to practical problems in physical chemistry.
Fail Little or no evidence of command of knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Lack of analytical and critical abilities and logical thinking, with very little or no ability to apply knowledge to practical problems in physical chemistry.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 24
Laboratory lab sessions 6x4 hours of computational laboratory 24
Tutorials 6
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments continuous assessment of on class quizzes & assignments 40 CLO 1,2,3
Examination 60 CLO 1,2,3

Required/recommended reading and online materials
Attila Szabo & Neil S. Ostlund: Modern Quantum Chemistry (1st ed.)
J.M. Haile: Molecular Dynamics Simulation
Andrew R. Leach: Molecular Modelling - Principles and Applications

Additional Course Information
This course is equivalent to CHEM6109 Computational Chemistry. CHEM4542 is offered every other year. Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

CHEM4543
Advanced physical chemistry (6 credits)
Offering Department Chemistry
Course Co-ordinator Prof G H Chen, Chemistry (ghc@yangtze.hku.hk)
Course Objectives
This course covers advanced topics in physical chemistry. It is offered for students majoring in physical chemistry and for students who are interested in postgraduate studies.
Course Contents
Time-resolved spectroscopy methods, excited states and reactive intermediates, photophysics and photochemical
Department of Chemistry

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand the basic concepts of quantum chemistry, statistical thermodynamics and molecular dynamics.
- CLO 2 understand Hartree-Fock method, statistical ensembles, quantum statistics, H-Theorem, and reaction dynamics.
- CLO 3 understand the elementary numerical procedures in Hartree-Fock and molecular mechanics methods.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3541

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y
Offer in 2019 - 2020: N

Grade Descriptors

<table>
<thead>
<tr>
<th>Grade</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mastery of advanced knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Strong analytical and critical abilities and logical thinking, with strong ability to apply knowledge to practical problems in physical chemistry.</td>
</tr>
<tr>
<td>B</td>
<td>Substantial command of a broad range of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Evidence of analytical and critical abilities and logical thinking, with ability to apply knowledge to practical problems in physical chemistry.</td>
</tr>
<tr>
<td>C</td>
<td>Command of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Evidence of some coherent analytical and critical abilities and logical thinking, with limited ability to apply knowledge to practical problems in physical chemistry.</td>
</tr>
<tr>
<td>D</td>
<td>Partial but limited command of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Lack of analytical and critical abilities and logical thinking, with little or no ability to apply knowledge to practical problems in physical chemistry.</td>
</tr>
<tr>
<td>Fail</td>
<td>Little or no evidence of command of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Lack of critical abilities and logical thinking, with very little or no ability to apply knowledge to practical problems in physical chemistry.</td>
</tr>
</tbody>
</table>

Course Type
Lecture-based course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments (continuous assessment)</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>80</td>
</tr>
</tbody>
</table>

Assessment Methods to CLO Mapping

<table>
<thead>
<tr>
<th>CLO</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>Understand the thermodynamic and kinetic processes of a charge transfer process at the electrode-electrolyte interface and transport of relevant species in molecular and macroscopic scales.</td>
</tr>
<tr>
<td>CLO 2</td>
<td>Apply voltammetry methods to characterize an electrochemical process.</td>
</tr>
<tr>
<td>CLO 3</td>
<td>Correlate performance of electrochemical cells to materials, design, and operation parameters.</td>
</tr>
</tbody>
</table>

Course Contents & Topics

Course Objectives
To understand the science of electrochemistry, methods to characterise electrochemical cells, and factors affecting electrochemical applications and technologies.

Course Co-ordinator
Prof G K Y Chan, Chemistry (hrsccky@hku.hk)

Teachers Involved
(Prof G K Y Chan, Chemistry (Visiting Professor, Chemistry)

Offering Department
Chemistry

Quota
36

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 Understand the thermodynamic and kinetic processes of a charge transfer process at the electrode-electrolyte interface and transport of relevant species in molecular and macroscopic scales.
- CLO 2 Apply voltammetry methods to characterize an electrochemical process.
- CLO 3 Correlate performance of electrochemical cells to materials, design, and operation parameters.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3241 or CHEM3541 or CHEM3542

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : N

Grade Descriptors

<table>
<thead>
<tr>
<th>Grade</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough knowledge of electrochemical science and technology, and mastery of skills required for attaining all of the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to solve problems in a wide range of complex, familiar and unfamiliar situations. Critical use of data and sourcing of references. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial knowledge of electrochemical science and technology and command of skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to solve problems in familiar and some unfamiliar situations. Critical use of data and sourcing of references. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete knowledge of electrochemical science and technology and command of skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to solve problems in some familiar situations. Mostly correct but some erroneous use of data and references. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited knowledge of electrochemical science and technology and command of skills required for attaining some of the course learning outcomes. Show evidence of some coherent analytical and critical abilities. Evidence of some coherent ability to apply knowledge to solve problems. Limited ability to use data and source references. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of knowledge of electrochemical science and technology, and command of skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Misuse of data and references. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>
### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>Laboratory/Project</td>
<td>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments (assignments, test and term paper)</td>
<td>40</td>
<td>CLO 1.2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1.2,3</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

### Additional Course Information
This course is offered every other year.

### CHEM4910
**Chemistry literacy and research (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr X Li, Chemistry (<a href="mailto:xiangli@hku.hk">xiangli@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Various teachers in the Department, Chemistry</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course is designed for final year students who would like to gain experience on research methods and techniques by working on small projects on literature research and chemical research.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>The course provides training on chemistry literature research techniques. Students will work on a small project on literature research and a short laboratory-based research project. The latter is provided by the students’ supervisors who are assigned by the department.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major including CHEM3241, and CHEM3341, and CHEM3441, and CHEM3541. This capstone course is for Chemistry Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 2nd sem Offer in 2020 - 2021 : Y</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Show an extensive comprehension of the research project. Demonstrate very able analytical and critical thought with presence of some originality, illuminating utilization and critical analysis / evaluation of information acquired from a wide range of high quality sources. Critical employment of data and results to synthesize appropriate and illuminating conclusions. Demonstrate integration of a wide range of appropriate theories, principles, data and methods. Employ very effective organizational and presentational skills. (Work of A+ should demonstrate substantial additional work beyond that is required in wider areas relevant to the topic.)</td>
</tr>
<tr>
<td>B</td>
<td>Show a substantial comprehension of the research project. Demonstrate able analytical and critical thinking with use of relevant information from sources. Demonstrate ability to compose meaningful comparisons between different secondary interpretations. Correct utilization of data and results to form appropriate conclusions. Compose general integration of theories, principles, data and methods. Perform effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Show a general but incomplete comprehension of the research project. Presence of some analytical and critical thinking with use of relevant information from sources. Demonstrate ability to compose comparisons between different interpretations. Mainly correct but some incorrect utilization of data and results to form appropriate conclusions. Demonstrate some partial integration of theories, principles, data and methods. Perform moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Show a partial but limited comprehension, with knowledge of some relevant information, of the research project. Presence of some coherent and logical thinking, but with limited analytical and critical abilities. Show utilization and reference of several sources, but mostly via summary instead of by analysis and comparison. Limited ability to employ data and results to form appropriate conclusions. Demonstrate limited integration of theories, principles, data and methods. Perform limited or marginally effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Show little or no comprehension of the research project. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited employment of secondary sources and no critical comparison of them. Incorrectly utilize data and results and/or unable to form appropriate conclusions. Demonstrate little or no integration of theories, principles, data and methods. Organization and presentational skills are of very limited use or ineffective.</td>
</tr>
<tr>
<td>Course Type</td>
<td>Project-based course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>12 hrs tutorials; 46 hrs of workshops and 100 hrs reading/self study</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td></td>
</tr>
<tr>
<td>Methods</td>
<td>Details</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>50</td>
</tr>
<tr>
<td>Research report</td>
<td>50</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>Reading materials will be assigned depending on the project.</td>
</tr>
<tr>
<td>Additional Course Information</td>
<td>Satisfactory completion of this course will be counted towards the Capstone requirement.</td>
</tr>
</tbody>
</table>

### CHEM4911
**Capstone experience for chemistry undergraduates: HKUtopia (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr A P L Tong, Chemistry (<a href="mailto:apltong@hku.hk">apltong@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Various teachers in the Department, Chemistry</td>
</tr>
</tbody>
</table>

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### Department of Chemistry
This project-based course with the theme of Chemistry for a Better Living in a Foreseeable Future aims to provide students with a capstone experience. It aims to enable the world is facing with that have to be solved by chemistry and related technology. Students will need to apply what they have learnt in classroom and conduct literature search regarding advanced chemistry research and related technology under development to solve the problems identified in their project using various channels.

Course Contents

- No formal teaching. It is expected that students are actively engaged and should devote 120-140 hours to working on this project.
- Students will work in groups of two or three, under the supervision of the course coordinator. The duration of the project will be two to three months. The time of running this project-based course is in the summer (May - August).

Course Learning Objectives

On successful completion of this course, students should be able to:
- CLO 1 observe and evaluate the various ways we are facing with and determine in which ways chemistry can be used to solve the problems.
- CLO 2 integrate theory and practice, and understand the limitations of their current knowledge.
- CLO 3 work in a team and to collaborate with people with different background.
- CLO 4 express scientific ideas effectively in both written and oral forms.
- CLO 5 develop further logical, critical thinking and creativity.
- CLO 6 advocate to others the appreciation for chemistry as to its relevance to our daily life.

Pre-requisites

Students are expected to have satisfactorily completed all introductory chemistry disciplinary core courses and at least 24 credits of advanced level disciplinary core/elective chemistry courses in the Chemistry Major. Students who are interested in taking the course should contact the course coordinator for application in April - May. Late application may not be considered.

This capstone course is for Chemistry Major students only.

The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Summer Offer in 2020</td>
<td>No Exam</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Methods Details

<table>
<thead>
<tr>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>40%</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

No specific list of textbooks and references. Students are encouraged to obtain information via various channels (main library, e-journals, internet, and discussions with classmates and teachers, etc.).

Additional Course Information

Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

CHEM4966

Chemistry internship (6 credits)

Offering Department: Chemistry

Teachers Involved: Dr H Y Au-Yeung, Chemistry (hoyuay@hku.hk)

Course Objectives

- Within the University: The student will be supervised by a staff member (Supervisor), working on a project or various tasks as instructed by the Supervisor.
- Outside the University: The student will work in an external agency related to the major of study. The student will be supervised under a staff member of the external agency (the External Supervisor) and a staff member of the Department/School of the student (the Internal Supervisor). The work to be performed by the student will normally be instructed by the External Supervisor, with prior agreement of the Internal Supervisor.

Course Learning Outcomes

On successful completion of this course, students should be able to:
- CLO 1 apply knowledge in their major study in solving practical problems in the work place
- CLO 2 gain first hand work experience in the industry related to their major study

Pre-requisites

Pass in at least 24 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major.

This capstone course is for Chemistry Major/ Chemistry Major (Intensive) students only.
The earliest that a student is allowed to take this capstone course is their year 3 study.

Grade Descriptors (Pass /Pass with distinction /Fail)

- **Pass**: Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of "Distinction".

- **Fail**: Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Internship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td></td>
</tr>
<tr>
<td>Internship work</td>
<td>It is expected that students are to work at least 160 hours (or the equivalent of 4 weeks full-time)</td>
</tr>
</tbody>
</table>

| Assessment Methods and Weighting | |
| Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
| Written report | written report, employer's feedback and oral presentation | 100 | CLO 1,2 |

Additional Course Information

Satisfactory completion of this course can be counted towards the Capstone requirement. Details of internship will be recorded on the student's transcript. This course will be assessed on "Pass/Fail" basis. Students who are interested to enrol in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

CHEM4999: Chemistry project (12 credits)

**Offering Department** Chemistry

**Course Co-ordinator** Dr J Y Tang, Chemistry (jinyao@hku.hk)

**Course Objectives**

- To provide experience of research techniques by working on a short project under the direct supervision of a member of staff. This course would prepare students for graduate school work in chemistry.

**Course Contents & Topics**

A short research project provided by a member of staff (e.g., the students supervisor).

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1**: Understand the terminology and nomenclature associated with their own research chemistry project
- **CLO 2**: Demonstrate knowledge and understanding of the chemical techniques they used to do the research in their own chemical project
- **CLO 3**: Demonstrate critical thinking skill in their own research project and understanding the motivation and target of the research
- **CLO 4**: Demonstrate knowledge and understanding of the results of their own chemistry project and its context in the broader research area
- **CLO 5**: Demonstrate ability to integrate the knowledge acquired from previous courses and develop fundamental knowledge of designing research plan

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in at least 24 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major including CHEM3241, and CHEM3341, and CHEM3441, and CHEM3541. This capstone course is for Chemistry Major/ Chemistry Major (Intensive) students only.

The earliest that a student is allowed to take this capstone course is their year 3 study.

**Course Type** Project-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading / Self study</td>
<td>8 hours per week for 24 weeks or longer discussions &amp; meetings</td>
<td>192</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

- **Methods**: Dissertation
  - Details: including a written report and an oral presentation
  - Weighting in final course grade (%): 100
  - Assessment Methods to CLO Mapping: CLO 1,2,3,4,5

**Required/recommended reading and online materials**

Specialist texts dependant on the selected topic.

**Additional Course Information**

Third year students with exceptional academic achievement may also apply for this course.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Offering Department</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC9001</td>
<td>Practical Chinese for science students (6 credits)</td>
<td>Chinese</td>
<td>2019</td>
<td>---</td>
</tr>
</tbody>
</table>

### Offering Department
Mr K W Wong, Chinese  
(kwwongb@hku.hk)

### Teachers Involved
- Dr C M Chan, Chinese
- Dr K T Lam, Chinese
- Dr S F Lee, Chinese
- Mr K W Wong, Chinese

### Course Objectives
This course aims to enhance the students' competence using Chinese for professional communication. It helps the students to master the techniques of writing different types of documents such as memos, emails, letters, announcements, notice, brochures, leaflets, and reports. In addition, topics addressing presentation and discussion techniques, the style and rhetoric of reader-based writings are included to heighten the students' linguistic sensitivity.

### Course Contents & Topics

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 develop a balanced competency in modern Chinese and write well-formed sentences
- CLO 2 employ rhetorical devices and stylistics, as well as practical writing skills specific to their discipline
- CLO 3 explore new tactics of communication, initiate discussions and debates and address new challenges
- CLO 4 apply their disciplinary knowledge and their Chinese writing skills and professional presentation techniques analytically, critically and creatively in different social or professional discourses

### Pre-requisites
NIL

### Offer in 2019 - 2020
Y 1st sem 2nd sem Offer in 2020 - 2021 : Y

### Grade Descriptors
(A+ to F)
- A: The student acquired a superb ability to achieve the intended learning outcomes of the course at all levels of learning: describe, apply, evaluate, and synthesize the language techniques for effective communication in all situations.
- B: The student acquired the ability to achieve the intended learning outcomes of the course at all levels of learning: describe, apply, evaluate, and synthesize the language techniques for effective communication in most situations.
- C: The student acquired adequate ability to achieve the intended learning outcomes of the course at low levels of learning (i.e. describe and apply the language techniques for effective communication) but not at high levels of learning (i.e. evaluate and synthesize the language techniques for effective communication).
- D: The student only has basic familiarity with the subject.
- Fail: The student has very limited familiarity with the subject.

### Course Type
Lecture-based course

### Course Teaching & Learning Activities
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Tutorials</td>
<td>Small group tutorials</td>
<td>12</td>
</tr>
<tr>
<td>Group work</td>
<td>Workshops</td>
<td>24</td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Reading/self study (20 hours) and preparation (12 hours)</td>
<td>32</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Self-access &amp; online exercises (40%) and Tutorial discussion (10%)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
- 汪麗炎, 1998年。《漢語修辭》。上海︰上海大學出版社。李家樹、謝耀基, 1994年。《漢語的特性和運用》。香港︰香港大學出版社。李家樹、謝耀基, 1994年。《現代商業傳意大全》。香港︰廣東經濟出版社。劉美森, 2001年。《新編公文寫作學》。成都︰四川人民出版社。黎運漢、李軍, 2001年。《商業語言》，台北︰台灣商務印書館。
### EASC1020
#### Introduction to climate science (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Earth Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr S H Li, Earth Sciences (<a href="mailto:zhliu@hku.hk">zhliu@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr Z H Liu, Earth Sciences)</td>
</tr>
<tr>
<td></td>
<td>(Dr Z H Liu, Earth Sciences)</td>
</tr>
</tbody>
</table>

#### Course Objectives
This course provides an introduction to the study of global climate systems and climate change. We study the controls of temporal and spatial variations in earth's climate and its histories of past climates preserved in the geological record. We look at modern research methods that are used in paleoclimatic and paleoenvironmental reconstructions.

#### Course Contents & Topics
Global climatic systems, climate classification, natural variability of climate, physical causes for changes through geologic time, external and internal forcing mechanisms, solar orbital variations, major climatic events of the past and their effects on how our planet has developed, glacial and interglacial oscillations, predicting future global change.

#### Course Learning Outcomes
On successful completion of this course, students should be able to:

- **CLO 1** identify major aspects of climatology and approaches to climatological study
- **CLO 2** explain the factors and physical processes controlling climate system
- **CLO 3** understand the driving forces of Earth's climate change
- **CLO 4** recognize the history of Earth's climate change

#### Pre-requisites (and Co-requisites and Impermissible combinations)
NIL

#### Offer in 2019 - 2020
- **Y** 2nd sem
- **Offer in 2020 - 2021 : Y**

#### Grade Descriptors
- **A** demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate critical use of data and results to draw appropriate and insightful conclusions. Show insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly.
- **B** demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate correct use of data and results to draw appropriate conclusions. Show critical use of relevant information from sources and ability to make meaningful comparisons between different interpretations and to quote/reference aptly.
- **C** demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Demonstrate mostly correct but some erroneous use of data and results to draw appropriate conclusions. Show use of relevant information from sources and ability to make comparisons between different interpretations and to quote/reference aptly.
- **D** demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent logic and critical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Demonstrate limited ability to use data and results to draw appropriate conclusions. Show use and reference of several sources, but mainly through summary rather than analysis and comparison.
- **Fail** demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Demonstrate misuse of data and results and/or unable to draw appropriate conclusions. Show limited use of secondary sources and no critical comparison of them.

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Project work</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>50</td>
<td>CLO 2,3</td>
</tr>
<tr>
<td>Essay</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

#### Course Type
Lecture-based course

#### Course Teaching & Learning Activities

#### Teachers Involved
- Robert V. Rohli and Anthony J. Vega: Climatology (Jones and Bartlett Publishers, 2008)

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### EASC1401
#### Blue Planet (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Earth Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr P Bach, Earth Sciences (<a href="mailto:pabach@hku.hk">pabach@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr P Bach, Earth Sciences)</td>
</tr>
</tbody>
</table>

#### Course Objectives
The aim is to provide those students who are taking a first course in Earth System Sciences with a fundamental knowledge of how our diverse and living planet Earth works with weaving together an understanding of the dynamic and interactive processes in the Earth's lithosphere, hydrosphere, biosphere and atmosphere. In addition, students should become familiar with the way the study of Earth Sciences blends observation, information, hypothesis, communication and decision making for a better understanding of the future of our planet.

#### Course Contents & Topics
The course will introduce and discuss the following topics:
- Introduction to Earth Systems and Habitable Planet Earth,
- Lithosphere (Earth Materials, Plate Tectonics, Volcanism, Earthquakes, Surface Processes and Rock Cycle)
- Hydrosphere (Surface- and Groundwater, Oceans and Water Cycle)
- Atmosphere (Composition, Weather, Climate, Green House Effect, Oxygen Cycle)

#### Course Learning Outcomes
On successful completion of this course, students should be able to:

- **CLO 1** understand the terminology and nomenclature appropriate to the introductory study of Earth Sciences
- **CLO 2** demonstrate knowledge and understanding of the underlying concepts associated with the study of the Earth Systems and their dynamic interactive processes
- **CLO 3** understand the extent and nature of global change and environmental concerns around us
- **CLO 4** demonstrate the ability to make and record observations on Earth Systems processes in natural field
Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>CLO 5 develop skills to synthesize observation and knowledge in a report in essay form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requisites and Impermissible combinations</td>
<td>NIL</td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 1st sem</td>
</tr>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery of extensive knowledge / competencies/skills at an Earth Science introductory level required for attaining most or all of the course learning outcomes. Shows clear understanding of introductory terminology and concepts and strong abilities to apply and relate them in a range of complex interactive processes between Earth Systems. Demonstrates highly effective observational skills in field as well as organizational skills to present important observations made and uses them to draw appropriate and insightful conclusions with an impressive level of detail and original thoughts.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of knowledge / competencies/skills at an Earth Science introductory level required for attaining most of the course learning outcomes. Shows evidence for understanding of introductory terminology and concepts and some abilities to apply and relate them in a range of complex interactive processes between Earth Systems. Demonstrates effective observational skills in field as well as organizational skills to present important observations made and uses them to draw appropriate and insightful conclusions with some level of depth.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge / competencies/skills at an Earth Science introductory level required for attaining most of the course learning outcomes. Shows evidence for some understanding of introductory terminology and concepts and some abilities to apply and relate them in some interactive processes between Earth Systems. Demonstrates moderately effective observational skills in field as well as organizational skills to present observations made mostly correct but with some erroneous use and results to draw appropriate conclusions.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge / competencies/skills at an Earth Science introductory level required for attaining some of the course learning outcomes. Shows evidence of limited understanding of introductory terminology and concepts and limited abilities to apply and relate them in some interactive processes between Earth Systems. Demonstrates limited observational skills in field. Applies incoherent organizational and poor presentational skills. Ineffective presentation of observed details and facts correctly. Limited ability to draw appropriate conclusions.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge / competencies/skills at an Earth Science introductory level required for attaining the course learning outcomes. Shows little or no evidence of understanding of introductory terminology and concepts and little or no abilities to apply and relate them in interactive processes between Earth Systems. Demonstrates poor observational skills in field. Applies incoherent organizational and poor presentational skills. Ineffective presentation of observed details and facts and unable to draw appropriate conclusions.</td>
</tr>
</tbody>
</table>

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Field work</td>
<td>Compulsory 2-day field camp</td>
<td>16</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>40</td>
<td>CLO 1.2,3</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>20</td>
<td>CLO 1.2,4</td>
<td></td>
</tr>
<tr>
<td>Project report</td>
<td>Field project report and field notebook</td>
<td>30</td>
<td>CLO 1.2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td>Online Quizzes</td>
<td>10</td>
<td>CLO 1.2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Murphy, B and Damian N.: Earth Science Today (1999)
Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>12 sessions x 2 hours</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>laboratory practical on rocks and minerals, earthquakes, fossil identification</td>
<td>16</td>
</tr>
<tr>
<td>Field work</td>
<td>1 field trip</td>
<td>8</td>
</tr>
<tr>
<td>Group work</td>
<td>1 group project with presentation</td>
<td>4</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>Practical/field reports</td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Project report</td>
<td>Presentation and report</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Tarbuck E.J. and Jungers F.K.: The Earth: An Introduction to Physical Geology (latest edition)

EASC1403

Geological heritage of Hong Kong (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Prof M F Zhou, Earth Sciences
Prof M F Zhou. Earth Sciences

Teachers Involved
Dr M C Cheung. Earth Sciences

Course Objectives
To give an overview of the geological heritage of Hong Kong, potential geological resources for tourism and the role of geology in the development of Hong Kong's infrastructure.

Course Contents & Topics
6 Lectures on general geology of Hong Kong, geology of Hong Kong's Country Parks, and aspects of geological knowledge pertaining to large scale construction project plus at least 4 weekend field trips (equivalent to a total of 32 hours) guided by experts to localities of geological interest.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 acquire an appreciation of the processes leading to the formation of various landforms
CLO 2 demonstrate understanding of the major morphological features in Hong Kong
CLO 3 enhance the observation and analytical skills, and physical ability through participation in the field excursion
CLO 4 understanding the different impacts on / importance of geological heritage of Hong Kong

Pre-requisites (and Co-requisites and Impermissible combinations)
NIL

Offer in 2019 - 2020
Grades Descriptors (A+ to F)

Years 2nd sem Offer in 2020 - 2021 Y Examination May

A Demonstrate thorough understanding at an advanced level of extensive knowledge and skills with evidence for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking. Evidence of original thoughts, excellent field observation and ability to solve problems. Highly effective organization and presentation skills.

B Demonstrate substantial understanding at an advanced level of extensive knowledge and skills with evidence for attaining all the course learning outcomes. Show analytical and critical abilities and logical thinking. Evidence of original thoughts and abilities of field observation. Effective organization and presentation skills.

C Demonstrate general but incomplete understanding required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking. Moderately effective organization and presentation skills.

D Demonstrate partial but limited understanding for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>6 sessions x 2 hours</td>
<td>12</td>
</tr>
<tr>
<td>Field work</td>
<td>4 field trips</td>
<td>32</td>
</tr>
<tr>
<td>Group work</td>
<td>1 presentation and report</td>
<td>20</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Assessment</td>
<td>1 essay</td>
<td>20</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>attendance of compulsory guided field trips</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Essay</td>
<td>1 individual essay</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written examination</td>
<td>50</td>
<td>CLO 1,2,4</td>
</tr>
<tr>
<td>Project report</td>
<td>1 group project</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

EASC1404

Early life on earth (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
TBC, Earth Sciences
This course focuses on the origins of life. It provides an overview of Earth’s early environments, how life is thought to have originated on Earth, and how the Earth’s dynamic environment impacted the origin of life. This course will also provide a basic overview of habitable environments on Earth and elsewhere in the Solar system.

This course will cover the following topics: the composition and properties of the early Earth and Earth’s first oceans; the central role of water in life; abundance of biological elements on the early Earth and elsewhere in the Solar system; possible conditions for the synthesis of life’s first building blocks; the (geo)chemical roots of early life on Earth and the search for life’s signatures in the solar system and beyond.

On successful completion of this course, students should be able to:

- CLO 1 describe the basic physical and chemical conditions on the early Earth
- CLO 2 explain and describe the role of water and extreme geochemical conditions in the synthesis of biological molecules
- CLO 3 understand the role that different geological environments played during the origins of life
- CLO 4 identify challenges associated with each step in the origins of life
- CLO 5 investigate a current origins of life topic

Student demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Shows strong analytical and critical abilities and logical thinking, with evidence of original thought, and the ability to apply his/her knowledge to a wide range of problems that center around “origins of life” topics, and at the same time, can combine knowledge from the natural sciences to better understand potential early Life processes on Earth and elsewhere. Student shows the ability to apply highly effective organizational and presentational skills.

Student demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Shows evidence of analytical and critical abilities and logical thinking, and apply his/her knowledge to a range of problems in the field of the “origins of life”, and at the same, is capable to combine knowledge from the natural sciences to better understand potential early Life processes on Earth and elsewhere. Student shows the ability to apply effective organizational and presentational skills.

Student demonstrates general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Shows evidence of some analytical and critical abilities and logical thinking, and ability to apply his/her knowledge to a range of problems in the field of the “origins of life”. Student shows the ability to apply moderately effective organizational and presentational skills.

Student demonstrates partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability understand key topics in the “origins of life” field. Student shows the ability to apply limited or barely effective organizational and presentational skills.

Student demonstrates little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Shows very little or no ability to apply knowledge to understand basic topics related to the origins of life. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities | Details | No. of Hours |
--- | --- | --- |
Lectures |  | 24 |
Laboratory | Reading / Self study | 24 |
| | 100 |

Assessment Methods and Weighting
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
--- | --- | --- | --- |
Assignments | 1 midterm, group presentations, short-essay | 60 |
Examination | 2-hour written examination | 40 |

Required/recommended reading and online materials
Sections from: Mason, S.F.: Chemical Evolution (Oxford University Press, 1991)
familiar situations. Apply moderately effective organizational and presentational skills.

**D**
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes.
Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

**Fail**
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
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</thead>
<tbody>
<tr>
<td>Course &amp; Learning Activities</td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
</tr>
<tr>
<td>Field work</td>
<td></td>
</tr>
<tr>
<td>Group work</td>
<td></td>
</tr>
<tr>
<td>Project work</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Group activities and reports</td>
<td>30</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour</td>
<td>50</td>
<td>CLO 1,2,4</td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td>Individual Report</td>
<td>20</td>
<td>CLO 1,3,4</td>
<td></td>
</tr>
</tbody>
</table>

| Required/recommended reading and online materials | To be announced |

**EASC1406**
**Offering Department** Earth Sciences
**Course Co-ordinator** Dr S Crowe, Earth Sciences (sacrowe@hku.hk)
**Course Objectives**
This course provides students with an introduction to the biosphere, including physical, chemical, geological and biological interpretations on the co-evolution of the biosphere, atmosphere, hydrosphere and geosphere through deep geological time, the current Earth-Life interactions with the influence of human beings and the future of the Human-Earth system.

**Course Contents & Topics**
A habitable planet; the carbon cycle; plate tectonics, climate and life; mountains and climate change; the emergence and persistence of life; life in the Phanerozoic; the Earth at extremes; the future of the Human-Earth system.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- **CLO 1** understand the coevolution of the inanimate world and the living world on Earth through deep geological time
- **CLO 2** explain why the Earth is a habitable planet
- **CLO 3** understand the biological process as an agent of the modern and past Earth system
- **CLO 4** demonstrate knowledge and understanding of the natural carbon cycle and the impacts of human activities
- **CLO 5** analyse qualitatively questions related to systematic structure and evolution of the Earth-life system

**Pre-requisites** (and Co-requisites and Impermissible combinations)
Pass in EASC1401

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 2nd sem Offer in 2020 - 2021: Y</td>
<td>Examination</td>
</tr>
</tbody>
</table>

**Grade Descriptors**

**A**
Demonstrate thorough and complete grasp of the subject in order to fulfi l most or all learning outcomes. Show clear understanding of the connections between the geosphere, hydrosphere and biosphere of the modern Earth and in the geological past. Able to understand the interactions between human beings and the nature only happens as the latest processes on Earth.

**B**
Demonstrate understanding at an advanced level of extensive knowledge and skills with evidence for attaining all the course learning outcomes. Show understanding of the connections between the geosphere, hydrosphere and biosphere of the modern Earth and in the geological past. Can demonstrate the interactions between human being and the nature only happen in the latest geological time.

**C**
Demonstrate general but incomplete understanding required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking. Moderately effective organization and presentation skills.

**D**
Demonstrate partial but limited understanding for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to solve problems. Apply limited or barely effective organizational and presentational skills.

**Fail**
Get no or little knowledge about the subject. No evidence for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Very little or no ability for solving problems. Poor organization and presentational skills.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course &amp; Learning Activities</td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>80</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>One in-class examination</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
</tbody>
</table>

| Required/recommended reading and online materials | C. Cockell, R. Corfield, N. Edwards and N. Harris: An Introduction to the Earth-Life System (Cambridge University Press, 2008) |

**EASC2401**
**Offering Department** Earth Sciences
**Course Co-ordinator** Dr K H Lemke, Earth Sciences (kono@hku.hk)
**Course Objectives**
Fluid/solid interactions in earth processes (6 credits)

**Course Contents & Topics**
Fluid/solid interactions in earth processes (6 credits)

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- **CLO 1** understand the coevolution of the inanimate world and the living world on Earth through deep geological time
- **CLO 2** explain why the Earth is a habitable planet
- **CLO 3** understand the biological process as an agent of the modern and past Earth system
- **CLO 4** demonstrate knowledge and understanding of the natural carbon cycle and the impacts of human activities
- **CLO 5** analyse qualitatively questions related to systematic structure and evolution of the Earth-life system

**Pre-requisites** (and Co-requisites and Impermissible combinations)
Pass in EASC1401

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 2nd sem Offer in 2020 - 2021: Y</td>
<td>Examination</td>
</tr>
</tbody>
</table>

**Grade Descriptors**

**A**
Demonstrate thorough and complete grasp of the subject in order to fulfi l most or all learning outcomes. Show clear understanding of the connections between the geosphere, hydrosphere and biosphere of the modern Earth and in the geological past. Able to understand the interactions between human beings and the nature only happens as the latest processes on Earth.

**B**
Demonstrate understanding at an advanced level of extensive knowledge and skills with evidence for attaining all the course learning outcomes. Show understanding of the connections between the geosphere, hydrosphere and biosphere of the modern Earth and in the geological past. Can demonstrate the interactions between human being and the nature only happen in the latest geological time.

**C**
Demonstrate general but incomplete understanding required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking. Moderately effective organization and presentation skills.

**D**
Demonstrate partial but limited understanding for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to solve problems. Apply limited or barely effective organizational and presentational skills.

**Fail**
Get no or little knowledge about the subject. No evidence for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Very little or no ability for solving problems. Poor organization and presentational skills.
Course Objectives
This course provides an overview of the physical and chemical principles that govern Earth processes.

Course Contents & Topics
- Earth in the laboratory, scaling time and space (1)
- Introduction to thermodynamics, and the concept of equilibrium (2)
- States of matter, phase diagrams - sublimation, condensation, crystallisation and melting (2)
- Mineral-solution interfaces (1)
- Energy exchange in Earth environments: convection, conduction and radiation (2)
- Kinetics, reaction rates and isotope fractionation on geological time scales (1)
- Newtonian mechanics and basic laws of motion (1)
- Fluid flow and particle transport (1)
- Gravitational, geostrophic and centripetal forces (1)

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand basic principles of equilibrium thermodynamics as applied to the Earth Sciences
CLO 2 use phase diagrams to explain processes of fluid/solid interactions, in particular systems containing melts and solids
CLO 3 describe how energy is exchanged throughout the Earth System,
CLO 4 demonstrate an understanding of principles governing isotope exchange reactions in single phase systems and across fluid/solid and fluid/gas interfaces.
CLO 5 comprehend the principles of motion and the basic forces affecting movement of gases, liquids and solids on Earth

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in EASC1401 or EASC1402

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors
(A+ to F)

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities
Details
No. of Hours
Lectures
12 sessions x 2 hour
24
Laboratory

Assessment Methods and Weighting
Methods
Details
Weighting in final course grade (%)
Assessment Methods to CLO Mapping
Project report
3 projects
45
CLO 1,2,3,4,5
Test
Two in-class examination (one for 15% and another one for 40%)
55
CLO 1,2,3,4,5

Required/recommended reading and online materials

EASC2402
Field and laboratory methods (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Dr J A King, Earth Sciences (jessking@hku.hk)

Teachers Involved
(Dr J A King,Earth Sciences)
(Dr M C Cheung,Earth Sciences)

Course Objectives
This course is hands-on field and laboratory-based that introduces basic geological and geomorphological field and mapping techniques and the use of geological equipment and air photographs, an overview of the geology and natural environment of Hong Kong.

Course Contents & Topics
- Maps and map reading, map reference system (lectures and class practice)
- Interpretation of geological and topographic maps: topographic and geological cross sections, geological structures from outcrop patterns and structural contour lines (horizontal, inclined strata, folded, and faulted strata, unconformities (lectures and class practice)
- Interpretation and use of air photographs (class practice)
- Field observation and description of rocks, outcrops (with fieldtrips in Hong Kong)
- Field observation and description of landscape units (with fieldtrips in Hong Kong)
- Laboratory equipment and techniques (lectures and lab sessions)

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 read geological maps and comprehend 3-D geological structures from 2-D geological maps
CLO 2 construct a geological cross section showing interpreted subsurface rocks and structures, and natural landscape units
CLO 3 demonstrate techniques for basic field observations, measurements and identifications
CLO 4 create and interpret an internally consistent geological and landscape maps from a set of collected field observations and data
CLO 5 develop skills in integrating geological field data in determining a geological and landscape history and writing a structured field report
CLO 6 understand to the basics of a series of laboratory techniques for geological and environmental studies

Department of Earth Sciences

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### EASC2404 Introduction to atmosphere and hydrosphere (6 credits)

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Course Teaching &amp; Learning Activities</th>
<th>Assessment Methods and Weighting</th>
<th>Required/recommended reading and online materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field camps</td>
<td>Lectures 12 sessions x 1 hour Field work 5-day field camp &amp; 2 day trips Laboratory work 12 hours paper exercises Reading / Self study</td>
<td>Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping</td>
<td>Comprehensive Course Notes provided. John Barnes: Basic Geological Mapping (Wiley, 1995, 3rd edition)</td>
</tr>
<tr>
<td>Field camps</td>
<td>Lectures 12 sessions x 1 hour Field work 5-day field camp &amp; 2 day trips Laboratory work 12 hours paper exercises Reading / Self study</td>
<td>Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping</td>
<td>Comprehensive Course Notes provided. John Barnes: Basic Geological Mapping (Wiley, 1995, 3rd edition)</td>
</tr>
</tbody>
</table>

#### Grade Descriptors (A to F)

- **A**: Thorough grasp of the subject; evidence of critical abilities and logical thinking; highly effective organizational and presentational skills; insightful use of critical analysis; evaluation of information drawn from a full range of high quality sources and to quote/reference aptly; integration of the full range of appropriate theories, principles, evidence and techniques.
- **B**: Substantial grasp of the subject; evidence of critical abilities and logical thinking; effective organizational and presentational skills; critical use of relevant information from sources; showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly; general integration of theories, principles, evidence and techniques.
- **C**: General but incomplete grasp of the subject; evidence of some critical abilities and logical thinking; moderately effective organizational and presentational skills; use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly; some partial integration of theories, principles, evidence and techniques.
- **D**: Limited grasp of the subject, retention of some relevant information of the subject; all learning outcomes of only a strong limited or barely effective organizational and presentational skills; use and reference of several sources, but mainly through summary rather than analysis and comparison; limited integration of theories, principles, evidence and techniques.
- **Fail**: Little or no grasp of the knowledge and understanding of critical thinking, coherent organization and poor presentational skills; limited use of secondary sources and no critical comparison of them; little or no inapt integration of theories, principles, evidence and techniques.

#### Offer in 2019 - 2020

- **Y**: 1st sem Offer in 2020 - 2021: **Y**

#### Offer in 2020 - 2021

- **Y**: 1st sem Offer in 2020 - 2021: **Y**

#### Examination

- **No Exam**
## Geochemistry (6 credits)

**Offering Department:** Earth Sciences  
**Course Co-ordinator:** Dr S H Li, Earth Sciences (shli@hku.hk)  
**Teachers Involved:** (Dr S H Li, Earth Sciences)

### Course Objectives
On successful completion of this course, students should be able to:
- Chemical weathering
- Oxidation and reduction,
- Stable isotope geochemistry,
- Radioactive isotope geochemistry,
- Chemical controls on soil formation,
- Chemistry of igneous rocks,
- Trace element,
- Chemistry of igneous rocks,
- Chemical controls on soil formation,
- Radioactive isotope geochemistry,
- Stable isotope geochemistry,
- Oxidation and reduction,
- Chemical weathering

### Course contents & topics
- Physical and chemical state of the earth,
- Differentiation of and cosmic abundance of elements,
- Aqueous solutions and chemistry of natural water,
- Trace element,
- Chemistry of igneous rocks,
- Chemical controls on soil formation,
- Radioactive isotope geochemistry,
- Stable isotope geochemistry,
- Oxidation and reduction,
- Chemical weathering

### Course Learning Outcomes
- Demonstrate an understanding of basic principles of geochemistry and their applications to geological studies
- Describe element distribution in major rocks
- Apply the principles of isotopes to dating and studies of petrogenesis and climate changes
- Demonstrate knowledge of the chemical weathering processes

### Pre-requisites
Pass in EASC1402

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Address</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assignments</strong></td>
<td>20</td>
<td>CLO 4.5</td>
<td></td>
</tr>
<tr>
<td><strong>Essay</strong></td>
<td>25</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td><strong>Examination</strong></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
<td>5</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
</tbody>
</table>

### Grade Descriptors

- **A**
  - Demonstrate extensive knowledge and skills at an advanced level required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply highly effective lab skills and techniques to solve problems. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

- **B**
  - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply effective lab skills and techniques to solve problems. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

- **C**
  - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply moderately effective lab skills and techniques to solve problems. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

- **D**
  - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities, and limited ability to apply partially effective lab skills and techniques to solve problems. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

- **Fail**
  - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking, and ability to apply minimally effective or ineffective lab skills and techniques to solve problems. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimal effective or ineffective.

### Required/recommended reading and online materials
- Walther J.V.: Essentials of Geochemistry (Jones and Bartlett Publishers 2005)

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## Mineralogy (6 credits)

**Offering Department:** Earth Sciences  
**Course Co-ordinator:** Oceanography, An Invitation to Marine Science

### Course Type
Lecture with laboratory component course

### Grading System

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate extensive knowledge and skills at an advanced level required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply highly effective lab skills and techniques to solve problems. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply effective lab skills and techniques to solve problems. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply moderately effective lab skills and techniques to solve problems. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities, and limited ability to apply partially effective lab skills and techniques to solve problems. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking, and ability to apply minimally effective or ineffective lab skills and techniques to solve problems. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimal effective or ineffective.</td>
</tr>
</tbody>
</table>

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Department of Earth Sciences
### Course Co-ordinator
Prof M Sun, Earth Sciences (minsun@hku.hk)

### Teachers Involved
(Prof M F Zhou, Earth Sciences)
(Prof M Sun, Earth Sciences)

### Course Objectives
To provide essential knowledge of mineralogy, to familiarize students with common minerals that are basis for study of petrography of igneous, sedimentary and metamorphic rocks.

### Course Contents & Topics
- Mineral crystalization, mineral chemistry
- Mineral symmetry, Miller indices
- Physical properties of minerals
- Mineral composition, structure and classification
- Identification of rock forming minerals-hand specimens
- Use of petrographic microscope
- Optical properties under plane polarized light
- Optical properties under orthoscopic illumination
- Optical properties under conoscopic illumination
- Identification of rock forming minerals in thin sections
- Chemical variations of minerals

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 describe the methods and systems used in classification of minerals
- CLO 2 apply the physical properties to identify rock-forming minerals
- CLO 3 describe the principle of optical mineralogy
- CLO 4 identify the common rock-forming minerals in hand specimens and thin sections

### Pre-requisites
Pass in EASC1402

### Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021: Y

### Assessment

<table>
<thead>
<tr>
<th>Grade Descriptors (A to F)</th>
<th>Weighting in final course grade (%)</th>
<th>Method</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>60</td>
<td>Examination</td>
<td>40</td>
<td>CLO 1.2,3,4</td>
</tr>
<tr>
<td>B</td>
<td>40</td>
<td>Assignments</td>
<td>60</td>
<td>CLO 1.2,3,4</td>
</tr>
<tr>
<td>C</td>
<td>24</td>
<td>Lectures</td>
<td>12 sessions x 2 hours</td>
<td>24</td>
</tr>
<tr>
<td>D</td>
<td>24</td>
<td>Laboratory</td>
<td>12 sessions x 2 hours</td>
<td>24</td>
</tr>
</tbody>
</table>

### Reading / Self study
100

### Assessment Methods
- Chemical variations of minerals
- Identification of rock forming minerals in thin sections
- Use of petrographic microscope
- Optical properties under plane polarized light
- Optical properties under orthoscopic illumination
- Optical properties under conoscopic illumination
- Identification of rock forming minerals in thin sections
- Chemical variations of minerals

### Course Type
Lecture with laboratory component course

### Course Contents & Topics
This course provides students with an introduction to the origin, evolution, structure, composition and distribution of matter in the Solar System condensed in the form of planets, satellites, comets, asteroids and rings, with particular emphasis on surface features, internal structures and histories from a geological point of view. The course incorporates the findings from recent space investigations, planetary imagery, remote sensing and Earth analogues to extraterrestrial features into a fascinating portrayal of the geological activities and histories in our Solar System. This course incorporates the findings from recent space investigations, planetary imagery, remote sensing and Earth analogues to extraterrestrial features into a fascinating portrayal of the geological activities and histories in our Solar System. For example, the terrestrial planets Mercury, Venus, the Earth-Moon system, and Mars; the giant planets Jupiter, Saturn, Uranus, and Neptune and their moons; Pluto, Charon and the Kuiper Belt; asteroids, meteorites, comets and the Oort cloud; Origin of our Solar System.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 describe the methods and systems used in classification of minerals
- CLO 2 apply the physical properties to identify rock-forming minerals
- CLO 3 describe the principle of optical mineralogy
- CLO 4 identify the common rock-forming minerals in hand specimens and thin sections

### Pre-requisites
Pass in EASC1401 or EASC1402 or PHYS1650

### Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021: Y

### Examination

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
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<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>A</td>
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<td>CLO 1.2,3,4</td>
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<tr>
<td>B</td>
<td></td>
<td></td>
<td>CLO 1.2,3,4</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td>CLO 1.2,3,4</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td>CLO 1.2,3,4</td>
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<tr>
<td>Fail</td>
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### Literature

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EASC2408

### Planetary geology (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Academic Year</th>
<th>Quota</th>
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<tbody>
<tr>
<td>Earth Sciences</td>
<td>2019</td>
<td>---</td>
</tr>
</tbody>
</table>

### Course Co-ordinator
Dr M H Lee, Earth Sciences (mhlee@hku.hk)

### Teachers Involved
(Dr M H Lee, Earth Sciences)

### Course Objectives
This course provides students with an introduction to the origin, evolution, structure, composition and distribution of matter in the Solar System condensed in the form of planets, satellites, comets, asteroids and rings, with particular emphasis on surface features, internal structures and histories from a geological point of view. The course incorporates the findings from recent space investigations, planetary imagery, remote sensing and Earth analogues to extraterrestrial features into a fascinating portrayal of the geological activities and histories in our Solar System.

### Course Contents & Topics
Formation, evolution, internal structure and surface processes of planetary bodies; the terrestrial planets Mercury, Venus, the Earth-Moon system, and Mars; the giant planets Jupiter, Saturn, Uranus, and Neptune and their moons; Pluto, Charon and the Kuiper Belt; asteroids, meteorites, comets and the Oort cloud; Origin of our Solar System.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 describe the basic features of our Solar System and its constituents
- CLO 2 explain how this knowledge is acquired through observations and experiments
- CLO 3 demonstrate knowledge and understanding of the key geological, physical and chemical processes governing the structure, formation and evolution of planetary bodies
- CLO 4 compare and contrast our own planet Earth with other planetary bodies

### Pre-requisites
Pass in EASC1401 or EASC1402 or PHYS1650

### Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021: Y

### Examination

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>CLO 1.2,3,4</td>
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<tr>
<td>B</td>
<td></td>
<td></td>
<td>CLO 1.2,3,4</td>
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<tr>
<td>Fail</td>
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<td></td>
<td>CLO 1.2,3,4</td>
</tr>
</tbody>
</table>

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721
Department of Earth Sciences

Regional field studies (6 credits)

Dr J R Ali, Earth Sciences

This course is field-based and introduces geology of China, Taiwan and/or regions in the vicinity of Hong Kong through hands on studies and field excursions.

Offering Department: Earth Sciences

Course Co-ordinator: Dr J R Ali, Earth Sciences (jrali@hku.hk)

Teachers Involved:
- Dr J R Ali (Japan Field Trip) in Sem 2, Earth Sciences
- Dr J R Ali (Taiwan Field Trip) in Sem 1, Earth Sciences
- Dr T Nakagawa (Japan Field Trip) in Sem 2, Earth Sciences

Course Objectives:
This course is field-based and introduces geology of China, Taiwan and/or regions in the vicinity of Hong Kong through hands on studies and field excursions. The course is compulsory for students doing the Geology (Intensive) major.

Course Contents & Topics:
The course will introduce the following topics:
- Geological studies in Southern China, Japan and/or Taiwan
- Geological history of S. China, Japan, and/or Taiwan
- Recognition of rock units and minerals in the field
- Field recognition and description of geological structures
- Stratigraphic measurements
- Field geology of active and passive margins, volcanic systems
- Engineering geology
- Management of geological hazards
- Basic geological mapping techniques

Course Learning Outcomes:
On successful completion of this course, students should be able to:
- CLO 1 demonstrate an advanced level of understanding of the geology of the study sites, ability to give a detailed account of the geological history of the study region, as well as strong ability to produce good-quality reports on independent field measurement techniques.
- CLO 2 demonstrate a satisfactory understanding of the geology of the study sites with evidence of efforts to unravel the geological history of the study region and acceptable level of competence in field measurement techniques.
- CLO 3 could only demonstrate an incomplete understanding of the geology of the study sites and some ability to make field observations and a basic knowledge on field measurement techniques.
- CLO 4 demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Pre-requisites (and Co-requisites and Impermissible combinations):
- Pass in EASC1401 or EASC1402; and consent of course coordinator

Offer in 2019 - 2020: Y

Offer in 2020 - 2021: Y

Examination: No Exam

Grade Descriptors (A+ to F):

A - Demonstrate thorough mastery of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:

Reading / Self study 20
Field work 14 days
Laboratory 12 sessions x 2 hours
Lectures 12 sessions x 2 hours

Grade Descriptors (A+ to F):

A - Demonstrate an advanced level of understanding of the geology of the study sites, ability to give a detailed account of the geological history of the study region, as well as strong ability to produce good-quality reports on independent field measurement techniques.

B - Demonstrate a satisfactory understanding of the geology of the study sites with evidence on efforts to unravel the geological history of the study region and acceptable level of competence in field measurement techniques.

C - Could only demonstrate an incomplete understanding of the geology of the study sites and some ability to make field observations and a basic knowledge on field measurement techniques.

D - Demonstrate limited understanding of the geology of the study sites and limited ability to apply field measurement techniques.

Fail - Show no or little knowledge of the geology of the study sites and lack of ability in making field observations and applying field measurement techniques.

Course Type:
Field camps

Grade Descriptors (A+ to F):

A - Demonstrate thorough mastery of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Report</td>
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<td>100</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:
Comprehensive course notes provided
## EASC2410: Data analysis and modeling in earth sciences (6 credits)

**Offering Department:** Earth Sciences  
**Academic Year:** 2019

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
<td>24</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
<td>24</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
<td>100</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
<td></td>
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**Pre-requisites:** Pass in EASC1401

**Offer in 2019 - 2020:** Y  
**2nd sem**  
**Offer in 2020 - 2021:** Y  
**Examination:** No Exam

## EASC3020: Global change: anthropogenic impacts (6 credits)

**Offering Department:** Earth Sciences  
**Academic Year:** 2019

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate critical use of data and results to draw appropriate and insightful conclusions. Show insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly.</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
<td></td>
</tr>
</tbody>
</table>
and some unfamiliar situations. Demonstrate correct use of data and results to draw appropriate conclusions. Show critical use of relevant information from sources and ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly.

C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar situations. Demonstrate mostly correct but some erroneous use of data and results to draw appropriate conclusions. Show use of relevant information from sources and ability to make comparisons between different interpretations and to quote/reference aptly.

D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Demonstrate limited ability to use data and results to draw appropriate conclusions. Show use and reference of several sources, but mainly through summary rather than analysis and comparison.

Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Demonstrate misuse of data and results and/or unable to draw appropriate conclusions. Show limited use of secondary sources and no critical comparison of them.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Assessment Methods and Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture-based course</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>36</td>
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<tr>
<td>Project work</td>
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<td>Tutorials</td>
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<td>Discussion</td>
<td>24</td>
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<tr>
<td>Reading / Self study</td>
<td>48</td>
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<table>
<thead>
<tr>
<th>Assessment Methods</th>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Essay</td>
<td>Coursework Assessment</td>
<td>25</td>
<td>CLO 1, 2, 4</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>50</td>
<td>CLO 1, 2, 4</td>
</tr>
<tr>
<td>Project report</td>
<td></td>
<td>25</td>
<td>CLO 2, 3, 4</td>
</tr>
</tbody>
</table>

**EASC3402** Petrology (6 credits)  
**Offering Department** Earth Sciences  
**Academic Year** 2019  
**Quota** ---

**Course Co-ordinator** Prof G Zhao, Earth Sciences (gzhao@hku.hk)

**Teachers Involved** (Dr M Pittman,Earth Sciences) (Prof G Zhao,Earth Sciences) (Prof M Sun,Earth Sciences)

**Course Objectives** To give students an understanding of the features in sedimentary, igneous and metamorphic rocks, as well as the ability to identify major rock types and their textures and structures in both hand specimens and under microscope.

**Course Contents & Topics**
- Magma and magmatism; textures and structures of igneous rocks, classification of igneous rocks, including volcanism and plutonism
- Basic igneous rocks
- Intermediate igneous rocks
- Acid igneous rocks
- Sedimentary diagenesis, classification of sedimentary rocks; textures and structures of sedimentary rocks.
- Clastic sedimentary rocks: conglomerate and sandstone, siltstone and mudstone
- Biochemical sedimentary rocks: limestone and dolostone
- Metamorphism; controlling factors of metamorphism; textures and structures of metamorphic rocks; classification of metamorphic rocks
- Meta-pelitic rocks
- Meta-basic rocks
- Meta-carbonate rocks and meta-felsic rocks

**Course Learning Outcomes** On successful completion of this course, students should be able to:

CLO 1 identify major igneous rocks and their textures and structures in both hand specimens and under microscope

CLO 2 identify major sedimentary rocks and their textures and structures in both hand specimens and under microscope

CLO 3 identify major metamorphic rocks and their textures and structures in both hand specimens and under microscope

CLO 4 make full description and write report on the above rock types

**Pre-requisites (and Co-requisites and Impermissible combinations)** Pass in EASC2407

**Offer in 2019 - 2020** Y 2nd sem  
**Offer in 2020 - 2021** Y

**Grade Descriptors (A+ to F)**

**Course Type** Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>12 sessions x 2 hours</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>specimen descriptions &amp; thin-section observations under microscope</td>
<td>24</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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**Assessment Methods**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>and Weighting</td>
<td>course grade (%)</td>
<td>Methods to CLO Mapping</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Assignments</td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

### EASC3403
**Sedimentary environments (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Earth Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr N R McKenzie, Earth Sciences (<a href="mailto:ryan00@hku.hk">ryan00@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr J King, Earth Sciences)</td>
</tr>
<tr>
<td></td>
<td>(Dr N R McKenzie, Earth Sciences)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course discusses the origin, diagenesis, classification and economic importance of sedimentary rocks. Students will learn features and processes of sedimentary geology, paleontology and depositional processes.</td>
</tr>
</tbody>
</table>
| Course Contents & Topics | - Overview of sedimentary geology  
- Physics of erosion, transportation and sedimentation  
- Sedimentary structures  
- Depositional environments (non-marine)  
- Depositional environments (marine)  
- Sequence stratigraphy  
- Basin analysis  
- Sedimentary environment around Hong Kong  
- Sedimentary environment on Mars |
| Course Learning Outcomes | On successful completion of this course, students should be able to:  
CLO 1: describe the nature and significance of sedimentary features and structures  
CLO 2: identify carbonate and siliciclastic rocks in hand sample  
CLO 3: describe the facies in a depositional environment  
CLO 4: undertake detailed study of a stratigraphic section in the field  
CLO 5: conduct basic observations and interpretations from outcrops |
| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in EASC2402 or EASC3402 |
| Offer in 2019 - 2020 | Y 2nd sem Offer in 2020 - 2021 : Y |
| Grade Descriptors (A+ to F) | A: Demonstrate thorough grasp of the subject. Show strong analytical abilities and logical thinking. Apply highly effective lab/fieldwork skills and techniques. Apply highly effective organizational and presentational skills.  
B: Demonstrate substantial grasp of the subject. Show strong analytical abilities and logical thinking. Apply effective lab/fieldwork skills and techniques. Apply highly effective organizational and presentational skills.  
C: Demonstrate general but incomplete grasp of the subject. Show some analytical abilities and logical thinking. Apply moderately effective lab/fieldwork skills and techniques. Apply moderately effective organizational and presentational skills.  
D: Demonstrate partial but limited grasp of the subject. Show some analytical abilities and logical thinking. Apply partially effective lab/fieldwork skills and techniques. Apply limited or barely effective organizational and presentational skills.  
Fail: Demonstrate little or no grasp of the subject. Evidence of little or lack of analytical abilities and logical thinking. Apply minimally effective lab/fieldwork skills and techniques. Organization and presentational skills are ineffective. |
| Course Type | Lecture with laboratory component course |
| Course Teaching & Learning Activities | Activities | Details | No. of Hours |
| Lectures | 12 sessions x 2 hours | 24 |
| Laboratory | 6 sessions x 2 hours | 12 |
| Field work | 1 day trip with field project | 8 |
| Project work | Examples for sedimentary environments | 12 |
| Reading / Self study | | 90 |
| Assessment Methods and Weighting | Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
| Examination | | | 40 | CLO 1,2,3,4 |
| Laboratory reports | Labs and Field Exercise | | 30 | CLO 1,2,3,4,5 |
| Presentation | | | 10 | CLO 3 |
| Test | Mid-term examination | | 20 | CLO 1,2,3 |
| Required/recommended reading and online materials | Sedimentology and Stratigraphy (Second Edition), Gary Nichols |

### EASC3404
**Structural geology (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Earth Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr J R Ali, Earth Sciences (<a href="mailto:jrali@hku.hk">jrali@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr A A G Webb, Earth Sciences)</td>
</tr>
<tr>
<td></td>
<td>(Dr J R Ali, Earth Sciences)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>Structural Geology is the study of rock deformation. Participants in this course will learn about the geometries, kinematics, and mechanics of rock deformation, and how to answer structural geology questions. The course will involve heavy use and generation of geological maps and cross sections and explore their utility for interpreting structure.</td>
</tr>
</tbody>
</table>
| Course Contents & Topics | Class-room based: lecture and laboratory  
- Introduction: basics on stress, strain, stress-strain relation  
- Stress  
- Stereonets  
- Deformation mechanisms  
- Strain  
- Joints |
Environmental remote sensing (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Dr J Michalski, Earth Sciences (jmmich@hku.hk)

Teachers Involved
Dr J Michalski, Earth Sciences
Dr J Wu, Biological Sciences

Course Objectives
Familiarity with remote sensing data is an essential skill for the modern day geoscientist and environmental scientist. This course will teach you not only about the fundamentals of remote sensing, but also practical skills such as: 1) how to obtain remote sensing data, 2) how to process, correct and interpret images, 3) how to apply results to scientific problems, 4) how to report on your results, 5) how to use cutting edge software, and 6) how to represent your new skills on your CV.

Course Contents & Topics
1. Explanation of the fundamentals of remote sensing
2. Description of key remote sensing platforms, sensors and their purposes.
3. How to obtain data of sites on Earth and other planets.
4. How to process, analyse and correct remote sensing data.
5. How to interpret remote sensing data.
6. How to use software for remote sensing. You will be an expert in highly employable skills if you work hard.
8. How to apply remote sensing to modern problems in geoscience, climate science, planetary science, and your...
Reconstruction of past climate (6 credits)

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 demonstrate knowledge of how remotely sensed data are acquired
CLO 2 comprehend the basic techniques of image processing
CLO 3 handle remotely sensed data within geographic information systems
CLO 4 understand how remotely sensed be used for environmental assessment
CLO 5 evaluate and interpret remotely sensed data
CLO 6 present and discuss results

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in EASC2404 or EASC2406 or EASC2407 or ENVS2002

Offer in 2019 - 2020

Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors

(A+ to F)

A Demonstrate thorough mastery of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Correct use of data and results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities, and limited ability to apply knowledge to solve problems. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show little or no ability to apply knowledge to solve problems. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Lab exercises 25 CLO 1,2,3,4,5,6
Laboratory reports 25 CLO 1,2,3,4,5,6
Test 50 CLO 1,2,3,4,5,6

Assessment Methods and Weighting

Lectures 24
Laboratory 24
Project work 12
Reading / Self study 100

Required/recommended reading and online materials

Remote Sensing: Principles and Applications (3rd edition)
Author(s) : Floyd F. Sabins
Publisher : Waveland Press
Edition : 3rd
Print ISBN : 9781577665076, 1577665074
eText ISBN : 9781478618171.0

If you sign up for the course, plan on buying the book. The e-version is inexpensive. You will be expected to know the material from the book.

Course Website
http://www.clays.space

Additional Course Information

You can learn more by visiting the website http://www.clays.space

EASC3406 Reconstruction of past climate (6 credits) Academic Year 2019
Offering Department Earth Sciences Quota ---
Course Co-ordinator Dr S H Li, Earth Sciences (shli@hku.hk)
Teachers Involved (Dr S H Li, Earth Sciences)
Course Objectives

This course provides students with an understanding of how dynamic earth is and how it has changed over the last 2.6 million years. This course introduces the theory and methods of climate reconstructions.

Course Contents & Topics

The Quaternary period (1),
Climate changes in the last 2.6 million years (1),
Driven forces of climate change (1),
Quantitative reconstruction methods (1),
Pollen analysis and biological proxies (2),
Climate change in arid regions (1),
Quaternary geochronology (1),
Climate changes in East Asia (1),
Climate change impacts on human evolution and society (1),
Global warming and future climate change (1),
Climate change in Asia and Europe

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand the earth climate change during last 2.6 million years
CLO 2 understand the driving forces of climate changes in different scales
CLO 3 learn the methods for palaeo-environment reconstruction
CLO 4 understand the impacts of climate changes
CLO 5 synthesize and interpret data sets of climate change proxies
### Course Details

**Course Code:** EASC3408  
**Title:** Geophysics (6 credits)  
**Offering Department:** Earth Sciences  
**Academic Year:** 2019  
**Quota:** ---  
**Pre-requisites (and Co-requisites and Impermissible combinations):** Pass in EASC2401

#### Course Objectives
An overview of the geophysical characteristics and processes of the solid earth and a survey of the various geophysical disciplines, including seismology, gravity, geothermometry, geomagnetism, as well as exploration geophysical methods for studying the earth's interior and near subsurface structure.

#### Course Contents & Topics
- Gravity and gravity anomalies
- Isostasy and Geodesy
- Geomagnetism
- Paleomagnetism and rock magnetism
- Thermal Properties of the Earth
- Seismology

#### Course Learning Outcomes
On successful completion of this course, students should be able to:

- **CLO 1** describe the approaches and methods geophysicists use to study the interior of the earth
- **CLO 2** apply basic techniques in measurements of earthquakes and interpret a seismogram
- **CLO 3** describe the procedure to determine gravity anomalies and their interpretation
- **CLO 4** understand the methods of paleomagnetism and describe the processes of rock magnetisation
- **CLO 5** describe how density, pressure and temperature of the earth's interior are determined

#### Assessment Methods and Weighting
- **Assignments:** 50%  
  Weighting in final course grade (%): 50
- **Essay:** 50%  
  Weighting in final course grade (%): 50

**Assessment Methods to CLO Mapping**

<table>
<thead>
<tr>
<th>CLO</th>
<th>Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
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<tr>
<td>2</td>
<td>B</td>
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<tr>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
</tr>
<tr>
<td>5</td>
<td>E</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
- W.F. Ruddiman: Earths climate: Past and future (Freeman, 2008, 2nd ed.)

**Additional Course Information**
Previous course code & title: EASC2131 A Cool World: Ice Ages and Climate Change
EASC3409  Igneous and metamorphic petrogenesis (6 credits)  Academic Year 2019
Offering Department Earth Sciences  Quota 30
Course Co-ordinator Prof M Sun, Earth Sciences (minsun@hku.hk)
(Prof G Zhao,Earth Sciences)  (Prof M Sun,Earth Sciences)
Teachers Involved
Course Objectives To provide a comprehensive coverage of the principles and techniques used in the study of petrogenesis of igneous and metamorphic rocks and their cause-and-effect relationships with tectonic settings and crustal evolution.
Course Contents & Topics
- Magma generation: physicochemical conditions and tectonic settings.
- Application of trace elements and isotopes to the study of magma genesis
- Basaltic magmatism and mantle characteristics
- Granitic magma and crustal characteristics
- Magmatism at convergent boundaries
- Magmatism and crustal growth
- Types of metamorphism
- Chemical equilibrium/disequilibrium in metamorphism; metamorphic phase diagrams (ACF, A'KF, AFM, etc)
- Metamorphic processes and reactions
- Metamorphic petrogenesis and evolution of pelitic rocks
- Metamorphic petrogenesis and evolution of mafic rocks
- Metamorphism in different tectonic settings; metamorphic pressure-temperature-time (P-T-t) paths and their tectonic implications.
Course Learning Outcomes On successful completion of this course, students should be able to:
CLO 1 use rock associations, textures, structures and geochemical characteristics to infer the petrogenesis of major igneous rocks
CLO 2 use magmatic rocks to study the mantle and crustal characteristics
CLO 3 apply mineral assemblages, microtextures, mineral reaction relationships and metamorphic P-T paths to infer the tectonothermal evolution of metamorphic rocks
CLO 4 demonstrate knowledge and understanding of magmatic and metamorphic processes and their cause-and-effect relationships with tectonic settings and crustal evolution
Pre-requisites (and Co-requisites and Impermissible combinations) Pass in EASC3402
Offer in 2019 - 2020 Y 2nd sem Offer in 2020 - 2021 : Y Examination May
Grade Descriptors (A+ to F)
A  Demonstrate extensive knowledge and skills at an advanced level required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply highly effective lab skills and techniques to solve problems. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply effective lab skills and techniques to solve problems. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.
C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply moderately effective lab skills and techniques to solve problems. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities, and limited ability to apply partially effective lab skills and techniques to solve problems. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.
Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking, and ability to apply minimally effective or ineffective lab skills and techniques to solve problems. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.
Course Type Lecture with laboratory component course
Course Teaching & Learning Activities Activities Details No. of Hours
Lectures 24
Laboratory 24
Reading / Self study 100
Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 30 CLO 1,2,3,4
Examination 70 CLO 1,2,3,4
Required/recommended reading and online materials M.G. Best: Igneous and Metamorphic Petrology (Oxford Blackwell Science, 2003, 2nd ed.)
Additional Course Information John D Winter: An Introduction to Igneous and Metamorphic Petrology (Prentice Hall, 2001)
EASC3410  Hydrogeology (6 credits)  Academic Year 2019
Offering Department Earth Sciences  Quota 40
Course Co-ordinator Prof J J Jiao, Earth Sciences (jiao@hku.hk)
Teachers Involved (Prof J J Jiao,Earth Sciences)
Course Objectives This course aims to introduce some basic concepts and theories of groundwater flow with special reference to case studies in HK. It consists of three components: 1) fundamentals of groundwater physics; 2) well hydraulics and evaluation of groundwater as a resource; and 3) influence of groundwater on geotechnical and environmental engineering
Course Contents Hydrologic Cycle And water Budgets, Introduction to Hydrogeology (1 Week)
### Course Objectives
To provide students with knowledge about the classification of mineral deposits and their basic features; to understand the processes that lead to their formation; to gain hands-on experience with mining procedures. In addition, students should gain knowledge about the world-wide distributions of mineral and industrial resources.

### Course Contents & Topics
- Concepts in mineral deposits and mining industrial; exploration and mining methods; classification of mineral deposit, mineral deposit models, magmatic oxide and sulfide deposits, skarn deposits, porphyry deposits, volcanogenic massive sulfide deposits, coal, oil and gas, resource evaluation.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: understand the terminology and nomenclature in the mining industrial and mineral deposits
- CLO 2: understand factors that are key to the formation of metallic and industrial resources
- CLO 3: understand the controls of earth resources in a global scale
- CLO 4: methods of exploration and exploitation for mineral deposits

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in EASC2402 or EASC3402

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
</tbody>
</table>

### Grade Descriptors (A+ to F)

- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex practical problems. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to most practical problems. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to some practical problems. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve practical problems. Apply limited or barely effective organizational and presentational skills.
- F: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve practical problems. Organization and presentational skills are minimally effective or ineffective.

### Required/recommended reading and online materials
### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>2 hour lectures per week for 10 weeks</td>
<td>20</td>
</tr>
<tr>
<td>Laboratory</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Field work</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Field work</td>
<td>100</td>
</tr>
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</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>68.5</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>31.5</td>
<td>CLO 1, 2</td>
</tr>
</tbody>
</table>

### Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y

### Grade Descriptors (A+ to F)

- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge and skills to solve a wide range of complex, familiar and unfamiliar practical problems. Apply highly effective organizational and presentational skills.

- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge and skills to solve familiar and some unfamiliar practical problems. Apply effective organizational and presentational skills.

- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge and skills to solve most familiar, but not unfamiliar, practical problems. Apply moderately effective organizational and presentational skills.

- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge and skills to solve familiar practical problems. Apply limited or barely effective organizational and presentational skills.

- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge and skills to practical problems. Organization and presentational skills are minimally effective or ineffective.

### Course Learning Outcomes

- To present some of the concepts and skills of importance in the profession of Engineering Geology and illustrate their use by case histories.
- To provide a basic knowledge of soil and rock mechanics for those wishing to consider further studies on a career in engineering geology/geotechnics.

### Required/recommended reading and online materials


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### EASC3414

#### Offering Department
Earth Sciences

#### Academic Year
2019

#### Course Co-ordinator
Prof J J Jiao, Earth Sciences (jiao@hku.hk)

#### Teachers Involved
(Prof J J Jiao,Earth Sciences)

#### Course Objectives
To provide a basic knowledge of soil and rock mechanics for those wishing to consider further studies on a career in engineering geology/geotechnics.

#### Course Contents
Stress and strain; properties and classifications of soil and rock; clay minerals; pore pressure and effective stress;
## Course Contents & Topics

- **Course Learning Outcomes**
  - On successful completion of this course, students should be able to:
    - CLO 1: Understand basic concepts of stress and strain, pore pressure and effective stress, strength and failure criteria.
    - CLO 2: Understand basic properties and classifications of soil and rock.
    - CLO 3: Appreciate the process of rock deformation and soil consolidation.

- **Pre-requisites (and Co-requisites and Impermissible combinations)**
  - Pass in EASC3410, or already enrolled in this course.

- **Offer in 2019 - 2020**
  - Y 2nd sem Offer in 2020 - 2021 : Y Examination May

- **Grade Descriptors (A+ to F)**
  - A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking. Apply highly effective organizational and presentational skills.
  - B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking. Apply effective organizational and presentational skills.
  - C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking. Apply moderately effective organizational and presentational skills.
  - D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply limited or barely effective organizational and presentational skills.
  - Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Organization and presentational skills are minimally effective or ineffective.

- **Course Type**
  - Lecture-based course

- **Course Teaching & Learning Activities**
  - Activities: Details: No. of Hours
    - Lectures: 24
    - Laboratory: 24
    - Reading / Self study: 100

- **Assessment Methods and Weighting**
  - Methods: Details: Weighting in final course grade (%): Assessment to CLO Mapping
    - Assignments: 30 CLO 1,2,3
    - Examination: 70 CLO 1,2,3

- **Required/recommended reading and online materials**
  - R. F. Craig: Soil Mechanics (Chapman & Hall, 6th ed.)

## EASC3415 Meteorology (6 credits)

- **Offering Department**
  - Earth Sciences

- **Course Co-ordinator**
  - Dr Jed Kaplan, Earth Sciences (jkaplan@hku.hk)

- **Teachers Involved**
  - (Dr J Kaplan,Earth Sciences)
  - (Dr M H Lee,Earth Sciences)

- **Course Objectives**
  - This course provides students with a modern understanding of weather by examining at an advanced level the processes that govern atmospheric structure and behavior, weather elements, and weather systems.

- **Course Contents & Topics**
  - Energy budget, radiative forcing, and greenhouse effect; stability, convection, and lapse rates; equation of state and pressure; thermodynamic diagrams; weather charts; Forces, winds, and general circulation; Monsoons, air masses, and fronts; thunderstorms, mid-latitude cyclones, and tropical cyclones; basic equations of the atmosphere; weather forecasting.

- **Course Learning Outcomes**
  - On successful completion of this course, students should be able to:
    - CLO 1: Describe key aspects of weather phenomena.
    - CLO 2: Explain essential elements of atmospheric processes governing weather.
    - CLO 3: Apply physical principles to construct models for some basic aspects of weather.
    - CLO 4: Explain synoptic charts (weather maps).
    - CLO 5: Interpret Hong Kong weather (typhoons etc.)

- **Pre-requisites (and Co-requisites and Impermissible combinations)**
  - Pass in EASC2404

- **Offer in 2019 - 2020**
  - Y 1st sem Offer in 2020 - 2021 : Y Examination Dec

- **Grade Descriptors (A+ to F)**
  - A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate critical use of data and results to draw appropriate and insightful conclusions. Show insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly.
  - B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate correct use of data and results to draw appropriate conclusions. Show critical use of relevant information from sources and ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly.
  - C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate correct use of data and results to draw appropriate conclusions. Show critical use of relevant information from sources and ability to make comparisons between different interpretations and to quote/reference aptly.
  - D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Demonstrate limited ability to use data and results to draw appropriate conclusions. Show use and reference of several sources, but mainly through summary rather than analysis and comparison.
  - Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or none apt ability to apply knowledge to solve problems. Demonstrate misuse of data and results and/or unable to draw appropriate conclusions. Show limited use of secondary sources and no critical comparison of them.

- **Course Type**
  - Lecture-based course
### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Project work</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>48</td>
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</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>100</td>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1.2.4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

Roland B. Stull, Meteorology for Scientists and Engineers (Brooks/Cole, 2000).

### EASC3416

#### Advanced geochemistry and geochronology (6 credits)

**Offering Department**: Earth Sciences

**Course Co-ordinator**: Prof M F Zhou, Earth Sciences (mfzhou@hku.hk)

**Teachers Involved**

- Prof M F Zhou, Earth Sciences (mfzhou@hku.hk)

**Course Objectives**

To present key concepts of modern geochemistry and geochronology and their application to environmental and Earth science problems.

**Course Contents & Topics**

1. Principles of radiogenic isotopic dating and modern instruments
2. Zircon U-Pb isotopic dating and its application
3. Principles and techniques for dating mineral deposits
4. Introduction to Quaternary geochronology
5. Principle, development and applications of Luminescence dating

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge of concepts and ideas of modern geochemistry
- CLO 2 explain principles of radiogenic isotopic dating
- CLO 3 understand how modern analytical techniques are applied to dating earth materials
- CLO 4 understand how geochemical methods are applied to gain insight into process in environmental and Earth sciences

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in EASC2401 or EASC2406 or EASC2407

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Student demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Shows strong analytical and critical abilities and logical thinking, with evidence of original thought, and the ability to apply his/her knowledge to a wide range of problems in geochemistry, and at the same, can combine fundamental knowledge in geochemistry to understand the interactions among minerals, fluids and gases and how these processes impact fluxes of materials over geological time periods and on a global scale. Student shows the ability to apply highly effective organizational and presentational skills.</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Student demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and apply his/her knowledge to a range of problems in geochemistry, and at the same combine knowledge in geochemistry to understand material fluxes among minerals, fluids and gases over geological time periods and on a global scale. Student shows the ability to apply effective organizational and presentational skills.</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Student demonstrates general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply his/her knowledge to a range of problems in geochemistry and how interactions among minerals, fluids and gases impact material fluxes on a global scale. Student shows the ability to apply moderately effective organizational and presentational skills.</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Student demonstrates partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Shows limited ability to understand key topics in geochemistry and limited capability to transfer this knowledge to geological phenomena. Student shows the ability to apply limited or barely effective organizational and presentational skills.</td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>Student demonstrates little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Shows very little or no ability to apply knowledge to understand basic topics related to the geochemistry and the application of these principles to geological problems. Organization and presentational skills are minimally effective or ineffective.</td>
<td></td>
</tr>
</tbody>
</table>

**Course Type**

Lecture with laboratory component course

**Assessment Methods**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Project report</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### EASC3417

#### Earth through time (6 credits)

**Offering Department**: Earth Sciences

**Course Co-ordinator**: Dr S C Chang, Earth Sciences (sunchin@hku.hk)

**Teachers Involved**

- Dr N R McKenzie, Earth Sciences
- Dr S C Chang, Earth Sciences

**Course Objectives**

To understand basic topics related to the geochemistry and the application of these principles to geological problems. Organization and presentational skills are minimally effective or ineffective.
## Course Objectives
To introduce the concept of geological time and basic geological principles. To provide an understanding of the geologic record and the integration of Earth Systems and plate tectonics. To gain an appreciation of our place in the Universe, an understanding of the evolution of Earth and life on Earth through time.

## Course Contents & Topics
Geological time, the origin of life, fossils and diversification of life through time, Important events in Earth history such as Snowball Earth, the Cambrian explosion of life, the Permian/Triassic mass extinction, the Cretaceous Tertiary extinction event, the origins of humans

## Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 define basic geological principles
- CLO 2 explain critical geological relationships
- CLO 3 outline the history of the development of our planet
- CLO 4 interpret the geological record of evolution through time
- CLO 5 compare and contrast various hypotheses put forward to explain major events in Earth history
- CLO 6 describe major fossil groups

## Pre-requisites
Pass in EASC3403

### Grade Descriptors (A+ to F)
- **A** Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills. Attend all the laboratory classes; showing strong ability in experiments, data processing and analysis; presenting lab reports with accurate language and correct results.
- **B** Evidence of analytical and critical abilities and logical thinking. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills. Attend all the laboratory classes; showing ability in experiments, data processing and analysis; presenting lab reports with correct results.
- **C** Evidence of some analytical and critical abilities and logical thinking. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills. Attend most of the laboratory classes; showing ability in experiments, data processing and analysis; presenting lab reports with mostly correct results.
- **D** Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills. Attend >50% of the laboratory classes; showing ability in experiments, data processing and analysis; presenting lab reports with acceptable results.
- **F** Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective. Miss more than half of lab work; not able to turn laboratory reports; cannot properly use computer and software for data processing; the lab report fail to give correct result.

### Course Type
Lecture with laboratory component course

### Assessment Methods and Weighting
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>40</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
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<tr>
<td>Laboratory reports</td>
<td></td>
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<tr>
<td>Presentation</td>
<td>Group Presentation</td>
<td>20</td>
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<tr>
<td>Test</td>
<td>MCQ Test</td>
<td>20</td>
<td>CLO 2, 4, 5</td>
</tr>
</tbody>
</table>

### Course Objectives
To introduce the concept of geological time and basic geological principles. To provide an understanding of the geologic record and the integration of Earth Systems and plate tectonics. To gain an appreciation of our place in the Universe, an understanding of the evolution of Earth and life on Earth through time.

### Course Contents & Topics
Geological time, the origin of life, fossils and diversification of life through time, Important events in Earth history such as Snowball Earth, the Cambrian explosion of life, the Permian/Triassic mass extinction, the Cretaceous Tertiary extinction event, the origins of humans

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 Describe the tectonic geomorphological processes that shape landscapes
- CLO 2 Assess quantitatively uplift and erosion
- CLO 3 Demonstrate knowledge of weathering processes and relationship to climate
- CLO 4 Understand fundamental elemental cycles at Earth’s surface
- CLO 5 Apply methods and proxies for Earth surface process studies

### Pre-requisites
Pass in EASC2401 and EASC2402 OR Pass in ENVS2001

### Offer in 2019 - 2020
<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 1st sem</td>
<td>Offer in 2020 - 2021 : Y</td>
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</tbody>
</table>

### Grade Descriptors (A+ to F)
- **A** Demonstrate through mastery of the course material. Show strong ability for analytical, critical and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate highly effective organizational and presentational skills.
- **B** Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Limited ability to use data and results to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective. Miss more than half of lab work; not able to turn laboratory reports; cannot properly use computer and software for data processing; the lab report fail to give correct result.
- **C** Evidence of limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills. Attend >50% of the laboratory classes; showing ability in experiments, data processing and analysis; presenting lab reports with acceptable results.
- **D** Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective. Miss more than half of lab work; not able to turn laboratory reports; cannot properly use computer and software for data processing; the lab report fail to give correct result.
- **F** Evidence of limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills. Attend >50% of the laboratory classes; showing ability in experiments, data processing and analysis; presenting lab reports with acceptable results.

### Required/recommended reading and online materials
### Earth System Science Field Studies (6 credits)

**Offering Department**
Department of Earth Sciences

**Course Co-ordinator**
Dr Jed O. Kaplan, Earth Sciences

**Teachers Involved**
(Dr Jed O. Kaplan, Earth Sciences)
(Dr Nicole S. Khan, Earth Sciences)

**Course Objectives**

In this field-based course, students will study the structure and dynamic processes of coastal zones, mountain glaciers, desert and loess landforms. Students will learn basic methods of field observation and survey so as to find out the systematic links between the different components of the Earth system.

**Course Contents & Topics**

Dynamic interactions between the atmospheric, oceanic, and terrestrial parts of the coastal zones; structure and dynamics of mountain glaciers; structure, mineral composition, and the role of wind in the formation of deserts and loess landforms.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** describe interactions between the sea, atmosphere and terrestrial environments at the coastal zone
- **CLO 2** describe principal characteristics of mountain glaciers, deserts and loess
- **CLO 3** explain causes and dynamic processes of these environments
- **CLO 4** show knowledge and critical understanding of the systematic relationships between these environments
- **CLO 5** demonstrate capability in analyzing the sustainable development of the human-environmental relationships

**Pre-requisites**

Pass in one of the following 2000-level courses:
- EASC2402 or ENVS2001 or GEOG2137

Or upon special arrangement with the course coordinator

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>N</th>
<th>Offer in 2020 - 2021 : Y</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Examination ---</td>
</tr>
</tbody>
</table>

### Grade Descriptors (A+ to F)

- **A** Demonstrate thorough mastery at an advanced level of knowledge and skills required for a planned field investigation. Show strong analytical and critical abilities and logical thinking, with evidence of insights, and the ability to apply the knowledge to understand the interactions between the different components of the Earth system and human impact. Show high competence in integrating knowledge and presentation skills.
- **B** Demonstrates a substantial grasp of a wide range of knowledge and skills required for a planned field investigation. Show evidence of analytical and critical abilities and logical thinking, and apply the knowledge to analyze the Earth system structure. Can combine the field investigation and indoor analysis to understand the differences between the natural and human-impacted processes. Show competence in integrating knowledge and presentation skills.
- **C** Demonstrates a general but incomplete grasp of knowledge and skills required for a planned field investigation. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply the knowledge to analyze some Earth System problems and the difference in rates and processes between natural and human-impacted processes. Shows the ability to integrate the learned knowledge and presentation skills.
- **D** Demonstrates partial but limited command of knowledge and some skills required for attaining the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to understand key processes in Earth Systems and limited capability to link this knowledge to the other systems. Shows certain ability to apply limited or barely effective organizational and presentation skills.
- **Fail** Demonstrate little evidence of getting the knowledge and skills required for attaining the course learning outcomes. Lack of analytical abilities, logical and coherent thinking. Show little ability to apply knowledge to understand the basic processes in Earth systems. Show little ability to integrate the collected materials and minimally effective or ineffective presentation skills.

### Required/Recommended reading and online materials

- Required reading to be announced.
- Three-two hour pre-trip course meetings, including one film screening and discussion.
- Practical seminar with a documentary filmmaker.

### Additional Course Information

Starting on the eastern slope of the Rocky Mountains in the northwestern U.S.A., we will make a three-week transect to the Pacific coast, covering more than 3500 km, and visiting a range of landscapes from glaciated alpine terrain, to loess plateaus, to sand dunes and deserts, and to coastlines. The Pacific Northwest of the United States.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Field camps</th>
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<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>12 lectures @2 hours each</td>
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<td></td>
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<tr>
<td>Laboratory</td>
<td></td>
<td>18</td>
<td></td>
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<tr>
<td>Field work</td>
<td></td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>CLO 1,2,3,4</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>Labs &amp; Field work</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>Preparant of final video (in groups)</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
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<table>
<thead>
<tr>
<th>CLO Mapping</th>
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<th>2</th>
<th>3</th>
<th>4</th>
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<tr>
<td>Weighting</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>F</td>
<td></td>
</tr>
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</table>

| Assignments | Daily assessment | 33 | CLO 1,2,3 |
| Report       | Video project    | 34 | CLO 1,2,3,4,5 |
| Test         | Oral examination | 33 | CLO 1,2,3,4,5 |
EASC3999  Directed studies in earth sciences (6 credits)  
Offering Department: Earth Sciences  
Course Co-ordinator: Prof M Sun, Earth Sciences (minsun@hku.hk)  
Teachers Involved: (Various teachers in the Department, Earth Sciences)  
Course Objectives: To enhance the student's knowledge of a particular topic and the student's self-directed learning and critical thinking skills.  
Course Contents & Topics: The student undertakes a self-managed study on a topic in earth sciences under the supervision of a staff member. The topic is preferably one not sufficiently covered in the regular curriculum. The directed study can be a critical review or a synthesis of published work on the subject, or a laboratory or field study that would enhance the student's understanding of the subject. The project may not require an element of originality.  
Course Learning Outcomes: On successful completion of this course, students should be able to:  
- CLO 1 enhance the ability in self-learning, data-collection and analysis, critical thinking, doing independent research in earth sciences  
- CLO 2 write scientific dissertation, and conduct oral presentation of the research results  
Pre-requisites (and Co-requisites and Impermissible combinations): Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary/core/elective courses in the Geology or Earth System Science Majors; and Cumulative GPA of 2.5 or above. This course is not a capstone course and students cannot use this course to fulfill the capstone requirement of the Earth System Science and Geology Majors. The earliest that a student is allowed to take this course is their year 3 study.  
Offer in 2019 - 2020: Y Year long  
Grade Descriptors (A+ to F):  
- A: Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly. Critical use of data and results to draw insightful conclusions and solve problems. Apply highly effective organizational and presentional skills. [Work of A+ should show considerable creative thinking and additional work beyond that is required in wider areas relevant to the topic.]  
- B: Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly. Correct use of data of results to draw appropriate conclusions to draw insightful conclusions and solve problems. Apply effective organizational and presentation skills.  
- C: Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly. Correct use of data of results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.  
- D: Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.  
- F: Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical companions of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentional skills are minimally effective or ineffective.  

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Course Teaching &amp; Learning Activities</th>
<th>Grade Descriptors (A+ to F)</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project-based course</td>
<td>Activities Details</td>
<td>Reading / Self study The student is expected to spend at least 120 hours on the project</td>
<td>120</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods Details</td>
<td>Weighting in final course grade (%) Assessment Methods to CLO Mapping</td>
<td></td>
</tr>
<tr>
<td>Research report Report and presentation</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

EASC4403  Biogeochemical cycles (6 credits)  
Offering Department: Earth Sciences  
Course Co-ordinator: Dr Y Li, Earth Sciences (yiliang@hku.hk)  
Course Objectives: This course presents how the basic geochemistries of the Earth system, from atmosphere to the geosphere and to hydrosphere, have been and are being affected by the origin, evolution and existence of life. Human activities in particular, from the rapid consumption of resources to the destruction of the rainforests and the expansion of cities, are leading to rapid changes in the geochemistry of the Earth systems.  
Course Contents & Topics:  
1) Origin of elements, the Solar system and the Earth  
2) Geobiology and biogeochemical cycles: their role in the Earth system  
3) Terrestrial biogeochemical cycles  
4) Aquatic biogeochemical cycles  
5) Marine biogeochemical cycles  
6) Phosphorous cycle  
7) Sulfur cycle  
8) Carbon cycle  
9) Nitrogen cycle  
10) Biogeochemical cycles and impacts from human activities  
Course Learning Outcomes: On successful completion of this course, students should be able to:  
- CLO 1 describe the major geochemical cycles on Earth  
- CLO 2 illustrate the interactions between the geochemical cycles and the main environments on Earth  
- CLO 3 draw connections between changes to the Earth systems and the cause/effect relationships of changes to biogeochemical cycles  
- CLO 4 knows why the anthropogenic activities become a significant part of globe change  
Pre-requisites (and Co-requisites and Impermissible combinations): Pass in EASC3403 or EASC3416 or ENV53313
# Earth dynamics & global tectonics (6 credits)

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>Y</th>
<th>1st sem</th>
<th>Offer in 2020 - 2021</th>
<th>Y</th>
<th>Examination</th>
<th>Dec</th>
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</table>

**Course Type & Learning Activities**

- **Lecture-based course**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26</td>
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<tr>
<td>Tutorials</td>
<td>10</td>
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</tr>
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<td>Field work</td>
<td>8</td>
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<tr>
<td>Group work</td>
<td>PBL group work</td>
<td>10</td>
</tr>
<tr>
<td>Project work</td>
<td>Writing course thesis</td>
<td>30</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
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</table>

## Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
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<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Essay</td>
<td>60</td>
<td></td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>40</td>
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<td>CLO 1,2,3,4</td>
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</table>

## Course Learning Outcomes

To review the concepts and processes that shape the configuration of the Earth, from core to crust. This course is intended to provide students with an understanding of the driving forces of Earth processes and the global outcome of these processes through an examination of direct and indirect observations, the evolution of hypotheses, and critical thinking.

## Course Contents & Topics

- Plate tectonics; orogenesis; accretionary and collisional orogenesis.
- Mantle convection; hot spots and plumes.
- Methods of investigation of large scale structures and processes; structure and physical properties of the planet; sea floor spreading; ocean ridges; transform faults; subduction zones; mountain belts and orogenesis; formation of continental crust.
- Continental rifts and continental margins; sedimentary basins.
- Mechanism, consequence and implication of plate tectonics.
- Hadean Earth: accretion of the Earth from the solar nebula; differentiation of the Earth; formation of the initial atmosphere and oceans; the earliest felsic crust; late heavy bombardment.
- Archean cratons: greenstones and TTG gneisses; origin of komatites; role of mantle plumes in Archean crustal formation and evolution; when did plate tectonics start on Earth?
- Paleo-proterozoic collision tectonics.
- Supercrations in Earth history: the assembly, outgrowth and breakup of supercontinents Columbia (Nuna), Rodinia and Pangea.

## Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Y</th>
<th>2nd sem</th>
<th>Offer in 2020 - 2021</th>
<th>Y</th>
<th>Examination</th>
<th>May</th>
</tr>
</thead>
</table>

**Grade Descriptors (A+ to F)**

- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical activities and logical thinking.
- **B** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking.
- **C** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Apply moderately effective organizational and presentational skills. Show interest in the taught topics, and to answer most questions correctly.
- **D** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. She limited ability to apply knowledge to solve problems. Show some interest in the taught topics. Able to answer more than half of question correctly.
- **Fail** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Does not show positive attitude in learning; not able to answer most of questions.

## Course Type

Lecture-based course

## Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26</td>
<td></td>
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<tr>
<td>Tutorials</td>
<td>10</td>
<td></td>
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<tr>
<td>Field work</td>
<td>8</td>
<td></td>
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<tr>
<td>Group work</td>
<td>PBL group work</td>
<td>10</td>
</tr>
<tr>
<td>Project work</td>
<td>Writing course thesis</td>
<td>30</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td></td>
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</table>

## Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essay</td>
<td>60</td>
<td></td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>40</td>
<td></td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

## Course Objectives

- To review the concepts and processes that shape the configuration of the Earth, from core to crust. This course is intended to provide students with an understanding of the driving forces of Earth processes and the global outcome of these processes through an examination of direct and indirect observations, the evolution of hypotheses, and critical thinking.

## Course Contents & Topics

- Plate tectonics; orogenesis; accretionary and collisional orogenesis.
- Mantle convection; hot spots and plumes.
- Methods of investigation of large scale structures and processes; structure and physical properties of the planet; sea floor spreading; ocean ridges; transform faults; subduction zones; mountain belts and orogenesis; formation of continental crust.
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## Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Y</th>
<th>1st sem</th>
<th>Offer in 2020 - 2021</th>
<th>Y</th>
<th>Examination</th>
<th>Dec</th>
</tr>
</thead>
</table>

**Grade Descriptors (A+ to F)**

- **A** The student should show a thorough mastery of the knowledge and skills necessary to attain all of the course outcomes, have an in-depth grasp of the subject, and provide evidence of strong analytical and logical thinking, where possible with original thought. Show outstanding and effective organizational and presentation skills, and the insightful use of data, literature reviews and other sources to undertake a high level of critical analysis and draw appropriate conclusions. Be able to integrate the full range of appropriate theories, principles, and evidence.
- **B** The student should show a substantial knowledge of a significant range of the skills necessary for attaining most, if not all, of the course outcomes, and have a substantial grasp of the subject. Show evidence of the ability to think critically and to have effective organizational and presentational skills and make critical use of relevant information from different sources, showing the ability to make comparisons between different interpretations. Be capable of the general integration of theories, principles and evidence.
- **C** The student should have a general command of the knowledge, competencies and skills required for attaining the majority of the course outcomes, and a general grasp of the subject. Show some evidence of critical ability and logical thinking and moderately effective organizational and presentational skills. The student should be moderately effective in the use of data to draw appropriate conclusions, should be able to use relevant information from sources and able to make comparisons between different interpretations, through partial integration of theories, principles and evidence.
- **D** The student should have a partial but limited command of the knowledge, competencies and skills necessary for attaining a number of the course learning outcomes, and a limited grasp of the subject. Show evidence of some analytical competence and
**Course Type**
Lecture-based course

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>student seminars and exercises</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td>essay, presentation plus additional reading</td>
<td>20</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essay</td>
<td>Including essays and seminars</td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5</td>
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<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1, 2, 3, 4, 5</td>
<td></td>
<td></td>
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</tbody>
</table>

**Required/recommended reading and online materials**
Turcotte, D and Schubert, G. Geodynamics (Cambridge Univ Press, 2002, 2nd ed.)
Davies, Geoffrey F., Mantle convection for geologists (Cambridge 2011)

**Course Description**
This course explores regional geologies as well as the approaches that geologists use to resolve regional geological questions.

We will use case studies to explore how regional investigations integrating field-based and analytical research tools can test models for the evolution of large-scale geological systems. Likely case studies include exploration of various climate-tectonic interactions across mountain belts (Andes, Himalaya), the complex intraplate deformation of East Asia, and the progressive development of metamorphic core complexes via low-angle normal faults (N. America, NE China). Students will advance their abilities to synthesize and communicate geological knowledge by creating new Wikipedia pages complete with original figures on regional geological topics of their interest.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1 appreciate the influential (and commonly conflicting) models that have been proposed to explain a range of regional tectonic phenomena
- CLO 2 understand the various "tools" that are commonly used by geo-scientists to test and develop models for the evolution of tectonically complicated regions
- CLO 3 carry out an in-depth scientific literature review on a key regional geological issue and to present the findings via visual and written communication in an engaging, comprehensive online format

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in EASC3402; and (EASC3403 or EASC3404)

**Grade Descriptors**
- **A** Thorough grasp of the subject; evidence of strong critical abilities and logical thinking; highly effective organizational and presentational skills; insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly
- **B** Substantial grasp of the subject; evidence of critical abilities and logical thinking; effective organizational and presentational skills; critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly
- **C** General but incomplete grasp of the subject; evidence of some critical abilities and logical thinking; moderately effective organizational and presentational skills; use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly
- **D** Limited grasp of the subject, retention of some relevant information of the subject; evidence of limited critical abilities; limited or barely effective organizational and presentational skills; use and reference of several sources, but mainly through summary rather than analysis and comparison.
- **Fail** Little or no grasp of the knowledge and understanding of the subject; little or no evidence of critical abilities and logical / coherent thinking; insipient organization and poor presentational skills; limited use of secondary sources and no critical comparison of them.

**Course Objectives**
The overall aim of this special topic is to develop an advanced understanding of our planet's place within the wider universe, the origins of our planetary system, and geological processes in extreme extraterrestrial environments. Students will explore the concept of abiogenic chemical evolution and learn about various important biomarkers targeted for life detection in modern space exploration missions. The course also provides opportunities to study meteorites and their relationship to the origin of the Earth, solar system & universe, and survey planetary topics,
Course Contents & Topics
The course will cover the following aspects of planetary science. The following topics will be covered in lectures:
1. The interstellar medium
2. Star formation and the accretion of planets
3. Meteorites and comets
4. Impacts and craters
5. Evolution of other terrestrial planets
6. Prebiotic chemistry and the origins of life
7. Biosynthetic isotopic fractionations
8. Biomarker and molecular signatures
9. Symmetry-breaking mechanisms
10. Mass spectrometry for organic geochemists
11. Planetary mission concepts
12. Life detection on habitable planet and moons

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 identify various planetary materials in the Solar System and understand how they formed and evolve
CLO 2 understand how planetary events shaped the history of the Earth and the structure of our solar system
CLO 3 recognise and differentiate between the organic signatures of biotic and abiotic materials, and appreciate the use of particular chemical structures as molecular fossils to interpret past life based on understandings of extant life
CLO 4 evaluate contemporary theories on the origin of life and the formation of complex organic molecules in space and their delivery to planetary surfaces
CLO 5 use modern analytical techniques to reconstruct organic constituents in samples and interpret data generated from the latest planetary missions
CLO 6 nurture their interests and curiosity in the field of planetary science

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in any EASC3XXX or EASC4XXX course

Grade Descriptors
(A to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes, and evidence of productive reading supplementing lectures. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to synthesize and apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate critical use of data, literature reviews, and other sources to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to synthesize and apply knowledge to familiar and some unfamiliar situations, but falling short on excellence in some of these aspects. Demonstrate correct use of data, literature reviews, and other sources to draw appropriate conclusions. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to synthesize and apply knowledge to most familiar situations. Demonstrate mostly correct but some erroneous use of data, literature reviews, and other sources to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to synthesize and apply knowledge to solve problems. Demonstrate limited ability of data, literature reviews, and other sources to draw appropriate conclusions. Apply barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to synthesize and apply knowledge to solve problems. Demonstrate misuse of data, literature reviews, and other sources and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 12 sessions x 2 hours 24
Laboratory 6 sessions x 2 hours 12
Group work preparation + presentation 15
Tutorials 6 sessions x 2 hours 12
Reading / Self study 60
Assessment 15

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments group presentation CLO 1,2,3,4,5,6
Presentation Project report CLO 1,2,3,4,6
CLO 1,2,3,4,6

Required/recommended reading and online materials
In Quest of the Universe, Koupelis, 2012. ISBN: 9781449647940

Enrichment:
There are enormous opportunities to read further on the subjects presented - just ask for details.

EASC4911
Earth system: contemporary issues (6 credits)

Offering Department Earth Sciences
Course Co-ordinator Dr S C Chang, Earth Sciences (suchin@hku.hk)
Teachers Involved (Dr S C Chang, Earth Sciences)

Course Objectives
This is a capstone course that provides students with an opportunity to synthesize and correlate the knowledge gained in previous courses in Earth System Science for them to gain a more in-depth appreciation and awareness of the Earth System: the interplay between its component parts, and some of the global issues. Students will also get some basic concepts on how to do strategic analysis on global trends of natural resources.

Course Contents
The Earth as an integrated system.
& Topics
The interactions between Earth's component parts.
The evolution of Earth's global climates in deep time.
The Earth as a fine-tuning system.
Natural resource and managements.
Natural hazards and managements.
Bio-resources and Bioethics.
Global trend in oil and natural gas.
Global trend in mineral resources (non-metals, ferrous metals and rare earth elements).

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 comprehend in some depth the nature of the issues confronting humankind as part of the Earth System
CLO 2 understand the basis of interrelationships through feedback loops within the Earth System
CLO 3 synthesize scientific data available from a variety of sources and apply the data to problem solving, particularly in areas of contemporary concern
CLO 4 understand how past and present activities on the planet will affect its future

Pre-requisites
Pass in at least 24 credits of advanced level (level 3 or 4) discipline/core/elective courses in the Earth System Science Major including at least two of the following courses: EASC3410, EASC3415 or ENV3313.

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y Examination No Exam

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all of the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to synthesize and apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate critical use of data, literature reviews, and other sources to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to synthesize and apply knowledge to familiar and some unfamiliar situations. Demonstrate correct use of data, literature reviews, and other sources to draw appropriate conclusions. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to synthesize and apply knowledge to most familiar situations. Demonstrate mostly correct but some erroneous use of data, literature reviews, and other sources to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to synthesize and apply knowledge to solve problems. Demonstrate limited ability to use of data, literature reviews, and other sources to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to synthesize and apply knowledge to solve problems. Demonstrate misuse of data, literature reviews, and other sources and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods and Weighting

Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Oral presentation | 40 | CLO 1,2,3,4
Research report | 60 | CLO 1,2,3,4

Required/recommended reading and online materials


EASC4955

Integrated field studies (6 credits) | Academic Year | 2019
Offering Department | Earth Sciences
Quota | 35

Course Co-ordinator
Dr J A King, Earth Sciences (jessking@hku.hk)

Teachers Involved
(Prof J A G Webb,Earth Sciences)
(Prof J A King,Earth Sciences)
(Prof R McKenzie,Earth Sciences)

Course Objectives
The aims of a geological field camp activities are to provide:
1) essential training and experience in geological mapping techniques.
2) the opportunity to gain confidence in independently applying these skills to areas of structural and stratigraphic complexity.
3) opportunities to study at first-hand areas of particular geological interest and importance of an overseas locality.
The course requires integration of geological knowledge from multiple geological disciplines.

Course Contents & Topics
Students will visit areas of geological interest and will undertake independent and group mapping and problem solving exercises in each area. The curriculum comprised 3 x 6-day long projects (based on an ~2x5km area of interest), where each week long project is typically scheduled as follows:
Day 1-2: Instructor-lead learning.
Day 3-5: Technique application/independent field mapping and site visit.
Day 6: Field examination.
Day 7: Write up/Rest.

For each project area students is required to produce:
A detailed geologic map of the area. (15% x 3 = 45%)
A cross-section of the area. (5% x 3 = 15%)

To accompany these maps, the students must prepare ONE report (15%) - This field report should include the tectonic evolution of region, synthesized from the all three projects and site visits, complete with interpretations of...
Earth Sciences internship (6 credits)  

**Offering Department**: Earth Sciences  
**Course Co-ordinator**: Dr M C Cheung, Earth Sciences (hmcc@hku.hk)  
**Course Objectives**:  
(1) The student will be supervised by a staff member (Supervisor), working on a project or various tasks as instructed by the Supervisor.  
(2) Outside the university: The student will work in an external agency related to the major of study. The student will be supervised by an external staff member of the external agency (the External Supervisor) and a staff member of the Department/School of the student (the Internal Supervisor). The work to be performed by the student will normally be instructed by the External Supervisor, with prior agreement of the Internal Supervisor.  

**Course Contents & Topics**  
This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great benefits to the students to apply their knowledge gained in the study to the real work environments. Students have to take on at least 160 hours of internship work either within the University or outside the University arranged by the School/Departments.  

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:  
CLO 1 gain at least 4 weeks of work experience in a geosciences-related firm or the Government  
CLO 2 acquire an understanding and appreciation of the real work environment  
CLO 3 have some experience with applying learned knowledge to solving real world problems.  

**Pre-requisites (and Co-requisites and Immissible combinations)**  
This course is not a capstone course and students cannot use this course to fulfill the capstone requirement of the Earth System Science and Geology Majors.  

**Offer in 2019 - 2020**  
Y 2nd sem  Offer in 2020 - 2021: Y  

**Grade Descriptors (A+ to F)**  
**A** Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective work skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.  
**B** Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Apply effective work skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.  
**C** Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective work skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.  
**D** Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply partially effective work skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.  
**Fail** Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Apply minimally effective or ineffective work skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.  

**Weighting in final course grade (%)**  
**1st sem**  
CLO 1, 2, 3: 40%  
CLO 4, 5, 6: 20%  
CLO 7: 20%  
CLO 8: 20%  

**Assessment Methods to CLO Mapping**  
CLO 1: 15% Final Report (5%)  
CLO 2: 15% Mid-term examination  
CLO 3, 4: 15% Mid-term examination  
CLO 5, 6: 20% Final Report (5%)  

**Pass /Fail with distinction**  
Pass Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of “Distinction”.  
Fail Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned.  

**Assessment Methods**  
- Assignments Area Maps & Cross-sections (3 x 20% each)  
- Report Final Report (15%) + 10% for professional conduct  
- Test Field Test (5%)  

**Methods**  
- Assignments  
- Report  
- Test  

**Details**  
- Field work 18 field days x 5 hours/day 90  
- Lectures 18 sessions x 1 hour 18  
- Reading / Self study 90  

**No. of Hours**  
- 72  

**Course Learning Activities**  
- Field camps  
- Assessments  
- Additional Course Information  
- Course Coordinator reserve the right to withdraw any students with unsatisfactory performance in pre-requisite courses underway during the semester (semester 2) prior to leaving for field camp (May/June). This will be decided on satisfactory mid-term examination result or laboratory performance.  

**Course Contents & Topics**  
This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great benefits to the students to apply their knowledge gained in the study to the real work environments. Students have to take on at least 160 hours of internship work either within the University or outside the University arranged by the School/Departments.  

**Outcomes**  
- On successful completion of this course, students should be awarded 10% will be awarded for professional conduct.  
- This must include either a PASS in, or student must be already enrolled in EASC3403, EASC3404 or EASC3409.  
- This capstone course is for Geology Major/Geology Major (Intensive) students only.  
- The earliest that a student is allowed to take this course is their year 3 study.

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Examination</th>
<th>Offer in 2020 - 2021</th>
<th>Summer Offer in 2020 - 2021</th>
<th>Quota</th>
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</thead>
<tbody>
<tr>
<td>Pass</td>
<td>No Exam</td>
<td>Y</td>
<td>Y</td>
<td>---</td>
</tr>
</tbody>
</table>
Course Type
Internship

Course Teaching & Learning Activities
Activities | Details | No. of Hours
--- | --- | ---
Internship work | it is expected that students are to work at least 160 hours (or the equivalent of 4 weeks full-time) | 160

Assessment Methods and Weighting
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Written report | written report, employer’s feedback and oral presentation | 100 | CLO 1,2,3

Additional Course Information
This course will be assessed on "Pass/Fail" basis. Students who are interested to enrol in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

EASC4999
Earth sciences project (12 credits) | Academic Year | 2019
Offering Department | Earth Sciences
Teachers Involved | Various teachers in the Department, Earth Sciences
Course Objectives
To enhance the student’s knowledge, ability and interest in advanced studies in the Earth Sciences by providing the student with an opportunity to be engaged in an advanced research project.
Course Contents & Topics
The student undertakes a research project in the form of a senior thesis under the supervision of a staff member. The project could be based on a particular component of a staff member's research or one proposed and designed by the student. The student must involve in the project in a non-trivial manner, and play a major role in the project formulation, data collection and analysis, and presentation. The project should contain an element of originality.
Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 acquire first-hand research experience in earth sciences by doing an individual research project independently under the supervision of a supervisor
- CLO 2 select research topics, design research path, choose research technology, and more importantly use critical thinking
- CLO 3 enhance the ability in doing independent earth/environmental research with field/laboratory components
Pre-requisites and Impermissible combinations
Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in the Geology or Earth System Science Majors; and Cumulative GPA of 2.7 or above. This course is not a capstone course and students cannot use this course to fulfill the capstone requirement of the Earth System Science and Geology Majors. The earliest that a student is allowed to take this course is their year 3 study.
Offer in 2019 - 2020
Year long | Offer in 2020 - 2021 | Examination | No Exam
Grade Descriptors (A to F)
A | Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and creative thinking, with evidence of original thought. Insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly. Critical use of first-hand data and results to draw insightful conclusions and solve problems. Apply highly effective organizational and presentational skills. [Work of A+ should show considerable creative thinking and additional work beyond that is required in wider areas relevant to the topic.]
B | Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and creative thinking. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly. Correct use of first-hand data of results to draw appropriate conclusions to draw insightful conclusions and solve problems. Apply effective organizational and presentational skills.
C | Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and creative thinking. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly. Mostly correct but some erroneous use of first-hand data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
D | Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use first-hand data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.
Fail | Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of first-hand data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.
Course Type
Project-based course

Course Teaching & Learning Activities
Activities | Details | No. of Hours
--- | --- | ---
Reading / Self study | The student is expected to spend at least 240 hours on the project | 240

Assessment Methods and Weighting
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Dissertation | Dissertation and presentation | 100 | CLO 1,2,3

ENVS1401
Introduction to environmental science (6 credits) | Academic Year | 2019
Offering Department | Earth Sciences
Course Co-ordinator | Dr C Dingle, Biological Sciences (c dlgingle@hku.hk)
Teachers Involved | (Dr C Dingle, School of Biological Sciences) (Dr C Not, Earth Sciences)
Course Objectives
To provide students with an inter-disciplinary introduction to Environmental Science highlighting the interconnections between biological, geological, and chemical processes. To convey the basic science behind environmental interactions and place it within the context of human impacts and dependence on the natural world. To better understand how humans interact, manage, and sustain the environment within the context of our economies, governments and individual choices.
Course Contents & Topics
Part I: The basics: application of science to solve environmental problems; key ecological, chemical, and earth
Course Learning Outcomes

Science concepts essential to environmental science, understanding the underlying causes of environmental problems (human population growth and economics).
Part II: Using and conserving our resources: how we use and misuse key natural resources; the difficulty in assuring a sustainable supply of energy; waste management and air pollution issues.
Part III: Global issues: How do our actions change the face of the planet? Urban ecology and understanding our contribution to global climate change.

On successful completion of this course, students should be able to:

CLO 1 Explain and describe connections between the physical and biological components of the environment.
CLO 2 Discuss the impacts of human activities on the environment.
CLO 3 Explain the concept of environmental sustainability and give examples of how society can adapt behavior to achieve sustainability.
CLO 4 Understand how we are overusing our resources and compare different approaches to resolving specific problems presented in class.

Pre-requisites (and Co-requisites and Impermissible combinations)

NIL

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021: Y Examination Dec

Grade Descriptors (A+ to F)

A Demonstrate thorough understanding of the subject and an ability to apply knowledge gained in class to a wide range of complex, familiar and unfamiliar situations. Show evidence of logical thinking and some original thought. Coursework completed on time and to a high academic standard.
B Demonstrate a good understanding of the subject and an ability to apply knowledge to familiar and some unfamiliar situations. Show evidence of logical thinking abilities. Coursework completed on time and to a good academic standard.
C Demonstrate general but incomplete understanding of the subject and an ability to apply knowledge to most familiar situations. Show some evidence of logical thinking, but with some inconsistencies. Some coursework incomplete, but submitted on time and in an adequate academic standard.
D Demonstrate partial but limited grasp of the subject and a limited ability to apply knowledge to some familiar situations. Show only able to apply knowledge to simple examples. Show little evidence of logical thinking. Coursework submitted late to a poor standard.
Fail Demonstrate little or no understanding of the subject and very little or no ability to apply knowledge to familiar situations. Show no evidence of logical or coherent thinking. Coursework missing or substandard.

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures 24
Tutorials group discussion/case studies 24
Field work two half day field trips 10
Reading / Self study 100

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Group projects and independent work 40 CLO 1,2,3,4
Examination 40 CLO 1,2,3,4
Test 4 quizzes 20 CLO 1,2,3,4

Required/recommended reading and online materials

Keller and Botkin: Essential Environmental Science (Wiley, 2008)

ENVS2020 Biogeochemistry of the environment (6 credits)

Academic Year 2019
Offering Department Earth Sciences
Course Co-ordinator Prof Y Q Zong, Earth Sciences (yzong@hku.hk)
Teachers Involved Prof Y Q Zong, Earth Sciences
Course Objectives On successful completion of this course, students should be able to:

Offer in 2019 - 2020 N Offer in 2020 - 2021: N Examination ---

Grade Descriptors (A+ to F)

A
B
C
D
Fail

Course Type ---

Course Teaching & Learning Activities Activities Details No. of Hours
Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

ENVS3004 Environment, society and economics (6 credits)

Academic Year 2019
Offering Department Earth Sciences
Course Co-ordinator Prof Y Q Zong, Earth Sciences (yzong@hku.hk)
Teachers Involved Prof Y Q Zong, Earth Sciences
Course Objectives This course follows up issues highlighted in the introductory course and provides in-depth studies about rural and urban environments for students to examine the problems of resource scarcity and pollutant accumulation in the
natural environment, which are the problems human society is currently confronted. The course will focus on major environmental problems and explore how Environmental Economics can be applied for resource management and environmental restoration/protection. Students will analyze the nature of key natural resources such as land, air, water and biomass, and explore ways to improve resource management, protect the environment and develop sustainable economies.

### Course Contents & Topics

- **Valuing the environment**
- **Basic concepts of Environmetal Economics**
- **Resource management for land, air, water and biomass**
- **Management of waste**
- **Energy policies and economics**
- **Planning and regulations for a sustainable future**

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge and critical understanding of the complexity and interconnectedness between human society and the natural environment
- CLO 2 recognise appropriate use and misuse of natural resources
- CLO 3 assess economic solutions and policies for solving environmental problems

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in one of the following courses: CHEM2041, EASC2404, ENVS2001 or ENVS2002

### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2019 - 2020</th>
<th>Y 1st sem</th>
<th>Offer in 2020 - 2021</th>
<th>Y</th>
<th>Examination</th>
<th>Dec</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery of the course material. Show strong ability for analytical, critical and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations.</td>
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<tr>
<td>B</td>
<td>Demonstrate substantial command of the course material and an ability to apply knowledge to familiar and some unfamiliar situations. Show evidence of analytical, critical thought to some complex issues. Apply effective organizational and presentional skills.</td>
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<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of the course material and an ability to apply knowledge to most familiar situations. Show evidence of some critical and logical thinking abilities. Apply moderately effective organizational and presentional skills.</td>
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<tr>
<td>D</td>
<td>Demonstrate partial but limited command of the course material and a limited ability to apply knowledge to solve problems. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply limited or barely effective organizational and presentional skills.</td>
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<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of course material with very little or no ability to apply knowledge to solve problems. Lack of critical thinking abilities and incoherent thinking. Organization and presentation skills are minimally effective or ineffective.</td>
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### Course Type

Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>12 sessions of 2 hrs</td>
<td>24</td>
</tr>
<tr>
<td>Project work</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Discussion</td>
<td>Interactive learning</td>
<td>24</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

- Tietenberg and Lewis: Environmental economics and policy
- Keller and Botkin: Essential Environmental Science (John Wiley & Sons, 2008)
- Kaufmann and Cleveland: Environmental Science (Amazon, 2008)

### Additional Course Information

Previous course code: ENVS2004

Compulsory to 4-year students

### ENVS3007

**Natural hazards and mitigation (6 credits)**

**Offering Department**: Earth Sciences

**Quota**: ---

**Course Co-ordinator**: Dr N S KHAN, Earth Sciences (nkskhan@hku.hk)

**Teachers Involved**: (Dr T Nakagawa, Earth Sciences)

**Course Objectives**: This course introduces students the mechanisms of major natural hazards including earthquake, storm and flood, landslide and tsunami. The teaching emphasizes the fundamental concepts: natural hazards are not entirely natural, and understanding the frequency and processes of these hazards is essential in developing prevention, protection and mitigation measures. With case studies, the course will help students explore the political, economical and engineering means of dealing with natural hazards.

**Course Contents & Topics**: Key characteristics of natural hazards
- Geological hazards and mitigation measures
- Climatic hazards and mitigation measures
- Preparedness and responses to large natural disasters
- Risk assessment and disaster management
- Financial (insurance) instruments for economic recovery

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge and critical understanding of the key characteristics of major natural hazards, the human aspects of the hazards, and technologies used to protect lives and properties

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in EASC2404 or ENVS2001 or ENVS2002

**Offer in 2019 - 2020**: Y 1st sem

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2020 - 2021</th>
<th>Y</th>
<th>Examination</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery of the course material. Show strong ability for analytical, critical and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations.</td>
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<td></td>
<td></td>
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<tr>
<td>B</td>
<td>Demonstrate highly effective organizational and presentional skills.</td>
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</tbody>
</table>
ENVS3042 Pollution (6 credits)  Academic Year 2019
Offering Department Earth Sciences
Course Co-ordinator Dr B Thibodeau, Earth Sciences (bthib@hku.hk)
Teachers Involved (Dr B Thibodeau, Earth Sciences)
Course Objectives
This multi-disciplinary course will introduce students to the most important physical, chemical, and biological contaminants that pollute the environment. The course will provide the basics of contaminant transport, toxicology, pollution monitoring and environmental risk assessment. The course will also explore in details different mechanisms and pathways for water, atmosphere, soil and land pollution. The student will also be invited to reflect on the socio-economic aspect of pollution and remediation.
Course Contents & Topics
Overview of Global Pollution
Physical-Chemical Characteristic of Soils, water and the atmosphere
Physical, Chemical and Biological Contaminants
Contaminants Transport Processes
Environmental Toxicology
Water Pollution
Atmospheric Pollution
Soil, Land and subsurface Pollution
Urban and Household pollution
Monitoring and Risk Assessment Strategy
Introduction to remediation, restoration, treatment and reuse
Global system and the human dimensions to environmental pollution
Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 identify the most important pollutants
CLO 2 describe the mechanisms responsible for the transport of pollutants in the environment
CLO 3 evaluate the environmental toxicity of different type of contamination
CLO 4 present the most important cases of environmental pollution
CLO 5 analyze lab-generated data and communicate the results and interpretations
Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in EASC2401 or CHEM2241 or BIOL2103 or ENVS2001
Offer in 2019 - 2020 Y
1st sem Offer in 2020 - 2021 Y
Examination Dec
Grade Descriptors (A+ to F) A
Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
B
Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.
C
Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
D
Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.
Fail
Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.
Course Type Lecture-based course
Course Teaching & Learning Activities Activities Details No. of Hours
Lectures 24
Tutorials 8
Discussion Group discussion 16
Reading / Self study 100
Assessment Methods and Weighting Methods Details Weighing in final course grade (%) Assessment Methods to CLO Mapping
Project reports 40 CLO 1
Four in-class quizzes (20%) and one in-class final examination (40%) 60 CLO 1
Test
Assignments 30 CLO 1,2,3,5
Course Type Lecture-based course
Course Teaching & Learning Activities Activities Details No. of Hours
Lectures 24
Tutorials 24
Reading / Self study 92
Assessment Methods and Weighting Methods Details Weighing in final course grade (%) Assessment Methods to CLO Mapping
Assignments
Reading / Self study
Assignments
Department of Earth Sciences

ENVS3202 Modelling the environment (6 credits)

Offering Department: Earth Sciences

Course Description:

The tutorials include theoretical and practical assignments.

Course Objectives:

On successful completion of this course, students should be able to:

- CLO 1: Describe the major surface and deep currents of the ocean
- CLO 2: Identify and describe important processes in the ocean controlling large scale circulation and nutrient transport
- CLO 3: Describe sources and distribution of critical chemicals and sea water properties in the ocean
- CLO 4: Illustrate connections between physical ocean processes, climate systems and biological activity

Assessment Methods and Weighting:

- Examination: 40
- Project reports: 20

Grade Descriptors:

- A: Demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining the entire course learning outcomes. Show ability to think logically and critically, with evidence of original thought. Critically evaluate data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
- B: Demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of logical and critical thought. Apply effective organizational and presentational skills. Correctly use of data and results to draw appropriate conclusions.
- C: Demonstrates general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some logical and critical thinking. Apply moderately effective organizational and presentational skills. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.
- D: Demonstrates partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show some logical and critical thinking. Apply limited or barely effective organizational and presentational skills. Limited ability to use data and results to draw appropriate conclusions.
- F: Demonstrates little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of critical, logical and/or coherent thinking. Organization and presentational skills are minimally effective or ineffective. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type:

Lecture with laboratory component course

Course Teaching & Learning Activities:

- Lectures: 12 sessions x 2 hours
- Laboratory: 10 labs x 2 hours
- Field work: 1 day field trip

ENVS3313 Environmental oceanography (6 credits)

Offering Department: Earth Sciences

Required/recommended reading and online materials:

Environmental and Pollution Science, Third Edition, 2019 by Mark L. Brusseau (Author), Ian L. Pepper (Author), Charles P. Gerba (Author)

Course Objectives:

To provide a solid foundation of knowledge about the physical processes dictating the oceans movements and their impacts on the environment and ecosystems. The oceans take up 71% of earth's surface and contain 98% of the water. By looking at the structure of the atmosphere, thermodynamic principals and properties governing sea water, we will evaluate the critical roles the ocean plays in the environmental system including its influence on (paleo)climate, coastal resources, and nutrient cycling. Case studies specifically examining changes in sea level rise, El Nino, and (paleo)climate will be used to connect oceanographic principles to environmental problems.

Course Contents & Topics:

To provide students with a thorough introduction to coastal and ocean processes with key questions to highlight the importance of the oceanographic processes to environmental and ecological conditions. To convey the basic science behind ocean-atmosphere and ocean-biosphere interactions and place it within the context of human's connectedness and impact to the physical world.

Course Learning Outcomes:

On successful completion of this course, students should be able to:

- CLO 1: Describe the major surface and deep currents of the ocean
- CLO 2: Identify and describe important processes in the ocean controlling large scale circulation and nutrient transport
- CLO 3: Describe sources and distribution of critical chemicals and sea water properties in the ocean
- CLO 4: Illustrate connections between physical ocean processes, climate systems and biological activity

Pre-requisites (and Co-requisites and Impermissible combinations):

Pass in BIOL2306 or EASC2404 or ENVS2001 or ENVS2002

Course Type:

Lecture with laboratory component course

Course Teaching & Learning Activities:

- Lectures: 12 sessions x 2 hours
- Laboratory: 10 labs x 2 hours
- Field work: 1 day field trip

Assessment Methods & Learning Activities:

- Examination: 40
- Project reports: 20

Grade Descriptors:

- A: Demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining the entire course learning outcomes. Show ability to think logically and critically, with evidence of original thought. Critically evaluate data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
- B: Demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of logical and critical thought. Apply effective organizational and presentational skills. Correctly use of data and results to draw appropriate conclusions.
- C: Demonstrates general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some logical and critical thinking. Apply moderately effective organizational and presentational skills. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.
- D: Demonstrates partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show some logical and critical thinking. Apply limited or barely effective organizational and presentational skills. Limited ability to use data and results to draw appropriate conclusions.
- F: Demonstrates little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of critical, logical and/or coherent thinking. Organization and presentational skills are minimally effective or ineffective. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type:

Lecture with laboratory component course

Course Teaching & Learning Activities:

- Lectures: 12 sessions x 2 hours
- Laboratory: 10 labs x 2 hours
- Field work: 1 day field trip
**Human dimensions of environmental science (6 credits)**

**Offering Department**
- Earth Sciences

**Teachers Involved**
- Dr C Dingle, Biological Sciences (cdingle@hku.hk)

**Course Objectives**
To enhance students' knowledge on a particular topic in environmental science and students' self-directed learning and critical thinking skills.

**Course Contents & Topics**
Students undertake extensive reading on a selected topic guided by a staff member. Reading should cover material beyond textbooks. Students are required to analyze the material read, formulate their own scientific argument, and present it in written form.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1: Complete a research task independently in one or more topical areas of the major.
- CLO 2: Show competence in formulating their own scientific argument.

**Pre-requisites (and Co-requisites and Impermissible combinations)**
- Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major.

**Course Teaching & Learning Activities**
- **Methods**: Project work, group project.
- **Details**: Reading / Self study.
- **Assessment Methods and Weighting**
  - **Methods**: Assignment, Test.
  - **Details**: 2-hour mid-term test, 2-hour final in-class exam.
  - **Weighting in final course grade (%)**: 50.
  - **Assessment Methods to CLO Mapping**: CLO 1,2,3,4.

**Grade Descriptors (A+ to F)**
- A: Demonstrates excellent understanding of the topic, excellent development of argument, logical analysis and insight into the topic, with evidence of original thought. Insightful use and critical analysis of information drawn from a full range of high quality sources to draw appropriate and insightful conclusions. Presented in high academic standard. Work of A+ should show considerable additional work beyond that is required in wider areas relevant to the topic.
- B: Most aspects of the chosen topic were addressed and researched adequately. Demonstrates understanding of most key concepts, evidence of elementary analysis and development of argument. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations. Presented in adequate standard.
- C: Demonstrate general but incomplete grasp of the chosen topic. Most aspects of the chosen topic were addressed and researched at a very basic level. Mostly correct but some erroneous use of relevant information from sources, demonstrates main description, and shows basic understanding, but lacking depth.
- D: Demonstrate partial but limited grasp of the chosen topic, with retention of some relevant information. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited to draw appropriate conclusions from the sources.
- Fail: Show little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

**Course Type**
- Project-based course

**Offer in 2019 - 2020**
- Y (1st sem) 2nd sem

**Additional Course Information**
Course will be offered every year starting from 2014-2015 and coordinated by DES.

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**ENVS3499**

**Human dimensions of environmental science (6 credits)**

**Offering Department**
- Earth Sciences

**Teachers Involved**
- Dr C Dingle, Biological Sciences (cdingle@hku.hk)

**Course Objectives**
To enhance students knowledge on a particular topic in environmental science and students self-directed learning and critical thinking skills.

**Course Contents & Topics**
Students undertake extensive reading on a selected topic guided by a staff member. Reading should cover material beyond textbooks. Students are required to analyze the material read, formulate their own scientific argument, and present it in written form.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1: Complete a research task independently in one or more topical areas of the major.
- CLO 2: Show competence in formulating their own scientific argument.

**Pre-requisites (and Co-requisites and Impermissible combinations)**
- Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major.

**Course Teaching & Learning Activities**
- **Methods**: Project work, group project.
- **Details**: Reading / Self study.
- **Assessment Methods and Weighting**
  - **Methods**: Assignment, Test.
  - **Details**: 2-hour mid-term test, 2-hour final in-class exam.
  - **Weighting in final course grade (%)**: 50.
  - **Assessment Methods to CLO Mapping**: CLO 1,2,3,4.

**Grade Descriptors (A+ to F)**
- A: Demonstrates excellent understanding of the topic, excellent development of argument, logical analysis and insight into the topic, with evidence of original thought. Insightful use and critical analysis of information drawn from a full range of high quality sources to draw appropriate and insightful conclusions. Presented in high academic standard. Work of A+ should show considerable additional work beyond that is required in wider areas relevant to the topic.
- B: Most aspects of the chosen topic were addressed and researched adequately. Demonstrates understanding of most key concepts, evidence of elementary analysis and development of argument. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations. Presented in adequate standard.
- C: Demonstrate general but incomplete grasp of the chosen topic. Most aspects of the chosen topic were addressed and researched at a very basic level. Mostly correct but some erroneous use of relevant information from sources, demonstrates main description, and shows basic understanding, but lacking depth.
- D: Demonstrate partial but limited grasp of the chosen topic, with retention of some relevant information. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited to draw appropriate conclusions from the sources.
- Fail: Show little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

**Course Type**
- Project-based course

**Offer in 2019 - 2020**
- Y (1st sem) 2nd sem

**Additional Course Information**
Course will be offered every year starting from 2014-2015 and coordinated by DES.
On successful completion of this course, students should be able to:

- **Course Objectives**
  - To provide students experiential learning experience in the field of environmental science. The course is primarily based on an array of experiential studies covering essential areas of environmental science during a residential fieldtrip.

- **Course Contents & Topics**
  - Students to attend a residential field trip outside Hong Kong to learn about environmental science in practice. The residential field trip will be, for example, to Japan and may include marine environmental survey, sediment core sampling, practical learning of ecological, paleoecology and environmental problems, environmental geology/paleontology excursion, and other activities. Students are required to write an independent report on an environmental science issue.

- **Course Learning Outcomes**
  - On successful completion of this course, students should be able to:
    - CLO 1: recognize ways of environmental science in practice
    - CLO 2: gain knowledge of current environmental problems and solutions
    - CLO 3: present and communicate their field observations and findings

- **Pre-requisites (and Co-requisites and Impermissible combinations)**
  - Pass in at least 12 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major.

- **Offer in 2019 - 2020**

- **Grade Descriptors (A+ to F)**
  - **A**
    - Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective lab / fieldwork skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
  - **B**
    - Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Apply effective lab / fieldwork skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presential skills.
  - **C**
    - Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective lab / fieldwork skills and techniques. Most correct but some erroneous, unreconized use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presential skills.
  - **D**
    - Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply partially effective lab / fieldwork skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presential skills.
  - **Fail**
    - Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Apply minimally effective or ineffective lab / fieldwork skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

- **Course Type**
  - Laboratory and workshop course

- **Course Teaching & Learning Activities**
  - **Activities**
    - **Details**
      - Field work: Field work and other learning students will take part in at least 66 hours of field trips and other learning 66 hours
      - Reading / Self study: 100
  - **Assessment Methods and Weighting**
    - **Methods**
      - Laboratory reports: field reports 30 CLO 1,2,3
      - Presentation: group presentations 30 CLO 1,2,3
      - Project reports: individual report 40 CLO 1,2,3
  - **Course Website**
    - Additional Course Information
  - **Enrollment Procedure:** The actual capacity of this course is limited and will vary year by year, regardless of the quota set. So, interested student must apply for the course with a short proposal (2 pages maximum) and CV via e-mail to Dr. Moriai Yasuhara (yasuhara@hku.hk) and Ms. Maria Lo (gyl@hku.hk) not later than 1st August (Note: this is 2nd semester course, but we need applications well in advance, on or before this date). Late applications will not be accepted. The proposal should include the following: (1) the specific reason(s)/motivation why you are interested in joining this course; (2) merit that you expect to receive from this course, especially regarding your future academic/career path; (3) brief description of academic interests. The CV should include: (1) Personal and academic details; (2) ID photograph; (4) GPA; (5) Pre-requisite courses taken and grades received. The selection will be made based on the quality of proposal and the justification of academic merit, in considering other factors. Only accepted students through this application process will be able to register this course.

The residential field trip will be organized in the reading week. Students will need to pay for their own travel cost for the residential field trip (please contact us for details and financial difficulty).

This course will be offered subject to a minimum enrollment number and availability of teachers.

**Course Learning**
- On successful completion of this course, students should be able to:
  - Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective lab / fieldwork skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
  - Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Apply effective lab / fieldwork skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presential skills.
  - Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective lab / fieldwork skills and techniques. Mostly correct but some erroneous, unreconized use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presential skills.
  - Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply partially effective lab / fieldwork skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presential skills.
  - Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Apply minimally effective or ineffective lab / fieldwork skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

**Assessment**
- Laboratory and workshop course
- Pass in at least 12 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major.
- Examination: ---

**Assessment Methods and Weighting**
- **Methods**
  - Laboratory reports: field reports 30 CLO 1,2,3
  - Presentation: group presentations 30 CLO 1,2,3
  - Project reports: individual report 40 CLO 1,2,3

**Course Website**

**Enrollment Procedure:** The actual capacity of this course is limited and will vary year by year, regardless of the quota set. So, interested student must apply for the course with a short proposal (2 pages maximum) and CV via e-mail to Dr. Moriai Yasuhara (yasuhara@hku.hk) and Ms. Maria Lo (gyl@hku.hk) not later than 1st August (Note: this is 2nd semester course, but we need applications well in advance, on or before this date). Late applications will not be accepted. The proposal should include the following: (1) the specific reason(s)/motivation why you are interested in joining this course; (2) merit that you expect to receive from this course, especially regarding your future academic/career path; (3) brief description of academic interests. The CV should include: (1) Personal and academic details; (2) ID photograph; (4) GPA; (5) Pre-requisite courses taken and grades received. The selection will be made based on the quality of proposal and the justification of academic merit, in considering other factors. Only accepted students through this application process will be able to register this course.

The residential field trip will be organized in the reading week. Students will need to pay for their own travel cost for the residential field trip (please contact us for details and financial difficulty).

This course will be offered subject to a minimum enrollment number and availability of teachers.

**Course Learning**
- On successful completion of this course, students should be able to:
  - Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective lab / fieldwork skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
  - Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Apply effective lab / fieldwork skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presential skills.
  - Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective lab / fieldwork skills and techniques. Mostly correct but some erroneous, unreconized use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presential skills.
  - Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply partially effective lab / fieldwork skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presential skills.
  - Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Apply minimally effective or ineffective lab / fieldwork skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

**Assessment**
- Laboratory and workshop course
- Pass in at least 12 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major.
- Examination: ---

**Assessment Methods and Weighting**
- **Methods**
  - Laboratory reports: field reports 30 CLO 1,2,3
  - Presentation: group presentations 30 CLO 1,2,3
  - Project reports: individual report 40 CLO 1,2,3

**Course Website**

**Enrollment Procedure:** The actual capacity of this course is limited and will vary year by year, regardless of the quota set. So, interested student must apply for the course with a short proposal (2 pages maximum) and CV via e-mail to Dr. Moriai Yasuhara (yasuhara@hku.hk) and Ms. Maria Lo (gyl@hku.hk) not later than 1st August (Note: this is 2nd semester course, but we need applications well in advance, on or before this date). Late applications will not be accepted. The proposal should include the following: (1) the specific reason(s)/motivation why you are interested in joining this course; (2) merit that you expect to receive from this course, especially regarding your future academic/career path; (3) brief description of academic interests. The CV should include: (1) Personal and academic details; (2) ID photograph; (4) GPA; (5) Pre-requisite courses taken and grades received. The selection will be made based on the quality of proposal and the justification of academic merit, in considering other factors. Only accepted students through this application process will be able to register this course.

The residential field trip will be organized in the reading week. Students will need to pay for their own travel cost for the residential field trip (please contact us for details and financial difficulty).

This course will be offered subject to a minimum enrollment number and availability of teachers.
## ENVS4999

**Environmental science project (12 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Earth Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Co-ordinator</strong></td>
<td>Dr C Dingle, Biological Sciences (<a href="mailto:cdingle@hku.hk">cdingle@hku.hk</a>)</td>
</tr>
<tr>
<td><strong>Teachers Involved</strong></td>
<td>Various teachers (ERS), Earth Sciences; Various teachers (SBS), Biological Sciences</td>
</tr>
<tr>
<td><strong>Course Objectives</strong></td>
<td>To enhance students knowledge and research skills in advanced level of environmental science.</td>
</tr>
<tr>
<td><strong>Course Contents &amp; Topics</strong></td>
<td>Students undertake a research project in the form of an undergraduate dissertation under the supervision of a staff member. Satisfaction completion of this course can be counted towards the Capstone requirement. Details of internship will be recorded on the student's transcript. This course will be assessed on &quot;Pass/Fail&quot; basis. Students who are interested to enrol in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.</td>
</tr>
<tr>
<td><strong>Course Learning Outcomes</strong></td>
<td>On successful completion of this course, students should be able to: CLO 1 complete a dissertation project of undergraduate level in one of the four areas of the major; CLO 2 show competence in formulation, data collection, analysis, and presentation of a research project</td>
</tr>
<tr>
<td><strong>Pre-requisites (and Co-requisites and Impermissible combinations)</strong></td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major; and</td>
</tr>
<tr>
<td><strong>Grade Descriptors (A+ to F)</strong></td>
<td>The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
</tr>
<tr>
<td><strong>Offer in 2019 - 2020</strong></td>
<td>Y</td>
</tr>
<tr>
<td><strong>Examination</strong></td>
<td>No Exam</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral presentation</td>
<td>10</td>
<td>CLO 3</td>
<td></td>
</tr>
<tr>
<td>Supervisor's feedback</td>
<td>20</td>
<td>CLO 1,2</td>
<td></td>
</tr>
<tr>
<td>Written report</td>
<td>70</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

### Course Website

http://moodle.hku.hk/

### Additional Course Information

No formal lecture is to be given, but it is expected that students are to work for at least 160 hours (or the equivalent of 4 weeks full-time), supervised by a staff member. Satisfaction completion of this course can be counted towards the Capstone requirement. Details of internship will be recorded on the student's transcript. This course will be assessed on "Pass/Fail" basis. Students who are interested to enrol in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.
### MATH1009

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr Y M Chan (1st sem); Dr K H Law (2nd sem), Mathematics (<a href="mailto:ymchan@maths.hku.hk">ymchan@maths.hku.hk</a>; <a href="mailto:lawkaho@maths.hku.hk">lawkaho@maths.hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr K H Law, Mathematics) (Dr Y M Chan, Mathematics)</td>
</tr>
</tbody>
</table>

#### Course Objectives
- This course aims at introducing important topics of mathematics for introductory or intermediate level courses in Business and Economics. Mathematical concepts and methods, as well as some Business and Economics applications, would be emphasized so that students could be furnished with the essential mathematical skills for the senior courses in these disciplines.

#### Course Contents & Topics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Logic</td>
</tr>
<tr>
<td>2.</td>
<td>Linear Equations</td>
</tr>
<tr>
<td>3.</td>
<td>Quadratic Equations</td>
</tr>
<tr>
<td>4.</td>
<td>Graphs and Functions</td>
</tr>
<tr>
<td>5.</td>
<td>Differentiation</td>
</tr>
<tr>
<td>6.</td>
<td>Unconstrained optimization</td>
</tr>
<tr>
<td>7.</td>
<td>Partial differentiation</td>
</tr>
<tr>
<td>8.</td>
<td>Constrained optimization</td>
</tr>
<tr>
<td>9.</td>
<td>Integration</td>
</tr>
<tr>
<td>10.</td>
<td>Geometric series</td>
</tr>
<tr>
<td>11.</td>
<td>Difference equations (optional)</td>
</tr>
<tr>
<td>12.</td>
<td>Differential equations (optional)</td>
</tr>
<tr>
<td>13.</td>
<td>Matrix algebra (optional)</td>
</tr>
</tbody>
</table>

#### Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1: demonstrate knowledge and understanding of the essential mathematics used in business and economics
  - CLO 2: apply mathematical skills to model and solve basic problems in business and economics
  - CLO 3: be more capable of coping with a higher level of mathematics required in various economic disciplines

#### Pre-requisites (and Co-requisites and Impermissible combinations)
- NIL

#### Offer in 2019 - 2020
- Y 1st sem 2nd sem Offer in 2020 - 2021: Y

#### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrates an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrates a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrates an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrates some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrates poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.</td>
</tr>
</tbody>
</table>

#### Assessment Methods

<table>
<thead>
<tr>
<th>activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

#### Reading / Self study
- 100 hours

### MATH1011

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr H Y Zhang, Mathematics (<a href="mailto:hyzhang@maths.hku.hk">hyzhang@maths.hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr H Y Zhang, Mathematics)</td>
</tr>
</tbody>
</table>

#### Course Objectives
- This course aims at students with only HKDSE Mathematics (or equivalent) background and provides them with basic knowledge of mathematics that serves as essential foundation in various disciplines. It is expected to be followed by MATH1013.

#### Course Contents & Topics
- Sets, Venn diagram, set operations.
- Permutations, combinations and elementary probabilities.
- Mathematical induction.
- Exponential and logarithmic functions.
- Trigonometric functions, trigonometric formulate.
- Limits of algebraic, exponential and logarithmic functions.
- Derivatives of algebraic, exponential and logarithmic functions.
- Differentiation rules: addition, product, quotient and chain rule.
Department of Mathematics

MATH1013

University mathematics II (6 credits)

Offering Department
Mathematics

Academic Year
2019

Teacher Co-ordinator
Dr C W Wong, Mathematics (cwwongab@hku.hk)

Course Objectives
This course aims at students with Core Mathematics plus Module 1 or Core Mathematics plus Module 2 background and provides them with basic knowledge of calculus and some linear algebra that can be applied in various disciplines. It is expected to be followed by courses such as MATH2012, MATH2101, MATH2102, MATH2211, and MATH2241.

Course Contents & Topics
- Functions; graphs; inverse functions.
- Limits; continuity and differentiability.
- Mean value theorem; Taylor's theorem; implicit differentiation; L'Hôpital's rule.
- Higher order derivatives; maxima and minima; graph sketching.
- Radian, calculus of trigonometric functions.
- Definite and indefinite integrals; integration by substitutions; integration by parts; integration by partial fractions.
- Complex numbers, polar form, de Moivre's formula.
- Applications: Solving simple ordinary differential equations.
- Basic matrix and vector (of orders 2 and 3) operations, determinants of 2x2 or 3x3 matrices.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 describe properties of functions and inverse functions
CLO 2 evaluate limits, and determine continuity and differentiability of functions
CLO 3 apply advanced rules/techniques of differentiation and integration to compute derivatives and integrals; sketch graphs of functions; approximation of functions
CLO 4 solve problems involving complex numbers
CLO 5 solve simple first and second order ordinary differential equations

Pre-requisites (and Co-requisites and Impermissible combinations)
Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1009 or MATH1101; and
Not for students who have passed MATH1821, or (MATH1851 and MATH1853), or have already enrolled in this course.

Offer in 2019 - 2020
Y 1st sem 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors
(A+ to F)

A Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.
B Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
C Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, applications through correctly analysing problems, but with some minor inadequacies in arguments or with some minor computational errors.
D Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in the approach to solving problems or presentation.
Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>assignments, tutorials, participation, etc</td>
<td>5</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>Test</td>
<td>3 tests</td>
<td>50</td>
</tr>
<tr>
<td>Test</td>
<td>45</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
- (Custom textbook) MATH1011 (Pearson, 2014)

Course Website & Information
http://moodle.hku.hk/
http://moodle.hku.hk/~math/Timetable/timetable1920_S2.pdf
### Department of Mathematics

#### Course Teaching

**Course Co-ordinator**


Adrian Banner: The Calculus Lifesaver: All the Tools You Need to Excel at Calculus (Princeton University Press, 2007)


### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
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<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
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<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>


**Course Website**

http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

**Requirement/recommended reading and online materials**

Students who have passed MATH1013 are not allowed to take MATH1009.

### Additional Course Information

- [http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf](http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf)

### MATH1641 Mathematical laboratory and modeling (6 credits)

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>30</td>
</tr>
</tbody>
</table>

#### Course Objectives

This course introduces a powerful and free computer software Scilab for scientific research. The programming language will be taught via a number of mathematical models in Physics, Chemistry, Biology, Ecology, Statistics and Management. Some basic and important techniques in Calculus and Linear Algebra will also be covered.

#### Course Contents & Topics


#### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: demonstrate the importance of numerical methods in mathematical modeling
- CLO 2: demonstrate basic algebraic and arithmetic computations in the Scilab environment
- CLO 3: write and interpret programs in Scilab programming language
- CLO 4: solve simple numerical problems by using interactive Scilab commands
- CLO 5: solve moderately complicated numerical problems by writing Scilab programs

#### Required/recommended reading and online materials

- To be decided by the course instructor.

### Course Type

Lecture-based course

#### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

### Outcomes

- **A** Demonstrate an excellent understanding of key concepts and Scilab skills by being able to identify the appropriate Scilab environments and their applications through correctly analysing problems, clearly and efficiently presenting correct algorithms and being able to solve numerical problems by writing Scilab programs carefully and correctly, and with some innovative approaches to solving problems.

- **B** Demonstrate a good understanding of key concepts and Scilab skills by being able to identify the appropriate Scilab environments and their applications through correctly analysing problems, but with some minor inadequacies in identifying the appropriate Scilab components or presenting correct algorithms or with some minor programming/computational errors.

- **C** Demonstrate an acceptable understanding of key concepts and Scilab skills by being able to correctly identify appropriate Scilab environments, but with some inadequacies in solving numerical problems with Scilab through incorrectly analysing problems with inappropriate Scilab environments or with a number of minor programming/computational errors.

- **D** Demonstrate some understanding of key concepts and Scilab skills by being able to correctly identify appropriate Scilab environments, but with substantial inadequacies in solving numerical problems with Scilab through incorrectly analysing problems with inappropriate Scilab environments or with substantial programming/computational errors.

- **Fail** Demonstrate poor and inadequate understanding by not being able to identify appropriate Scilab environments or their applications, or not being able to complete the solution.
MATH1821  

**Offering Department:** Mathematics  
**Course Co-ordinator:** Dr J T Chan, Mathematics (jchan@hku.hk)

**Teachers Involved:** (Dr J T Chan, Mathematics)

**Course Objectives:** This course is the first of the two mathematics courses designed to provide actuarial science students with a solid background of calculus of one and several variables and an introduction to linear algebra. The course focuses on single variable calculus and elementary matrix theory. It aims at students with Core Mathematics plus Module 1 or Core Mathematics plus Module 2 background.

**Course Contents & Topics:**
- Functions; graphs; inverse functions.
- Limits, continuity and differentiability.
- Mean value theorem; implicit differentiation; L’Hopital's rule.
- Binomial theorem and Newton’s method.
- Higher order derivatives, maxima and minima, graph sketching.
- Taylor approximation and error estimation.
- Improper integrals, partial fractions, integration by parts.
- Numerical integration, Trapezoidal rule and Simpson's rule.
- Basic matrix and vector (of orders 2 and 3) operations, determinants.
- Simple differential equations.

**Course Learning Outcomes:** On successful completion of this course, students should be able to:
- CLO 1 describe properties of a function and an inverse function.
- CLO 2 evaluate various kinds of limits, and determine continuity and differentiability of functions.
- CLO 3 apply advanced rules/techniques of differentiation and integration to compute derivatives and integrals; sketch graphs of functions.
- CLO 4 approximate integrals by numerical methods.
- CLO 5 perform matrix and vector operations, compute determinants.
- CLO 6 solve simple first and second order ordinary differential equations.

**Pre-requisites (and Co-requisites and Impermissible combinations):** Level 4 or above in HKDSE Mathematics plus Module 1, or Level 4 or above in HKDSE Mathematics plus Module 2, or equivalent; and

**Offer in 2019 - 2020:**

**Grade Descriptors (A+ to F):**

**A** Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

**B** Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

**C** Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

**D** Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

**Fail** Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

**Course Type:** Lecture-based course  
**Course Teaching & Learning Activities:**

**Assessment Methods and Weighting:**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>Test</td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td></td>
<td>2 tests</td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials:**

George B. Thomas; as revised by Maurice D. Weir and Joel Hass: Thomas' Calculus (Addison Wesley, 12th edition)

**Course Website:** http://moodle.hku.hk/

**Additional Course Information:**

**Course Website:** 

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**MATH1851  

**Offering Department:** Mathematics  
**Course Co-ordinator:** Dr Y K Lau, Mathematics (ykla@maths.hku.hk)

**Teachers Involved:** (Dr L Xu, Mechanical Engineering)  
(Prof K W Chow, Mechanical Engineering)

**Course Objectives:** In this course, students will be introduced to fundamental concepts of calculus and ordinary differential equations with a view on applications in different engineering fields. A concrete foundation of mathematics that underpins the various engineering subjects will be built. Mathematical concepts and principles, as well as some typical engineering applications, would be emphasized so that students could enhance their mathematical skills in solving engineering problems, and be well prepared in learning a higher level of applied mathematics required in different engineering disciplines.

**Course Contents & Topics:**
- Differential and integral calculus (single variable) (limits and continuity, derivatives, (higher-order) derivatives of elementary functions, derivatives by implicit differentiation, the mean value theorem, L'Hopital's rule, parametric representation of curves, polar coordinates, indefinite integrals, integration by parts, partial fractions decomposition, definite integrals, the fundamental theorem of calculus, and their applications)
- Ordinary differential equations (first order equations, integrating factors and linear equations, Bernouilli equations,
separable equations, homogeneous equations, exact differential equations, higher-order homogeneous linear equations with constant coefficients, characteristic polynomials, methods of undetermined coefficients and variation of parameters, higher-order inhomogeneous linear ordinary differential equations, choice of particular solutions and physical implication of resonance, Cauchy-Euler equations, and their applications] - Laplace transforms [Laplace transforms of elementary functions, inverse Laplace transforms, transforms of derivatives and integrals, derivatives of Laplace transform, first and second shifting theorems, convolutions, partial fractions, solution of linear differential equations (initial value problems) using Laplace transforms]

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 demonstrate knowledge and understanding of basic calculus and ordinary differential equations as well as their relationship with some typical physical/engineering applications; unerringly perform the calculation details for the solution, and accurately correlate the solution approach with the fundamental concepts involved

CLO 2 apply mathematical skills to model and solve some basic physical/engineering problems: analyze the given problem, identify the appropriate mathematical skills, articulate a convincing rationale for the approach used, clearly give the mathematical formulation, and correctly find the solution

CLO 3 understand well established methods to solve differential equations, and correlate qualitatively with potential applications in engineering topics like oscillations and electric circuits. Identify the occurrence of resonance where large amplitude displacements can be expected

CLO 4 explore the technique and usage of integral transform, using the Laplace transform as an illustrative example. Appreciate the power of these techniques in initial value problems and applications like vibrations and signal processing

CLO 5 be well prepared to cope with a higher level of engineering mathematics required in different engineering disciplines

Pre-requisites (and Co-requisites and Impermissible combinations)
Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1011. (This course is exclusively for Engineering students.)

Offer in 2019 - 2020

Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F)

A Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and methods and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and methods and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems and methods or their applications and presentation or with some minor computational errors.

C Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems and methods, but with some inadequacies in applying them through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

D Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems and methods, but with substantial inadequacies in applying them through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems and methods or their applications, and not being able to complete the solution.

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>10 CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>70 CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>2 tests</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

(Textbook) Introduction to Calculus and Differential Equations (Pearson)

Course Website
http://mooodle.hku.hk/

Additional Course Information
There will be no ‘make-up’ for a missed test or assignment under normal circumstances. Students are advised not to take MATH1851 and MATH1853 together in the same semester. This course is offered by the Department of Mathematics and the Faculty of Engineering. Tutorial timetable:
http://hkumath.hku.hk/~math/Timetable/timetable1920_S1.pdf
http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

MATH1853  Linear algebra, probability and statistics (6 credits)

Offering Department Mathematics
Quota 700

Course Co-ordinator Dr G Han, Mathematics (ghan@maths.hku.hk)
Teachers Involved
(Dr G Han, Mathematics)
(Prof S H Lo, Civil Engineering)
(Prof Z Q Yue, Civil Engineering)

Course Objectives
As the complementary course of MATH1851, students will be introduced to more topics of mathematics commonly applied in engineering so that students could be further enhanced with a concrete skill in mathematics underpinned for different engineering subjects. The course emphasizes mathematical concepts, principles, analysis, and their relationships to the modelling of engineering systems. Students could learn to work with the essential mathematical skills to analytically tackle some typical engineering problems to prepare for all the engineering subjects.

Course Contents & Topics
- Linear algebra [vectors and scalars, inner product, vector projection, linear dependence and independence, matrix, determinant, matrix inverse, system of linear equations, matrix equation, Gaussian elimination, Cramer's rule, matrix rank, eigenvalue, eigenvector, matrix diagonalization, positive, negative and semi-definiteness, and their applications]
- Elementary complex variables [arithmetics of complex numbers, representations of complex numbers, De
MATH2012 Fundamental concepts of mathematics (6 credits)

Offering Department
Mathematics

Academic Year
2019

Course Co-ordinator
Dr Y M Chan, Mathematics (ymchan@maths.hku.hk)

Teachers Involved
(Dr Y M Chan, Mathematics)

Course Objectives
To provide students with solid background on fundamental concepts of mathematics and methods of mathematical proofs. Such concepts and methods are important for subsequent studies in all higher level courses in mathematics. This course can be taken concurrently with other Level 2 or above courses.

Course Contents & Topics
- Elementary set theory.
- Statement calculus.
- Mathematical proofs.
- Relations and functions.
- Finite and infinite sets.
- Natural numbers and mathematical induction.
- Real numbers and the limits of sequences.
- Examples of groups.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the definition of a set and apply set theory in simple daily life problems

CLO 2 construct the truth table of a given statement

CLO 3 apply different proof strategies (e.g. proof by contradiction and mathematical induction) in proving a mathematical statement

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1.2, 3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>80</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

Pre-requisites and Co-requisites
Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1011.

(Advised for students who are taking MATH1851 and MATH1853 together in the same semester.)

Course Type
Lecture-based course

Additional Course Information
There will be no ‘make-up’ for a missed quiz or assignment under normal circumstances. Students are advised not to take MATH1851 and MATH1853 together in the same semester.

This course is offered by the Department of Mathematics and the Faculty of Engineering.

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Outcomes
On successful completion of this course, students should be able to:

CLO 1 demonstrate knowledge and understanding of linear algebra, complex numbers, probability theory and statistics as well as their relationship with some typical physical/engineering applications: unnerving perform the calculation details for the solution, and accurately correlate the solution approach with the fundamental concepts involved

CLO 2 apply such knowledge and understanding to solve certain practical problems that are relevant to physical/engineering applications: analyze the given problem, identify the appropriate mathematical skills, articulate a convincing rationale for the approach used, and clearly give the mathematical formulation, and correctly find the solution

CLO 3 be well prepared to cope with a higher level of engineering mathematics required in different engineering disciplines

S.J. Leon: Linear Algebra with Applications (Pearson Education, 2006, 7th ed.)
D.C. Lay: Linear Algebra and its Applications (Addison-Wesley, 2012, 4th ed.)

Assessment Methods

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Assignment</th>
<th>Examination</th>
<th>Grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>B</td>
<td></td>
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<td>70</td>
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<tr>
<td>C</td>
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<td></td>
<td>60</td>
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<tr>
<td>D</td>
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<td>50</td>
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<tr>
<td>Fail</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the definition of a set and apply set theory in simple daily life problems

CLO 2 construct the truth table of a given statement

CLO 3 apply different proof strategies (e.g. proof by contradiction and mathematical induction) in proving a mathematical statement

Course Website
http://moodle.hku.hk/
<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Offer in 2019 - 2020</th>
<th>Grade Descriptors (A to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853). Students with good grades in HKDSE Math Module 1 or Math Module 2 (or other equivalent qualifications) and have strong interests in math may also apply for taking this course concurrently with its prerequisites courses (subject to the approval from Course Director and/or Advisors).</td>
<td>Y 1st sem 2nd sem</td>
<td>A Demonstrate an excellent understanding of key concepts and ideas and being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B Demonstrate a good understanding of key concepts and ideas and being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C Demonstrate an acceptable understanding of key concepts and ideas and being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Demonstrate some understanding of key concepts and ideas and being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems incorrectly analysing problems with poor argument or presentation or with substantial computational errors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.</td>
</tr>
<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
<td></td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lectures</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
</tr>
<tr>
<td></td>
<td>Assignments</td>
<td>Tutorials and Assignments</td>
</tr>
<tr>
<td></td>
<td>Examination</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
<td></td>
</tr>
<tr>
<td>Additional Course Information</td>
<td>Tutorial timetable:</td>
<td><a href="http://hkumath.hku.hk/~math/Timetable/timetable1920_S1.pdf">http://hkumath.hku.hk/~math/Timetable/timetable1920_S1.pdf</a></td>
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<tr>
<td></td>
<td></td>
<td><a href="http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf">http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf</a></td>
</tr>
<tr>
<td>MATH2014</td>
<td>Multivariable calculus and linear algebra (6 credits)</td>
<td>Academic Year</td>
</tr>
<tr>
<td>Offering Department</td>
<td>Mathematics</td>
<td></td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr H Y Zhang, Mathematics (<a href="mailto:hyzhang@maths.hku.hk">hyzhang@maths.hku.hk</a>)</td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr H Y Zhang, Mathematics)</td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To provide students with a solid foundation in calculus of several variables and linear algebra, which they will need in the study of mathematics related subjects.</td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Vectors and Matrices: Vectors in space, dot product and cross product, determinants (with geometric interpretations).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Partial Derivatives: Functions of several variables, partial derivatives, extreme values and Lagrange multipliers, Taylor’s formula.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multiple Integrals: Double and triple integrals, substitution in multiple integrals.</td>
<td></td>
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<tr>
<td></td>
<td>Matrix Algebra: Matrix addition and multiplication, system of linear equations as a matrix equation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vector Spaces: The Euclidean spaces as vector spaces, its subspaces, span of vectors, linear independence, basis and dimension.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eigenvalues and Eigenvectors: Diagonalization and computing powers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Numerical Methods: Bisection method and Newton’s method for finding roots of equations, Simpson’s rule and Trapezoidal rule for numerical integration.</td>
<td></td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLO 1 understand the geometric meaning of partial and directional derivatives</td>
<td></td>
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<tr>
<td></td>
<td>CLO 2 optimize multivariate objective functions (with/without constraints)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLO 3 evaluate integrals over curvilinear regions in space</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLO 4 understand the concept of vector spaces, basis, dimension</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLO 5 solve simple eigenvalue problems and apply the theory to practical problems</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in MATH1013 or (MATH1851 and MATH1853). Not for students who have passed MATH2822 or (MATH2101 or MATH2102) and MATH2211, or have already enrolled in these courses.</td>
<td></td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 1st sem 2nd sem</td>
<td></td>
</tr>
<tr>
<td>Grade Descriptors (A to F)</td>
<td>Examination</td>
<td>Dec May</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A Demonstrate an excellent understanding of key concepts and ideas and being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.</td>
</tr>
<tr>
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<td></td>
<td>B Demonstrate a good understanding of key concepts and ideas and being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C Demonstrate an acceptable understanding of key concepts and ideas and being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D Demonstrate some understanding of key concepts and ideas and being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems incorrectly analysing problems with poor argument or presentation or with substantial computational errors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.</td>
</tr>
</tbody>
</table>
## MATH2101 Linear algebra I (6 credits)

### Offering Department
Mathematics

### Course Co-ordinator
Dr K H Law, Mathematics (lawkaho@maths.hku.hk)

### Teachers Involved
(Dr K H Law, Mathematics)

### Course Objectives
This is a first university level course on linear algebra, which aims at introducing to students the basic concept of linear structure through many concrete examples in the Euclidean spaces. The course also enriches students' exposure to mathematical rigor and prepares them for studying more advanced mathematical courses.

### Course Contents & Topics
- Vector Geometry in R^2 and R^3: Revision of addition and scalar multiplication of vectors, dot product, lines and planes; and applications to geometry.
- Matrix Algebra: Matrix addition and multiplication, determinant and inverse of square matrices, system of linear equations as a matrix equation.
- Systems of Linear Equations: Gauss-Jordan elimination, elementary row operations, row echelon form, elementary matrices, matrix inversion.
- Vector Spaces: Coordinate system in R^n, the Euclidean spaces as vector spaces, its subspaces, span of vectors, linear independence, basis, dimension, applications.
- Linear Transformations: Definition and examples of linear transformations in R^n, and standard matrices of linear transformations.
- Eigenvalue Problem: Eigenvalues and eigenvectors, diagonalization of matrices (with distinct eigenvalues), applications.
- Inner Product: Gram-Schmidt process, least square problems.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 handle matrix operations and use them in some practical problems
- CLO 2 solve systems of linear equations by Gauss-Jordan elimination and also compute inverses of square matrices
- CLO 3 understand the concept of vector spaces, basis, dimension, and linear transformations and compute the matrix representations of some linear transformations
- CLO 4 solve some simple eigenvalue problems and apply the theory to some practical problems
- CLO 5 solve some minimization problems by the least squares method

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853)

### Offer in 2019 - 2020
Y 1st sem 2nd sem Offer in 2020 - 2021 : Y

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

### Assessment Methods & Weighting
- Assignments: assignments, tutorials, participation, etc - 10 CLO 1,2,3,4,5
- Examination: - 50 CLO 1,2,3,4,5
- Test: 2 tests - 40 CLO 1,2,3,4,5

### Additional Course Information
- Course Website: http://moodle.hku.hk/
- Additional Course Information: http://hkumath.hku.hk/~math/Timetable/timetable1920_S1.pdf

### Course Information
- CLO to CLO Mapping

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
</tr>
</thead>
</table>
MATH2102
Linear algebra II (6 credits)
Offering Department: Mathematics
Course Co-ordinator: Dr T W Ching, Mathematics (lmtching@maths.hku.hk)
Teachers Involved: (Dr T W Ching, Mathematics)
Course Objectives:
This is a follow-up of the course Linear Algebra I. It aims at introducing the general concept of vector spaces, subspaces, dimensions, inner product spaces, etc. The course prepares the foundation on linear algebra for students' future study in mathematics and other disciplines. Many examples of applications will be drawn on different subject areas.

Course Contents & Topics:
1. Vector spaces: definition of field, subspaces/quotient spaces, direct sum, existence of basis, dual space
2. Linear transformations: kernel and image, isomorphisms, matrix representations of linear transformations, determinant
3. Linear operator: eigenvalues and eigenspaces, algebraic/geometric multiplicity, diagonalizability, Cayley-Hamilton theorem, canonical form (optional)
4. Inner product space: Inner product, orthonormal basis, orthogonal complement and projection
5. Linear operators on inner product space: adjoints of operators, orthogonal/unitary operators, orthogonal/unitary diagonalization of self-adjoint/normal operators, symmetric bilinear form and quadratic form
6. Additional selected topics up to the instructor

Course Learning Outcomes:
On successful completion of this course, students should be able to:
- CLO 1 identify vector space structures and apply relevant knowledge to some practical problems
- CLO 2 understand the notion of subspaces and compute basis, dimension, etc
- CLO 3 understand the base-free nature of linear transformations/operators. Relate the calculations of linear transformations to that of matrices by choosing particular basis
- CLO 4 be able to solve eigenvalue problem for linear operators and apply it to the problem of diagonalization
- CLO 5 understand the notions of inner product space and adjoints of operators. Be able to do calculation involving properties of adjoints

Pre-requisites (and Co-requisites and Impermissible combinations):
Pass in MATH2101 or (MATH1821 and MATH2822)


Grade Descriptors (A to F):
A Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

C Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

D Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type: Lecture-based course

Course Teaching & Learning Activities:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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</table>

Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Text</td>
<td></td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:
S. Friedberg, A. Insel, L. Spence: Linear algebra (Pearson, 4th edition)

Course Website:
http://moodle.hku.hk/

Additional Course Information:
Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

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MATH2211
Multivariable calculus (6 credits)
Offering Department: Mathematics
Course Co-ordinator: Dr T W Ching (1st sem); Dr Z Hua (2nd sem), Mathematics (lmtching@maths.hku.hk; huazheng@maths.hku.hk)
Teachers Involved: (Dr T W Ching, Mathematics)

Course Objectives:
Students of this course will learn the theory of multivariable calculus and learn how to apply the theory to solve practical problems. This is a required course for Mathematics and Mathematics/Physics Majors, and is suitable for all students in Science, Engineering, Economics and Finance, and other students who will use multivariable calculus in their areas of study. This is also a required course for all Minors offered by the Department of Mathematics, and is a pre-requisite of many advanced level mathematics courses.

Course Contents & Topics:
- Vectors: vectors in 2-, 3-, and n-dimensions; dot product and cross product; lines and planes; polar, cylindrical, and spherical coordinates.
- Differentiation in several variables: limits and derivatives; the chain rule; directional derivatives and gradients.
- Vector-valued functions: parameterized curves; arc-length; vector fields; gradient, divergence, curl, and the del operator.
- Maxima and minima: differentials and Taylor's Theorem of several variables; extrema of functions; Lagrange multipliers; applications of extrema.
- Multiple integration: double and triple integrals; change of variables; applications.
### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand and demonstrate the basic theory of calculus of functions in several real variables
- CLO 2 evaluate partial derivatives and multiple integrals; compute line integrals and surface integrals
- CLO 3 apply the knowledge to solve some practical problems, such as constrained optimization problems and other problems involving differentiation and integration of multivariable functions

### Pre-requisites (and Co-requisites and Impermissible combinations)

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>(A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853)</td>
<td></td>
</tr>
</tbody>
</table>

### Course Type

Lecture-based course

### Course Learning & Teaching Activities

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Assignments</td>
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</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
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<td>Test</td>
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<td>CLO 1,2,3</td>
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**Offer in 2020 - 2021**

<table>
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<tr>
<th>Y</th>
<th>1st sem</th>
<th>2nd sem</th>
<th>CLO 1,2,3</th>
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</thead>
<tbody>
<tr>
<td>Examination</td>
<td>Dec</td>
<td>May</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Course Information**

- Students are assumed to have mastered calculus of one-variable prior to taking this course.
- Reading materials:

### Course Objectives

- To introduce students to the basic ideas and techniques of mathematical analysis.
- The real number system: the real numbers as an ordered field, supremum and infimum, the completeness axiom, denseness of the rational numbers.
- Sequences and series of real numbers: limits of sequences, properties of convergent sequences, Cauchy sequences, subsequences, series, tests of convergence for series.
- Continuity of real-valued functions: properties of continuous functions, the extreme value theorem, the intermediate value theorem, uniform continuity, limits of functions.
- Differentiation: properties of differentiable functions, the mean value theorem, Taylor's theorem and its applications.
- Integration: construction of the Riemann integral using Darboux sums and Riemann sums, the fundamental theorem of calculus.

### Examination

**Mathematical Analysis** (6 credits)

<table>
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<th>Grade Descriptors</th>
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</thead>
<tbody>
<tr>
<td>CLO 1,2,3</td>
<td>2019</td>
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<tr>
<td>Offer in 2020-2021</td>
<td>Y</td>
</tr>
<tr>
<td>Offer in 2020-2021</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Offering Department**

Mathematics

**Teachers Involved**

Dr Y M Chan (1st sem); Dr T W Ching (2nd sem), Mathematics

**Course Objectives**

- To introduce students to the basic ideas and techniques of mathematical analysis.
- The real number system: the real numbers as an ordered field, supremum and infimum, the completeness axiom, denseness of the rational numbers.
- Sequences and series of real numbers: limits of sequences, properties of convergent sequences, Cauchy sequences, subsequences, series, tests of convergence for series.
- Continuity of real-valued functions: properties of continuous functions, the extreme value theorem, the intermediate value theorem, uniform continuity, limits of functions.
- Differentiation: properties of differentiable functions, the mean value theorem, Taylor's theorem and its applications.
- Integration: construction of the Riemann integral using Darboux sums and Riemann sums, the fundamental theorem of calculus.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 comprehend and use abstract mathematical arguments such as the epsilon-delta argument
- CLO 2 demonstrate convergence or non-convergence of a sequence/series using properties of convergent sequences/series
- CLO 3 elucidate important properties of continuous functions such as the extreme value theorem and the intermediate value theorem
- CLO 4 elucidate important properties of differentiable functions such as the mean value theorem, and to understand and apply Taylor's Theorem
- CLO 5 articulate the construction of the Riemann integral and its relation to differentiation

**Pre-requisites (and Co-requisites and Impermissible combinations)**

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>(A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass in MATH1013 or MATH1851 or MATH1853 or MATH2822. Students are strongly recommended to have taken MATH2012 if they wish to take this course.</td>
<td></td>
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<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>(A+ to F)</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate a thorough mastery of the mathematical notions and proof techniques taught in the course by being able to handle abstract mathematical arguments, to apply appropriate theorems correctly, and to make use of those proof techniques in novel situations. Ability to present solutions clearly and logically, and the use of innovative ideas in solving problems are expected.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate a substantial command of the mathematical notions and proof techniques taught in the course by being able to handle abstract mathematical arguments, to apply appropriate theorems correctly, and, with guidance, to make use of those proof techniques in novel situations. Ability to present solutions clearly and logically, and evidence of innovative ideas in solving problems are expected.</td>
</tr>
<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
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<tr>
<td>-------------</td>
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<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td><strong>Activities</strong></td>
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<td>Lectures</td>
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<td>Tutorials</td>
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<td></td>
<td>Reading / Self study</td>
</tr>
<tr>
<td>Assesment Methods and Weighting</td>
<td><strong>Methods</strong></td>
</tr>
<tr>
<td></td>
<td>Assignments</td>
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<tr>
<td></td>
<td>Examination</td>
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<tr>
<td></td>
<td>Test</td>
</tr>
<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
</tr>
</tbody>
</table>

**Course Objectives:**
- **C** Demonstrate a good understanding of the mathematical notions and proof techniques taught in the course by being able to handle abstract mathematical arguments and to apply appropriate theorems correctly. Ability to present solutions clearly and logically is expected.
- **D** Demonstrate some understanding of the mathematical notions taught in the course by being able to correctly identify appropriate theorems for applications and to carry out logical arguments that are leading to complete solutions.
- **Fail** Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems for applications, or not being able to apply the theorems correctly.

**Course Contents & Topics:**
- Matrices, systems of linear equations, determinants.
- Eigenvalues and eigenvectors, diagonalization of matrices.
- Quadratic functions and their standard forms.
- Vector spaces and subspaces.
- Functions of several variables; partial differentiation.
- Gradients and directional derivatives.
- Taylor approximation, Newton's method.
- Maxima and minima; Lagrange multipliers.
- Double and triple integrals, areas and volumes.

**Course Learning Outcomes:**
- **CLO 1** understand and recognize various topics in linear algebra such as the basic arithmetic of matrices, determinants, systems of linear equations, eigenvalues and eigenvectors, diagonalizable matrices, basis and dimension, and the rank-nullity theorem.
- **CLO 2** understand and recognize various topics in functions of several variables including partial differentiation, the Hessian test for local extrema, vector-valued functions, Jacobians, the method of Lagrange multipliers, double/triple integrals and the change of variable formula.

**Pre-requisites (and Co-requisites and Impermissible combinations):**
- Pass in MATH1821. For BSc(ActuarSc) students only.

**Offer in 2019 - 2020**
- **Y** 2nd sem
- **Offer in 2020 - 2021 : Y**

**Course Type**
- Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
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<td>Reading / Self study</td>
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**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Examination</td>
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<td>50</td>
<td>CLO 1,2</td>
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<tr>
<td>Test</td>
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<td>50</td>
<td>CLO 1,2</td>
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</table>

**Required/recommended reading and online materials**
- George B. Thomas; as revised by Maurice D. Weir and Joel Hass: Thomas' Calculus (Addison Wesley, 12th edition)
- Keith Matthews: Elementary Linear Algebra (Url: www.numbertheory.org/book/)
MATH3001 Development of mathematical ideas (6 credits)

Offering Department: Mathematics
Course Co-ordinator: TBC, Mathematics

Course Objectives
To acquaint the students with the origin and growth of basic mathematical concepts. To assist the students to gain a deeper insight and broader view of mathematics as a discipline and human endeavour. To provide the students with an opportunity to write on and talk about mathematics, and to engage in independent study.

Course Contents & Topics
- Selected topics in the development of mathematics from ancient to modern times depending on interest of the students and the lecturer, with attention paid to the evolution of mathematical ideas and the process of mathematical thinking and problem solving.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand and describe the origin and development of basic mathematical concepts
CLO 2 recognize and demonstrate the intellectual and the socio-cultural aspects of mathematics, and appreciate mathematics as both an academic discipline and a human endeavour
CLO 3 discuss, argue, and write about the development of various mathematical concepts and ideas
CLO 4 engage in independent study on a topic about the history or development of mathematics

Pre-requisites
Pass in MATH2101, MATH2102, MATH2211 and MATH2241

Offer in 2019 - 2020
N
Offer in 2020 - 2021 : N

Grade Descriptors
A Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Critical use of information from sources to draw appropriate and insightful conclusions. Actively engage in and contribute substantially and fruitfully to class discussions. Apply highly effective organizational and presentational skills.
B Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Correct use of information from sources to draw appropriate conclusions. Good participation in class discussions with generally good contributions. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Mostly correct but some erroneous use of information from sources to draw appropriate conclusions. Make some but not substantial fruitful contributions to class discussions. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Limited ability to use information from sources to draw appropriate conclusions. Contribute only in a limited way to fruitful and meaningful class discussions. Apply limited or barely effective organizational and presentational skills.
Fail Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Misuse of information from sources and/or unable to draw appropriate conclusions. Make little or no meaningful contributions to class discussions. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Analysis Methods and Weights
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 50
Test 50

Required/recommended reading and online materials
To be decided by the course instructor.

R. Laubenbacher and D. Pengelley: Mathematical Expeditions (Springer-Verlag, 1999)
R. Calinger (ed.): Classic of Mathematics (Prentice Hall, preprinted 1995)

MATH3002 Mathematics seminar (6 credits)

Offering Department: Mathematics
Course Co-ordinator: Prof W K Ching, Mathematics (wching@hku.hk)

Course Objectives
This is a seminar style course intended for those who have very strong interests and good ability in mathematics. Students will be given book chapters and elementary research articles for private study and then make presentations in front of the whole class. Individual meetings with the instructors will be arranged prior to their presentations. Active participation in all the discussions is expected. The aim of the course is to let students learn how to initiate self-dependent study in mathematics.

Course Contents & Topics
Topics chosen by the instructors, including chapters from books and elementary research articles.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 Initiate private independent study on some interesting mathematical topics

Pre-requisites
Pass in MATH2102, MATH2101, MATH2211 and MATH2241

Subject to approval by the Department.

Offer in 2019 - 2020
Y

Grade Descriptors
A Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Actively engage in and contribute substantially and fruitfully to class discussions. Apply highly effective organizational and presentational skills.
B Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Good participation
## MATH3301 Algebra I (6 credits)

### Offering Department
Mathematics

### Course Co-ordinator
Dr Y K Lau, Mathematics (yklaui@maths.hku.hk)

### Teachers Involved
Dr Y K Lau, Mathematics

### Course Objectives
This course aims to present those fundamental topics and techniques of algebra that are finding wide applications in mathematics and the applied sciences. It is complete in itself, and may also be followed by MATH4302 Algebra II and MATH7502 Topics in Applied Discrete Mathematics.

### Course Contents & Topics
- Groups: examples of groups, subgroups, cosets, Lagrange theorem, quotient groups, normal subgroups, group homomorphisms, direct product of groups, group actions.
- Rings: examples of rings, integral domains, ideals, fields of fractions, principal ideal domains, unique factorization domains.
- Fields: definition and examples of fields.
- Polynomials: polynomial rings in one variable.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: write down the precise definitions of the basic concepts in the "Course Contents".
- CLO 2: give examples for each of the concepts in the "Course Contents".
- CLO 3: understand basic properties of groups, rings, and fields.

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in MATH2101

### Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021: Y

### Grade Descriptors (A to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.</td>
</tr>
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### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Take-home and/or in tutorials</td>
<td>10</td>
<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Examination</td>
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<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Test</td>
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<td>40</td>
<td>CLO 1, 2, 3</td>
</tr>
</tbody>
</table>

### Course Website
http://moodle.hku.hk/

## MATH3303 Matrix theory and its applications (6 credits)

### Offering Department
Mathematics

### Academic Year
2019

### Quota
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<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Dr Y M Chan, Mathematics (<a href="mailto:ymchan@maths.hku.hk">ymchan@maths.hku.hk</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>Dr M Huang, Mathematics (<a href="mailto:bkhane@maths.hku.hk">bkhane@maths.hku.hk</a>)</td>
</tr>
</tbody>
</table>

**Course Objectives**

- Matrix theory has a close connection with other mathematical subjects such as linear algebra, functional analysis, and combinatorics. It also plays an important role in the development of many subjects in science, engineering, and social sciences. In this course, students will be taught the fundamentals of matrix analysis and its application to various kinds of practical problems. Mathematical software may be used in the course, so that students can learn how to use the computer to solve matrix problems.

**Course Contents & Topics**

- Eigenvalues and eigenvectors: similarities, applications on difference equations and differential equations.
- Orthogonality: inner products and the induced norms, orthogonality of null spaces and column spaces, applications to over- or under-determined systems, least squares fit, Unitary, normal, and Hermitian matrices: Schur's triangularization theorem. Variational description of eigenvalues: applications in optimization and in eigenvalue estimation.

**Course Learning Outcomes**

<table>
<thead>
<tr>
<th>Grade Descriptors (A to F)</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Have a good understanding on matrices, determinants, linear transformations, eigenvalues and eigenvectors</td>
</tr>
<tr>
<td>B</td>
<td>Understand the concept of similar matrices and the eigenvalue decompositions</td>
</tr>
<tr>
<td>C</td>
<td>Understand the concept of orthogonality</td>
</tr>
<tr>
<td>D</td>
<td>Understand the concept of unitary, normal, and Hermitian matrices</td>
</tr>
<tr>
<td>F</td>
<td>Understand the concept of the Jordan blocks, Jordan matrices and the Jordan canonical form of a matrix</td>
</tr>
</tbody>
</table>

**Pre-requisites**

- Pass in MATH2101 and MATH2102
- Orthogonality: inner products and the induced norms, orthogonality of null spaces and column spaces, applications to over- or under-determined systems, least squares fit, Unitary, normal, and Hermitian matrices: Schur's triangularization theorem. Variational description of eigenvalues: applications in optimization and in eigenvalue estimation.

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Grade</th>
<th>2nd sem</th>
<th>Offer in 2020 - 2021</th>
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<tbody>
<tr>
<td>A</td>
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<td>50 CLO 1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>B</td>
<td>12</td>
<td>50 CLO 6, 7, 8</td>
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</tbody>
</table>

**Teacher Involved**

- Jack L. Goldberg: Matrix Theory with Applications (McGraw-Hill, 1991)
- Steven J. Leon: Linear Algebra with Applications (McGmillan, 1994, 4th edition)
- Chris Rogers & Howard Anton: Applications of Linear Algebra (Wiley, 1984, 3rd edition)

**Course Website**

- http://moodle.hku.hk/ 

**Additional Course Information**


**Course Type**

- Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
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<td></td>
<td>36</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
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<tr>
<td>Reading / Self study</td>
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**Assessment Methods and Weighting**

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<tr>
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</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50 CLO 1.2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50 CLO 1.2, 3, 4, 5, 6</td>
</tr>
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</table>

**Required/recommended reading and online materials**

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jack L. Goldberg</td>
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<tr>
<td>Steven J. Leon</td>
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</tr>
<tr>
<td>Chris Rogers &amp; Howard Anton</td>
<td>Applications of Linear Algebra (Wiley, 1984, 3rd edition)</td>
</tr>
</tbody>
</table>

**MATH3304**

- Introduction to number theory (6 credits)
- Academic Year: 2019
- Quota: ---

**Offering Department**

- Mathematics

**Course Co-ordinator**

- Dr B Kane, Mathematics (bkane@maths.hku.hk)

**Course Involved**

- Dr S Banerjee, Mathematics (bsbanerjee@maths.hku.hk)

**Course Objectives**

- To provide students with basic concepts about numbers, their properties and basic knowledge on the arithmetic of congruences. The prime numbers are the building blocks of all the natural numbers under multiplication. The interplay between the multiplicative and additive properties of prime numbers is particularly interesting. The course will study further properties and the distribution of the prime numbers, and some of the longstanding open problems concerning them. Important applications of number theory to modern cryptography will also be introduced.

**Course Contents & Topics**

- The course will begin with some basic notions in number theory, including divisibility, greatest common divisor, Euclidean algorithm, congruences, etc. It will then be followed by several fundamental theorems, such as Chinese remainder theorem, solutions of linear and polynomial congruences, Fermat's Little theorem, and the quadratic reciprocity law.
- Many well-known open problems will be introduced. Application of number theory to public key cryptography will be explained. Some current research on the prime numbers will be discussed.
- Depending on the time available, the course will cover a selection of further topics, such as the prime number theorem, sum of squares, Dirichlet's theorem on diophantine approximations, continued fractions, etc.

**Course Learning Outcomes**

- On successful completion of this course, students should be able to:
  - CLO 1 solve a system of linear congruences
CLO 2 solve polynomial congruences
CLO 3 determine the solubility of quadratic congruences by computation of the Legendre symbol
CLO 4 determine the existence of primitive roots and use them in solving some exponential congruences
CLO 5 understand the prime number theorem
CLO 6 understanding some longstanding problems in number theory

Pre-requisites (and Co-requisites and Impermissible combinations) Pass in MATH2101 and MATH2211

Offer in 2019 - 2020 Y 2nd sem Offer in 2020 - 2021 : Y Examination May

Grade Descriptors (A+ to F) A  Demonstrate a thorough and coherent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing number theoretic problems, clearly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly.
B  Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing number theoretic problems, but with some minor errors/inadequacies in arguments and being able to present coherent logical reasoning and carry out computations carefully without major errors.
C  Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with weak and fragmentary argument and presentation, or with moderate computational errors.
D  Demonstrate some superficial understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation, or with substantial computational errors.
Fail  Demonstrate poor and inadequate understanding of the key concepts and ideas by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type Lecture-based course
Course Teaching & Learning Activities

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
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<tr>
<td>Assignments</td>
<td>Tutorials and Assignments</td>
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<td>Examination</td>
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<td>CLO 1,2,3,4,5,6</td>
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<tr>
<td>Test</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
J. H. Silverman: A friendly introduction to number theory (Prentice Hall, 2001)
http://moodle.hku.hk/

Course Website http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

Additional Course Information MATH3301 recommended but not required.

Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf
and Weighting

| Examination | 50 | Methods to CLO Mapping | CLO 1,2,3 |
| Test | 50 | CLO 1,2,3 |

Required/recommended reading and online materials

- Apostol: Mathematical Analysis
- Rudin: Principles of Mathematical Analysis

Course Website

http://moodle.hku.hk/

Additional Course Information

Tutorial timetable:
http://hkumath.hku.hk/~math/Timetable/timetable1920_S1.pdf

MATH3403

Offering Department: Mathematics

Course Co-ordinator: Prof N Mok, Mathematics (nmok@hku.hk)

Teachers Involved: Dr K K Wong, Mathematics

Course Objectives

This course is indispensable for studies in higher mathematical analysis and the more theoretical aspects of physics. In this course, the students are introduced to the fundamental concepts and properties of analytic functions and are shown how to look at analyticity from different points of view. At the same time, the techniques of solving problems without losing sight of the geometric picture are emphasized.

Course Contents & Topics

- Complex number system.
- Analytic functions and elementary functions.
- The Cauchy-Riemann equations.
- Cauchy's theorem and its applications.
- Taylor's series.
- Laurent's series.
- Zeros, singularities and poles.
- The Residue Theorem and its applications.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 recognize the theory of functions of a complex variable as a rigorous and foundational subject in mathematics.

CLO 2 grasp the techniques from Cauchy-Riemann equations, power series expansion and Cauchy integral formulas to study analytic functions from different perspectives.

CLO 3 compute contour integrals by calculating residues.

CLO 4 apply such techniques to determine improper integrals such as those for certain rational functions on the real line.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH2211 and MATH2241

Offer in 2019 - 2020

Y 2nd sem Offer in 2020 - 2021: Y

Grade Descriptors (A+ to F)

A Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

C Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

D Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type

Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
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Assessment Methods and Weighting

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<tr>
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<td>Test</td>
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<td>50</td>
<td>CLO 1,2,3,4</td>
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Required/recommended reading and online materials

- R.B. Ash and W.P. Novinger: Complex Variables (Dover, 2nd edition)
- J. Bak & D.J. Newman: Complex Analysis, Undergraduate Texts in Mathematics (Springer-Verlag)
- K. Kodaira: Introduction to Complex Analysis (Cambridge)
- J.P. Gilman, I. Kra and R.E. Rodriguez: Complex Analysis: In the spirit of Lipman Bers (Springer-Verlag)
- J.P. Gilman, I. Kra and R.E. Rodriguez: Complex Analysis: In the spirit of Lipman Bers (Springer-Verlag)

Course Website

http://moodle.hku.hk/

Additional Course Information

Tutorial timetable:
http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

MATH3405

Offering Department: Mathematics

Course Co-ordinator: Dr H Y Zhang, Mathematics (hyzhang@maths.hku.hk)

Teachers Involved: Dr H Y Zhang, Mathematics

Course Objectives

The standard topics in the wide field of ordinary differential equations (ODEs) included in this course are of importance to students of sciences and engineering. Our emphasis is on principles rather than routine calculations and our approach is a compromise between diversity and depth.

Course Contents

- Review of elementary differential equations.
### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1** solve simple first order and second order (linear or nonlinear) ODEs by various techniques, including auxiliary equations, variation of parameters, Laplace transform, and series method.

- **CLO 2** solve systems of first order linear ODEs with constant coefficients, of which the number of equations and the number of unknown functions are no more than three.

- **CLO 3** discuss qualitatively the solutions of nonlinear ODEs or systems of nonlinear ODEs by studying their linear approximations or their phase diagrams.

- **CLO 4** apply the theory of differential equations to study quantitatively/qualitatively problems arising from physical and life sciences.

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)

### Offer in 2019 - 2020

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### Course Type

Lecture-based course

### Course Teaching & Learning Activities

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### Assessment Methods and Weighting

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<td>Assignments</td>
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<td>Test</td>
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<td>CLO 1, 2, 3, 4</td>
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### Required/recommended reading and online materials


E.A. Coddington: An Introduction to Ordinary Differential Equations (Prentice-Hall)

### Course Website

http://moodle.hku.hk/

### Additional Course Information

Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

### MATH3408

Computational methods and differential equations with applications (6 credits)

<table>
<thead>
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<th>Quota</th>
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<td>2019</td>
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</tbody>
</table>

### Offered Department

Mathematics

### Course Co-ordinator

Prof W K Ching, Mathematics (wckching@hku.hk)

### Course Objectives

This course covers topics in the fields of differential equations, mathematical modelling and numerical analysis which are of importance to sciences students. The emphasis is practical applications of basic principles.

### Course Contents & Topics

- Solution of linear difference equations.
- Mathematical modelling and dynamical systems.
- Numerical differentiation and integration.
- LU factorization for solving linear system of equations.
- Elementary differential equations and power series method.
- Numerical solutions of ordinary and partial differential equations.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1** construct and implement numerical methods for numerical integration and differentiation, and the solution of linear and nonlinear system of equations.

- **CLO 2** explain mathematical ideas of numerical methods and mathematical modelling in solving linear difference equations, ordinary and partial differential equations.

- **CLO 3** construct one-step and linear multistep methods for the numerical solution of initial-value problems for ordinary differential equations and systems of such equations and analyze their stability and accuracy properties.

- **CLO 4** construct finite difference methods for the numerical solution of partial differential equations and analyze their stability and accuracy properties.
CLO 5: Implement numerical methods for solving initial and boundary value problems by software packages like MATLAB.

Grade Descriptors (A to F)

A: Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and computational methods and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and computational methods and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems and computational methods or their applications and presentation or with some minor computational errors.

C: Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems and computational methods, but with some inadequacies in applying them through incorrectly analysing problems with poor argument or presentation or a number of minor computational errors.

D: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems and computational methods, but with substantial inadequacies in applying them through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems and computational methods or their applications, or not being able to complete the solution.

Course Type: Lecture-based course

Assessment Methods and Weighting:

<table>
<thead>
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<td>Test</td>
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<td>CLO 1, 2, 3, 4, 5</td>
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</table>

Required/Recommended Reading and Online Materials:

- D.F. Parkhurst: Introduction to Applied Mathematics for Environmental Science (Springer)
- E.A. Coddington: An Introduction to Ordinary Differential Equations (Prentice-Hall)

Additional Course Information:

http://moodle.hku.hk/

Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf
<table>
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<th>Required/recommended reading and online materials</th>
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<td>Additional Course Information</td>
<td>Tutorial timetable:</td>
</tr>
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<table>
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<th>MATH3600</th>
<th>Discrete mathematics (6 credits)</th>
<th>Academic Year</th>
<th>2019</th>
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<tbody>
<tr>
<td>Offering Department</td>
<td>Mathematics</td>
<td>Quota</td>
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<tr>
<td>Course Co-ordinator</td>
<td>Dr K H Law, Mathematics (<a href="mailto:lawkaho@maths.hku.hk">lawkaho@maths.hku.hk</a>)</td>
<td></td>
<td></td>
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<tr>
<td>Teachers Involved</td>
<td>(Dr K H Law,Mathematics)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To introduce students to the basic ideas and techniques of discrete mathematics.</td>
<td></td>
<td></td>
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</tbody>
</table>
| Course Contents & Topics | - Counting: combinations, permutations, pigeonhole principle, inclusion-exclusion, recurrence relations, and generating functions.  
- Graph theory: paths, circuits, trees, connectivity, planarity, etc.  
- Applications of counting techniques and graph theory. |
| Course Learning Outcomes | On successful completion of this course, students should be able to:  
CLO 1 demonstrate knowledge and understanding of the basic ideas and techniques of discrete mathematics  
CLO 2 solve various real-world problems by using counting techniques and graph theory  
CLO 3 develop their ability to read, comprehend, and create mathematical arguments |
| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in (MATH1013 and any 1 of Level 2 MATH courses) or (MATH1851 and MATH1853 and any 1 of level 2 MATH courses) or MATH2014 or (MATH1821 and MATH2822) |
| Offer in 2019 - 2020 | Y 1st sem Offer in 2020 - 2021 : Y |
| Grade Descriptors (A+ to F) | A  
Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.  
B  
Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.  
C  
Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.  
D  
Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.  
Fail  
Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution. |
| Course Type | Lecture-based course |
| Course Teaching & Learning Activities | Activities Details No. of Hours |
| Lectures | 36 |
| Tutorials | 12 |
| Reading / Self study | 100 |
| Assessment Methods and Weighting | Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping |
| Assignments | assignments, tutorials, participation, etc 10 CLO 1,2,3 |
| Examination | 50 CLO 1,2,3 |
| Test | 40 CLO 1,2,3 |
| Required/recommended reading and online materials | Richard A. Brualdi: Introductory Combinatorics (Pearson) |
| Course Website | http://moodle.hku.hk/ |
| Additional Course Information | Tutorial timetable:  
http://hkumath.hku.hk/~math/Timetable/timetable1920_S1.pdf |

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<td>Mathematics</td>
<td>Quota</td>
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<tr>
<td>Course Co-ordinator</td>
<td>Dr Z Zhang, Mathematics (<a href="mailto:zhangzw@maths.hku.hk">zhangzw@maths.hku.hk</a>)</td>
<td></td>
<td></td>
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<tr>
<td>Teachers Involved</td>
<td>(Dr Z Zhang,Mathematics)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course covers both the theoretical and practical aspects of numerical analysis. Emphasis will be on basic principles and methods of solution, using high speed computers.</td>
<td></td>
<td></td>
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</tbody>
</table>
| Course Contents & Topics | - Different types of errors, condition number, and convergence order.  
- Polynomial interpolation and function approximation.  
- Solution of equations of one variable.  
- Direct and iterative methods for solving linear systems.  
- Numerical differentiation and integration  
- Simple initial value problems for Ordinary Differential Equations. |
| Course Learning Outcomes | On successful completion of this course, students should be able to:  
CLO 1 construct and implement algorithms to find the zeros of functions, apply the bisection, Newton, Secant and fixed point iteration methods; and construct and implement Newton's method to solve a system of nonlinear equations  
CLO 2 apply direct and iterative methods for solving linear equation systems  
CLO 3 construct interpolation polynomials in Lagrange, Newton, Hermite and spline forms  
CLO 4 understand the basic numerical integration and differentiation methods  
CLO 5 apply Euler methods and Runge-Kutta methods to solve initial value problems |
| Quota | --- |
| Offer in 2019 - 2020 | Y 1st sem Offer in 2020 - 2021 : Y |
| Examination | 50 CLO 1,2,3 |
| Test | 40 CLO 1,2,3 |

| Teachers Involved | (Dr K H Law,Mathematics) |
2. M.A. Armstrong: Basic topology (UTM), Springer |
| Course Website | http://moodle.hku.hk/ |
| Additional Course Information | Tutorial timetable:  
http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf |
Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)

Offer in 2019 - 2020

Y 1st sem Offer in 2020 - 2021 : Y Examination Dec

Grade Descriptors (A+ to F)

A  Demonstrate an excellent understanding of key concepts and methods by being able to identify the appropriate theories/algorithms and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out numerical procedures carefully and correctly, and with some innovative approaches to solving problems.

B  Demonstrate a good understanding of key concepts and methods by being able to identify the appropriate theories/algorithms and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate algorithms or their applications or with some minor computational errors.

C  Demonstrate an acceptable understanding of key concepts and methods by being able to correctly identify appropriate theories/algorithms, but with some inadequacies in applying the theories/methods through incorrectly analysing problems with poor argument and presentation or with a number of minor computational errors.

D  Demonstrate some understanding of key concepts and methods by being able to correctly identify appropriate theories/algorithms, but with substantial inadequacies in applying the theories/methods through incorrectly analysing problems with poor argument and presentation or with substantial computational errors.

Fail  Demonstrate poor and inadequate understanding by not being able to identify appropriate theories/algorithms or their applications, or not being able to complete the solution.

Course Type: Lecture-based course

Course & Teaching Learning Activities

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<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<tbody>
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<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
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Assessment Methods and Weighting

<table>
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Examination</td>
<td></td>
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<td>Test</td>
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Required/recommended reading and online materials

Instructor's Lecture Notes
A. Ralston and P. Rabinowitz: A First Course in Numerical Analysis (McGraw-Hill)

Course Website
http://moodle.hku.hk/

Additional Course Information
Tutorial timetable:
http://hkumath.hku.hk/~math/Timetable/timetable1920_S1.pdf

MATH3603

Academic Year: 2019

Offering Department: Mathematics

Quota: ---

Teachers Involved: Dr Z Qu, Mathematics (zhengqu@maths.hku.hk)

Course Objectives
The emphasis of this course will be on probability models and their applications. The primary aim is to elucidate the fundamental principles of probability theory through examples and to develop the ability of the students to apply what they have learned from this course to widely divergent concrete problems.

Course Contents 
- Basic probability theory: random variable, discrete and continuous probability distributions, expectation, variance, moment generating function, strong law of large numbers, central limit theorem.
- Conditional probability theory: conditional probability, Bayes theorem, conditional expectation, conditional variance, compound random variable, Polya's urn model, Bose-Einstein statistics.
- Markov chain theory: concepts of states and transition probability, irreducibility, stationary distribution, limiting probabilities, reversibility, hidden Markov chain, applications in marketing and genetic problems, branching process, Markov decision process.
- Poisson process and reliability theory: exponential distribution, memoryless property, Poisson process, concepts of reliability, applications to server queue problems.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understood and recognize the fundamental principles of probability theory
CLO 2 explain the typical proofs and computational techniques in probability theory and apply them to concrete problems
CLO 3 demonstrate knowledge and understanding of various types of probability models

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)

Offer in 2019 - 2020

Y 1st sem Offer in 2020 - 2021 : Y Examination Dec

Grade Descriptors (A+ to F)

A  Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B  Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications or with some minor computational errors.

C  Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems and their applications through correctly analysing problems, but with some inadequacies in applying the theorems or their applications or with some minor computational errors.

D  Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or with substantial computational errors.

Fail  Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final Assessment</th>
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</thead>
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<tr>
<td>Reading / Self study</td>
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</tr>
</tbody>
</table>

Course Website
http://moodle.hku.hk/
MATH3901  Operations research I (6 credits)

Offering Department: Mathematics
Course Co-ordinator: Prof W Zang, Mathematics (wzang@maths.hku.hk)
Teachers Involved: (Prof W Zang, Mathematics)

Course Objectives:
The objective is to provide a fundamental account of the basic results and techniques of Linear Programming (LP) and its related topics in operations research. The topics include the simplex method, the dual simplex method, parametric programming, decomposition method, cutting plane methods and branch and bound.

Course Contents & Topics:
- Linear programming
- Duality theory
- Sensitivity analysis and parametric linear programming
- Integer programming methods

Course Learning Outcomes:
On successful completion of this course, students should be able to:

CLO 1 understand the fundamental concept and approach of linear programming appropriate to the further study of operations research
CLO 2 demonstrate knowledge and understanding of the underlying techniques of the simplex method and its extensions such as the dual simplex algorithm and the decomposition method
CLO 3 understand and apply the theory of integer programming

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in MATH2014 or MATH2101 or MATH2102

Offer in 2019 - 2020:
Y 1st sem Offer in 2020 - 2021: Y

Grade Descriptors (A+ to F):
A  Demonstrate an excellent understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and to solve problems with some innovative approaches.
B  Demonstrate a good understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
C  Demonstrate an acceptable understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
D  Demonstrate some understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational error.
Fail  Demonstrate poor and inadequate understanding by not being able to identify basic principles, appropriate theorems, algorithms or their applications, or not being able to complete or compute the solution.

Course Type: Lecture-based course

Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
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<tr>
<td>Assignments</td>
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<td>Examination</td>
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<tr>
<td>Test</td>
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<td>CLO 1.2,3</td>
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MATH3904  Introduction to optimization (6 credits)

Offering Department: Mathematics
Course Co-ordinator: Prof W Zang, Mathematics (wzang@maths.hku.hk)

Course Objectives:
This course introduces students to the theory and techniques of optimization, aiming at preparing them for further studies in operations research, mathematical economics and related subject areas.

Course Contents & Topics:
- Unconstrained and constrained optimization.
- Necessary conditions and sufficient conditions for optimality, convexity, duality.
- Algorithms and numerical examples.

Course Learning:
On successful completion of this course, students should be able to:
Queueing theory and simulation (6 credits)

Pre-requisites
Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)

Course Type
Lecture-based course

Course Teaching & Learning Activities
- Lectures: 36
- Tutorials: 12
- Reading / Self study: 100

Assessment Methods and Weighting
- Examination: 50 CLO 1,2,3
- Test: 50 CLO 1,2,3

Required/recommended reading and online materials
Instructor's lecture notes

Additional Course Information
http://moodle.hku.hk/
http://hkumath.hku.hk/~math/Timetable/timetable1920_S1.pdf

MATH3905 Queueing theory and simulation (6 credits)
Offering Department Mathematics
Course Co-ordinator Dr G Han, Mathematics (ghan@maths.hku.hk)

Teachers Involved

Course Objectives
This course introduces students to the models and theory of queueing system, as well as the technique of simulation as a practical tool of analysis.

Course Contents & Topics
- Simulation of queueing models and discrete-event systems.
- Introduction of the Monte Carlo (MC) method and Markov Chain Monte Carlo (MCMC) method.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the terminology and nomenclature appropriate to queueing theory
CLO 2 demonstrate knowledge and understanding of various queueing models
CLO 3 formulate concrete problems using queueing theoretical approaches
CLO 4 become familiar with fundamental principles of simulation and compare different simulation techniques
CLO 5 use Monte Carlo method and Markov Chain Monte Carlo method to conduct numerical simulations

Pre-requisites
Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)

Course Type
Lecture-based course

Assessment Methods and Weighting
- Examination: 50 CLO 1,2,3,4,5

Course Co-ordinator
Dr G Han, Mathematics (ghan@maths.hku.hk)

Department of Mathematics
### Required/recommended reading and online materials

### Course Website
- http://moodle.hku.hk/

### Course Information

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
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<th>Offer in 2020 - 2021</th>
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<td>Offer in 2020 - 2021 : Y</td>
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<td>Examination</td>
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<td>Weighting in final course grade (%)</td>
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<td>CLO 1,2,3,4</td>
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<td>Assessment Methods to CLO Mapping</td>
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<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No. of Hours</td>
<td>Details</td>
<td>Method</td>
</tr>
</tbody>
</table>

### Course Objectives
On successful completion of this course, students should be able to:
- CLO 1 understand the terminology and nature of bonds, interest rates, forwards, futures, stocks, options, and the no-arbitrage-principle
- CLO 2 demonstrate knowledge on using binomial tree models to find option prices via the risk-neutral concept
- CLO 3 describe basic properties of a Brownian motion and the Black-Scholes stock price model
- CLO 4 implement stochastic calculus (such as Ito's Lemma) to derive Black-Scholes pricing partial differential equation on various type of options; and find a solution to this partial differential equation

### Pre-requisites and Co-requisites
Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822) or STAT2601

### Course Type
Lecture-based course

### Course Teaching & Learning Activities
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<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<tr>
<td>Lectures</td>
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<td>36</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand the basic terminology and solution concepts in game theory
- CLO 2 compute explicitly different solution concepts for some simple cooperative and non-cooperative games
- CLO 3 apply game theoretical ideas and methods to solve some problems in economics and biology

### Pre-requisites and Co-requisites
Pass in (MATH2101 and MATH2211) or (MATH1821 and MATH2822)
MATH3943  

**Course Type**  
Lecture-based course  

**Course Teaching & Learning Activities**  
<table>
<thead>
<tr>
<th>Activities</th>
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<tr>
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**Assessment Methods and Weighting**  
<table>
<thead>
<tr>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments, tutorials, participation etc</td>
<td>5</td>
<td>CLO 1, 2, 3</td>
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<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1, 2, 3</td>
<td></td>
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<tr>
<td>Project reports</td>
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<td>CLO 1, 2, 3</td>
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<tr>
<td>Test</td>
<td>25</td>
<td>CLO 1, 2, 3</td>
<td></td>
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</tbody>
</table>

**Required/recommended reading and online materials**  
- **Course Website**: [http://moodle.hku.hk/](http://moodle.hku.hk/)  
- **Additional Course Information**: Tutorial timetable: [http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf](http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf)

**Offer in 2019 - 2020**  
Y  2nd sem  Offer in 2020 - 2021 : Y  

**Grade Descriptors (A+ to F)**  
A Demonstrate an excellent understanding of key concepts and ideas of Game Theory by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and to solve problems with some innovative approaches.  
B Demonstrate a good understanding of key concepts and ideas of Game Theory by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.  
C Demonstrate an acceptable understanding of key concepts and ideas of Game Theory by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.  
D Demonstrate some understanding of key concepts and ideas of Game Theory by being able to identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.  
Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.  

**Course Content & Topics**  
- Graphs and algorithms.  
- Trees, matchings and paths.  
- Network models of transportation and assignment problems.  
- Ford-Fulkerson network flow theory and computation for maximum flow and minimum cost flow algorithms.  
- Applications to combinatorial optimization problems such as allocation, location and sequencing.  
- Project networks, if time permits.  

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:  
CLO 1 understand the fundamental concept and approach of graphs and network models appropriate to the further study of operations research  
CLO 2 demonstrate knowledge and understanding of the underlying techniques of the various graph and network algorithms and their extensions  
CLO 3 understand the theory of network flows and the duality aspects in such methods of flow computations  

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in (MATH2101 and MATH2211) or MATH2014; and Pass in MATH3901, or already enrolled in this course.

**Offering Department**  
Mathematics  

**Course Co-ordinator**  
Prof W Zang, Mathematics (wzang@maths.hku.hk)  

**Course Learning Outcomes**  
CLO 1 understand the fundamental concept and approach of graphs and network models appropriate to the further study of operations research  
CLO 2 demonstrate knowledge and understanding of the underlying techniques of the various graph and network algorithms and their extensions  
CLO 3 understand the theory of network flows and the duality aspects in such methods of flow computations  

**Accreditation**  
Academic Year: 2019  

**Grade Descriptors (A+ to F)**  
A Demonstrate an excellent understanding of key concepts and ideas of Game Theory by being able to identify basic principles, appropriate theorems, algorithms and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and to solve problems with some innovative approaches.  
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Fail Demonstrate poor and inadequate understanding by not being able to identify basic principles, appropriate theorems, algorithms or their applications, or not being able to complete or compute the solution.  

**Course Type**  
Lecture-based course  

**Course Teaching & Learning Activities**  
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<tr>
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**Assessment Methods and Weighting**  
<table>
<thead>
<tr>
<th>Methods</th>
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<tbody>
<tr>
<td>Assignments, tutorials, participation etc</td>
<td>5</td>
<td>CLO 1, 2, 3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1, 2, 3</td>
<td></td>
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<tr>
<td>Project reports</td>
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<tr>
<td>Test</td>
<td>25</td>
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**Course Content & Topics**  
- Graphs and algorithms.  
- Trees, matchings and paths.  
- Network models of transportation and assignment problems.  
- Ford-Fulkerson network flow theory and computation for maximum flow and minimum cost flow algorithms.  
- Applications to combinatorial optimization problems such as allocation, location and sequencing.  
- Project networks, if time permits.  

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:  
CLO 1 understand the fundamental concept and approach of graphs and network models appropriate to the further study of operations research  
CLO 2 demonstrate knowledge and understanding of the underlying techniques of the various graph and network algorithms and their extensions  
CLO 3 understand the theory of network flows and the duality aspects in such methods of flow computations  

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in (MATH2101 and MATH2211) or MATH2014; and Pass in MATH3901, or already enrolled in this course.

**Offer in 2019 - 2020**  
Y  2nd sem  Offer in 2020 - 2021 : N  

**Grade Descriptors (A+ to F)**  
A Demonstrate an excellent understanding of key concepts and ideas of Game Theory by being able to identify basic principles, appropriate theorems, algorithms and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and to solve problems with some innovative approaches.  
B Demonstrate a good understanding of key concepts and ideas of Game Theory by being able to identify basic principles, appropriate theorems, algorithms and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.  
C Demonstrate an acceptable understanding of key concepts and ideas of Game Theory by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.  
D Demonstrate some understanding of key concepts and ideas of Game Theory by being able to identify basic principles, appropriate theorems, algorithms and their applications but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.  
Fail Demonstrate poor and inadequate understanding by not being able to identify basic principles, appropriate theorems, algorithms or their applications, or not being able to complete or compute the solution.  

**Course Type**  
Lecture-based course  

**Course Teaching & Learning Activities**  
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**Assessment Methods and Weighting**  
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
</table>
MATH3999
Offering Department: Mathematics
Quota: ---

Course Objectives:
This course is designed for students who would like to have early experiences on research related independent studies.

Course Learning Outcomes:
On successful completion of this course, students should be able to:

- CLO 1: Understand basic examples of principal ideal domains and why principal ideal domains are unique factorization domains.
- CLO 2: Understand how mathematical theories are applied and/or extended in problem-solving.
- CLO 3: Gain experience in project writing and oral presentation.

Pre-requisites (and Co-requisites and Impermissible combinations):
Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX or MATH7XXX) in the Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors, in addition to a pass in MATH2101, MATH2102, MATH2211 and MATH2241.

Subject to approval by the Department.

This capstone course is for Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors students only.

The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020:
Y 1st sem 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F):
A Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Insightful use and critical evaluation of information drawn from a broad range of high quality sources and to reference aptly. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

B Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to reference aptly. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to reference aptly. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type: Project-based course

Assessment Methods and Weighting:
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Dissertation Written report plus oral presentation 100 CLO 1,2,3

MATH4302
Offering Department: Mathematics
Quota: ---

Course Objectives:
This course is an extension of MATH3301 and continues with more advanced topics in algebra. The course may be followed by MATH7501 and MATH7502.

Course Contents & Topics:
- Principal ideal domains and unique factorization domains;
- Structure theorem for finitely generated modules of principal ideal domains with applications to finitely generated abelian groups and canonical forms of matrices;
- Field extensions; introduction to Galois theory.

Course Learning Outcomes:
On successful completion of this course, students should be able to:

- CLO 1: Understand basic examples of principal ideal domains and why principal ideal domains are unique factorization domains.
- CLO 2: Understand the classification of finitely generated modules of principal ideal domains and certain canonical forms of matrices.
- CLO 3: Understand and compute splitting fields of irreducible polynomials.
- CLO 4: Compute examples of Galois groups.

Pre-requisites (and Co-requisites and Impermissible combinations):
Pass in MATH2102 and MATH3301

Offer in 2019 - 2020:
Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F):
A Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation.
Department of Mathematics

Offering Department: Mathematics

Course Objectives

A. Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B. Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

C. Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

D. Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail. Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities | Details | No. of Hours
--- | --- | ---
Lectures | 36
Tutorials | 12
Reading / Self study | 100

Assessment Methods and Weighting

Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Assignments | 10 | CLO 1,2,3,4
Examination | 50 | CLO 1,2,3,4
Test | 40 | CLO 1,2,3,4

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk/

Additional Course Information

Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

MATH4402 Analysis II (6 credits)

Offering Department: Mathematics

Course Co-ordinator: Dr Y M Chan, Mathematics (ymchan@maths.hku.hk)

Teachers Involved: Dr Y M Chan, Mathematics

Course Objectives

This course gives a comprehensive and rigorous treatment on calculus of several variables, and a modern treatment of integration theory in the language of differential forms which is essential for more advanced studies in analysis and geometry.

Course Contents & Topics

- Differentiation of functions of several variables: partial derivatives, differential, differentiability, inverse function theorem, implicit function theorem, submanifolds in R^n, method of Lagrange multipliers.
- Integration in R^n: Basic definitions, measure zero and content zero sets, integrability, Fubini's Theorem, partition of unity, change of variables.
- Integration on chains: tensors, alternating tensors, vector fields, differential forms, Poincare Lemma, Stokes' Theorem.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1. Demonstrate knowledge and understanding of the modern language of mathematical analysis and geometry (e.g., able to manipulate differential forms)

CLO 2. Demonstrate skills acquired in mathematical analysis to analyze and handle novel situations in a critical way (e.g., able to determine the differentiability and integrability of specific functions)

CLO 3. Think creatively and laterally to generate innovative solutions to novel problems (e.g., able to do integration of specific functions on chains)

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH3401

Offer in 2019 - 2020 Grade Descriptors (A+ to F)

Y | 2nd sem |
--- | --- |
A | Examination May
B | Examination May

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities | Details | No. of Hours
--- | --- | ---
Lectures | 36
Tutorials | 12
Reading / Self study | 100

Assessment Methods and Weighting

Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Examination | 50 | CLO 1,2,3
Test | 50 | CLO 1,2,3

Required/recommended reading and online materials

Apostol: Mathematical Analysis
Munkres: Analysis on Manifolds
Rudin: Principles of Mathematical Analysis
Spivak: Calculus on Manifolds
MATH4404

Functional analysis (6 credits)

Offering Department: Mathematics

Course Co-ordinator: Dr Y Gao, Mathematics (gaoyu90@hku.hk)

Course Objectives:

This course introduces students to the basic knowledge of linear functional analysis, an important branch of modern mathematics.

Course Contents & Topics:

- Spectral theory of linear operators.

Course Learning Outcomes:

On successful completion of this course, students should be able to:

CLO 1 compare and contrast (i) finite and infinite dimensional linear spaces, (ii) complete and incomplete linear space, and (iii) normed and inner product spaces; in particular, recognize the importance of completeness and discuss how vectors are represented in these spaces

CLO 2 understand the notions of Banach spaces and Hilbert Spaces. State and apply fundamental theorems in these spaces

CLO 3 discuss the dual spaces of some standard Banach spaces

CLO 4 discuss the boundedness of linear operators and the spectra of special linear operators

Pre-requisites (and Co-requisites and Impermissible combinations):

Pass in MATH2101, MATH2102, MATH2211, MATH2241 and MATH3401

Offer in 2019 - 2020:

Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F):

A: Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

C: Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, and with some inadequacies in applying the theorems through correctly analysing problems with poor argument and presentation or a number of minor computational errors.

D: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type: Lecture-based course

Assessment Methods and Weighting:

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 10 CLO 1,2,3,4
Examination 50 CLO 1,2,3,4
Test 40 CLO 1,2,3,4

Required/recommended reading and online materials:


Course Website: http://moodle.hku.hk/

Additional Course Information:

Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

MATH4406

Introduction to partial differential equations (6 credits)

Offering Department: Mathematics

Course Co-ordinator: Dr T K Wong, Mathematics (takkwong@maths.hku.hk)

Course Objectives:

This course introduces students to the basic techniques for solving partial differential equations as well as the underlying theories.

Course Content & Topics:

- Green's function, generalized functions and fundamental solutions.
- Maximum principle, existence, uniqueness and continuous dependence on data.
- If time permits Cauchy-Kowalevski theorem, variational method, nonlinear partial differential equations.

Course Learning Outcomes:

On successful completion of this course, students should be able to:

CLO 1 apply the tools of calculus, linear algebra, mathematical analysis in a coherent way to PDE problems

CLO 2 understand the basic theory of partial differential equations and the methods to solve them

CLO 3 apply the knowledge of partial differential equations to physical sciences and engineering

Pre-requisites (and Co-requisites)

Pass in MATH2101, MATH2102, MATH2241; and
Pass in MATH3405, or already enrolled in this course.

Course Website: http://moodle.hku.hk/

Additional Course Information:

Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

MATH4404

Functional analysis (6 credits)

Offering Department: Mathematics

Course Co-ordinator: Dr T K Wong, Mathematics (takkwong@maths.hku.hk)

Course Objectives:

This course introduces students to the basic knowledge of linear functional analysis, an important branch of modern analysis.

Course Contents & Topics:

- Spectral theory of linear operators.

Course Learning Outcomes:

On successful completion of this course, students should be able to:

CLO 1 compare and contrast (i) finite and infinite dimensional linear spaces, (ii) complete and incomplete linear space, and (iii) normed and inner product spaces; in particular, recognize the importance of completeness and discuss how vectors are represented in these spaces

CLO 2 understand the notions of Banach spaces and Hilbert Spaces. State and apply fundamental theorems in these spaces

CLO 3 discuss the dual spaces of some standard Banach spaces

CLO 4 discuss the boundedness of linear operators and the spectra of special linear operators

Pre-requisites (and Co-requisites and Impermissible combinations):

Pass in MATH2101, MATH2102, MATH2211, MATH2241 and MATH3401

Offer in 2019 - 2020:

Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F):

A: Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

C: Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, and with some inadequacies in applying the theorems through correctly analysing problems with poor argument and presentation or a number of minor computational errors.

D: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type: Lecture-based course

Assessment Methods and Weighting:

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 10 CLO 1,2,3,4
Examination 50 CLO 1,2,3,4
Test 40 CLO 1,2,3,4

Required/recommended reading and online materials:


Course Website: http://moodle.hku.hk/

Additional Course Information:

Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf
Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.</td>
</tr>
</tbody>
</table>

Course Type: Lecture-based course

Grade Descriptors:
- A: Excellent understanding
- B: Good understanding
- C: Acceptable understanding
- D: Some understanding
- F: Poor understanding

Grade Descriptors (A+ to F) and Weighting:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>40</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

Pre-requisites and Impermissible combinations:
- Pass in (MATH2101 and MATH2211), and Pass in (MATH3401 or MATH3403 or MATH3405).
- Students are strongly recommended to have taken MATH3401.

Course Objectives:
As geometric forms often appear in nature, the study of geometry helps us to understand better the universe in which we live. Moreover, geometry has much intrinsic beauty and the study of it is an excellent training in intuitive thinking. In this course we study the differential geometry of curves and surfaces in 3-space. In the study of regular surfaces in 3-space we exhibit geometric notions that are definable in terms of metrical properties of these surfaces alone, leading to the intrinsic geometry of surfaces.

Course Contents & Topics:
- Plane and space curves, regular surfaces in three-dimensional Euclidean space.
- The Gauss map, Gaussian and mean curvatures, Gauss's Theorem Egregium, geodesics, Gauss-Bonnet Theorem.

Course Learning Outcomes:
On successful completion of this course, students should be able to:
- CLO 1 understand the fundamental properties of curves and surfaces in space
- CLO 2 compute and interpret the Frenet apparatus, fundamental forms and their derived quantities
- CLO 3 understand the basics of intrinsic geometry of surfaces

Required/recommended reading and online materials:

Required/recommended reading and online materials:
Course Website | http://moodle.hku.hk/
--- | ---
Additional Course Information | Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S1.pdf

<table>
<thead>
<tr>
<th>Course</th>
<th>MATH4511</th>
<th>Introduction to differentiable manifolds (6 credits)</th>
<th>Academic Year</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Mathematics</td>
<td>Quota</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Mathematics</td>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>---</td>
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</tbody>
</table>

Course Objectives | The course aims at introducing students to the notion of differentiable manifolds and basic concepts and tools for their study. The course also aims at presenting concrete examples that are relevant to further fields of study. |

Course Contents & Topics | - Review on functions of several variables, inverse mapping theorem, implicit function theorem. - Differentiable manifolds: definitions and examples. - Maps between manifolds, submanifolds. Differential forms and exterior differentiation. - Integration on manifolds. - The tangent bundle, distributions and Frobenius Theorem. - Further topics. |

Course Learning Outcomes | On successful completion of this course, students should be able to: |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>speak the language of differentiable manifolds such as that of vector fields, differential forms, vector bundles, and integration on manifolds</td>
</tr>
<tr>
<td>CLO 2</td>
<td>present a number of examples of differentiable manifolds and carry out explicit calculations on such examples</td>
</tr>
</tbody>
</table>

Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in MATH3401 (having taken MATH4501 would be helpful; the course can also be taken concurrently with MATH4402). |

Offer in 2019 - 2020 | N | Offer in 2020 - 2021 : Y | Examination | --- |

Grade Descriptors (A+ to F) | A | Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems. |
| B | Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors. |
| C | Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or with a number of minor computational errors. |
| D | Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors. |
| Fail | Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution. |

Course Type | Lecture-based course |

Course Teaching & Learning Activities | Activities | Details | No. of Hours |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>---</td>
<td>---</td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td>Reading / Self study</td>
<td>---</td>
<td>12</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting | Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>---</td>
<td>---</td>
<td>10</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Examination</td>
<td>---</td>
<td>---</td>
<td>50</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Test</td>
<td>---</td>
<td>---</td>
<td>40</td>
<td>CLO 1,2</td>
</tr>
</tbody>
</table>


Course Website | http://moodle.hku.hk/ |

MATH4602 | Scientific computing (6 credits) | Academic Year | 2019 |
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Mathematics</td>
<td>Quota</td>
<td>---</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof X Yuan, Mathematics (<a href="mailto:xyuan@hku.hk">xyuan@hku.hk</a>)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof X Yuan, Mathematics</td>
<td>---</td>
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</tbody>
</table>

Course Objectives | To learn some basic theoretical and computational techniques for solving scientific computing problems. |

Course Contents & Topics | This course covers matrix computation problems, least squares problems, optimization problems, ordinary differential equations and partial differential equations. The contents may slightly vary from year to year. |

Course Learning Outcomes | On successful completion of this course, students should be able to: |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>apply direct methods to solve linear systems</td>
</tr>
<tr>
<td>CLO 2</td>
<td>apply iterative methods to solve linear systems</td>
</tr>
<tr>
<td>CLO 3</td>
<td>apply basic numerical methods to compute eigenvalues and eigenvectors of a matrix</td>
</tr>
<tr>
<td>CLO 4</td>
<td>implement singular value decomposition and understand its applications</td>
</tr>
<tr>
<td>CLO 5</td>
<td>understand basic theory and numerical methods for least squares problems</td>
</tr>
<tr>
<td>CLO 6</td>
<td>understand basic theory and numerical methods for optimization problems</td>
</tr>
<tr>
<td>CLO 7</td>
<td>apply numerical methods to solve simple ordinary differential equations</td>
</tr>
<tr>
<td>CLO 8</td>
<td>apply numerical methods to solve one-dimensional partial differential equations</td>
</tr>
</tbody>
</table>

Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in MATH3601 |

Offer in 2019 - 2020 | Y | Offer in 2020 - 2021 : Y | Examination | May |

Grade Descriptors (A+ to F) | A | Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and numerical algorithms and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems. |

Department of Mathematics
Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Two assignments 20 CLO 1,2,3,4,5,6,7,8
Essay Summary of the study 10 CLO 1,2,3,4,5,6,7,8
Examination Final exam 50 CLO 1,2,3,4,5,6,7,8
Test 20 CLO 1,2,3,4,5

Required/recommended reading and online materials
James W. Demmel: Applied Numerical Linear Algebra, SIAM, 1 Aug 1997
Peter E. Kloeden and Eckhard Platen: Numerical Solution of Stochastic Differential Equations

Course Website
http://moodle.hku.hk/

Additional Course Information
Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

MATH4902 Operations research II (6 credits) Academic Year 2019
Offering Department Mathematics
Course Co-ordinator Dr G Han, Mathematics (ghan@maths.hku.hk)
Teachers Involved

Course Objectives
The objective is to provide a fundamental account of the basic results and techniques of dynamic programming (DP), Markov decision processes (MDP), Queuing Theory (QT) and simulation in operations research. There is emphasis on aspects of algorithms as well as applications. The course serves, together with courses on linear programming and network models, to provide essential optimization concept and algorithms for more advanced studies in operations research.

Course Contents & Topics
- Dynamic programming (deterministic/stochastic)
- Markov decision process (discounted/average costs)
- Queuing Theory
- Simulation

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand the terminology and nomenclature appropriate to dynamic programming, Markov decision process, queueing theory and simulation
CLO 2 explain the typical techniques employed in dynamic programming, Markov decision process, queueing theory and simulation
CLO 3 demonstrate the knowledge on algorithms for a variety of problems in operations research

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in MATH2101, MATH2211 and MATH3603.

Offer in 2019 - 2020
N Offer in 2020 - 2021 : N Examination ---

Grade Descriptors (A to F)
A Demonstrate an excellent understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications through correctly analysing problems, clearly and elegantly presenting correct logic, reasoning and argumentation and being able to carry out computations carefully and correctly, and to solve problems with some innovative approaches.
B Demonstrate a good understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
C Demonstrate an acceptable understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
D Demonstrate some understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems and numerical algorithms or their applications, or not being able to complete the solution.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100
### Course Objectives

This course aims at providing effective numerical methods as well as their theoretical aspects for solving problems arisen from financial derivatives and asset pricing.

- Lattice methods, Monte Carlo simulations and their performance analyses.

### Course Contents & Topics

- Introduction to the mathematical theory of vanilla and exotic options, both the PDE and the Martingale approach.

### Course Learning Outcomes

On successful completion of this course, students should to be:

- CLO 1 demonstrate knowledge and understanding of the martingale theory in option pricings as well as related financial derivatives.
- CLO 2 implement and analyse various numerical methods on the Black-Scholes pricing differential equation.
- CLO 3 understand the connection between the binomial tree method and the finite difference method of the Black-Scholes pricing differential equation.
- CLO 4 implement and analyse Monte Carlo simulation methods on the martingale pricing formula.

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH3908 or equivalent.

### Offer in 2019 - 2020

Y 2nd sem Offer in 2020 - 2021 : Y

### Activities Details No. of Hours

| Lectures | 36 |
| Tutorials | 12 |
| Reading / Self study | 100 |

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>50</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

### Assessment Methods Details

<table>
<thead>
<tr>
<th>Methods</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td>40</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Required/Recommended reading and online materials

- P. Tihy: Markov Decision Processes (COMAP, Inc. 1983)
- Alison Etheridge: A Course in Financial Calculus (Cambridge University Press)

### Course Website

http://moodle.hku.hk/
Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 explain and discuss the contents of the topics they studied
- CLO 2 critique and argue about the ideas and theories of the work they studied
- CLO 3 organize and synthesize the material they have learned, and report orally and in writing using mathematical language

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors. Subject to approval by the Department.

This capstone course is for Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020 Grade Descriptors (A+ to F)

A 2nd sem Offer in 2020 - 2021: Y Examination No Exam

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 demonstrate an excellent understanding of the material by lucid exposition. Engage constructively by providing insightful analyses and raising critical points in group discussion. Demonstrate clear and critical analysis, coherent synthesis, and effective application of the knowledge through writing and oral presentation using mathematical language.
- CLO 2 demonstrate a good understanding of the material by mostly clear and effective presentation. Engage actively in group discussion most of the time with some useful input. Demonstrate moderately clear and effective analysis, synthesis, and application of the knowledge through writing and oral presentation using mathematical language.
- CLO 3 demonstrate a general understanding of the material by moderately effective presentation. Engage in group discussion most of the time with some useful input. Demonstrate moderately clear and effective analysis, synthesis, and application of the knowledge through writing and oral presentation using mathematical language.

Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors. Subject to approval by the Department.

This capstone course is for Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020 Grade Descriptors (A+ to F)

A 2nd sem Offer in 2020 - 2021: Y Examination No Exam

Course Type

Project-based course

Course Teaching & Learning Activities

- Activities: Details
  - Meeting with supervisor: Seminars: Students take turns to give presentations to the whole class; group discussions.
  - Reading / Self study: Reading material and preparation for presentations and discussions; writing of reports/research papers.

No. of Hours

- 36
- 100

Assessment Methods and Weighting

- Methods: Details
  - Dissertation: Based on class participation and group discussions.
  - Oral presentation: Seminar presentations.
  - Research report: Written report / research paper: Individual and/or group reports/research papers totally no more than 10,000 words.

- Weighting in final course grade (%)
  - 20
  - 30
  - 50

- Assessment Methods to CLO Mapping
  - CLO 1,2,3

Required/recommended reading and online materials

TBC

Course Website

http://moodle.hku.hk/
Course Type: Project-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting with supervisor</td>
<td>Students meet with their supervisor(s) to present results or to discuss their progress.</td>
<td>20</td>
</tr>
<tr>
<td>Assessment</td>
<td>Project work: Students work on their project</td>
<td>130</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissertation</td>
<td>Coursework assessment: Based on participation and collaboration throughout the whole project.</td>
<td>20</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>Oral presentation components of the project may include seminars, lectures, oral reports, audio recordings, etc.</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Research report</td>
<td>Written report / media production: This part may include written reports, booklets, exhibition materials, video productions, computer software, etc.</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

TBC

**Course Website**

http://moodle.hku.hk/

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MATH4996

Mathematics internship (6 credits)

**Offering Department** Mathematics

**Course Co-ordinator** Dr C W Wong, Mathematics (internship@maths.hku.hk)

**Teachers Involved** (All teaching staff, Mathematics)

**Course Objectives**

This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great benefit to the students to apply their knowledge gained in the study to the real work environments. Students have to take on at least 160 hours of internship work either within the University or outside the University arranged by the department.

Within the university: each student will be supervised by a staff member (supervisor), working on a project or various tasks as instructed by the supervisor.

Outside the university: each student will carry out approved work under the guidance and supervision of an external supervisor.

**Course Contents & Topics**

The aim of the course is to provide students with the opportunity to formulate and to investigate, in depth, problems they are interested to enrol in this course should contact the Department to obtain the approval.

Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 gain work experience in an industry related to mathematical sciences
- CLO 2 have an understanding of how mathematics is used to solve real-world problems

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors.

This capstone course is for Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors students only.

The earliest that a student is allowed to take this capstone course is their year 3 study.

**Offer in 2019 - 2020**

Y 1st sem 2nd sem Summer Offer in 2020 - 2021: Y

**Grade Descriptors (Pass /Pass with distinction /Fail)**

- **Pass** Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of “Distinction”.

- **Fail** Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.

**Course Type** Internship

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internship work</td>
<td>it is expected that students are to work at least 160 hours (or the equivalent of 4 weeks full-time)</td>
<td>160</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written report</td>
<td>written report, employer’s feedback and oral presentation</td>
<td>100</td>
<td>CLO 1,2</td>
</tr>
</tbody>
</table>

**Additional Course Information**

Satisfactory completion of this course can be counted towards the Capstone requirement. Details of internship will be recorded on the student's transcript. This course will be assessed on "Pass/Fail" basis. Students who are interested to enroll in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

**MATH4999**

Mathematics project (12 credits)

**Offering Department** Mathematics

**Course Co-ordinator** Prof T W Ng, Mathematics (ntw@maths.hku.hk)

**Teachers Involved** (All teaching staff, Mathematics)

**Course Objectives**

The aim of the course is to provide students with the opportunity to formulate and to investigate, in depth, problems
of practical interest and/or to have a foretaste of mathematical research. The work, to be done on an individual
basis, is considered a highly desirable part of the training of a mathematician.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 analyze rational functions on the Riemann Sphere and analyze elliptic functions, equivalently meromorphic
  functions, on elliptic curves.
- CLO 2 formulate various classical existence problems on meromorphic functions and reduce them to analytic or
  cohomological problems, being able to solve them in certain typical cases.
- CLO 3 identify the key arguments in the proofs of various mathematical results concerning meromorphic functions
  on compact Riemann surfaces or on plain domains and apply them in solving problems.
- CLO 4 identify the key elements in the theoretic foundation of various additional topics covered in the course and
  apply them in solving problems.

Pre-requisites
Pass in a first course in Complex Analysis such as MATH3403, and approval by the course coordinator.

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y Examination No Exam

Grade Descriptors (A+ to F)
A
Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and
their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation
and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B
Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their
applications through correctly analysing problems, but with some minor inadequacies in applying the theorems through
incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

C
Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems,
but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and
presentation or a number of minor computational errors.

D
Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with

Course Contents & Topics
The subject matter of the project will be determined by consultation between the student and his/her supervisor. The
projects will be selected from areas of pure and applied mathematics. Students must achieve good standing
and get the approval from both the prospective supervisor and the course co-ordinator to take this course.

Course Type
Project-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Reading / Self study independent work & to attend meetings & seminars 240

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Dissertation Written report plus oral presentation 100 CLO 1,2,3,4

MATH7101 Intermediate complex analysis (6 credits) Academic Year 2019
Offering Department Mathematics Quota ---
Course Co-ordinator Prof N Mok, Mathematics (nmok@hku.hk)
Teachers Involved (Dr X Zhang, Mathematics) (Prof N Mok, Mathematics)
Course Objectives
The objective is to familiarize students with analytic, algebraic and geometric concepts and techniques in the study of
Complex Analysis in a single variable beyond an introductory course on functions of a complex variable.

Course Contents & Topics
- In the course we study meromorphic functions on compact Riemann surfaces and on open Riemann surfaces
  using analytic and algebraic techniques. Topics on meromorphic functions include the constructions of
  meromorphic functions on compact Riemann surfaces, the Mittag-Leffler Problem and the Weierstrass Problem on compact
  Riemann surfaces and on open Riemann surfaces.
- In the course of study of meromorphic functions, sheaf cohomology theory and cohomology theories in terms of
differential forms will be introduced.
- A choice of other topics may be included. Examples of possible topics include normal families, the Riemann
  Mapping Theorem, geometric theory of holomorphic mappings, potential theory in one complex variable, complex
dynamics, and special functions.

Pre-requisites and Co-requisites (and Impermissible combinations)
Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors.

Subject to approval by the Department.
This capstone course is for Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors students only.
The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020
Y Year long Offer in 2020 - 2021 : Y Examination No Exam

Grade Descriptors (A+ to F)
A
Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of
original thought. Insightful use and critical evaluation of information drawn from a broad range of high quality sources and
to reference aptly. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective
organizational and presentational skills.

B
Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Critical use of
relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations
and to reference aptly. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and
presentational skills.

C
Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking.
Use of relevant information from sources, showing ability to make comparisons between different interpretations and to reference
aptly. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective
organizational and presentational skills.

D
Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and
logical thinking, but with limited analytical and critical abilities. Demonstrate use of data and results, but mainly
through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions.
Apply limited or barely effective organizational and presentational skills.

Fail
Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of
analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of
them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are
minimally effective or ineffective.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 study independently and in depth an advanced topic that is not available in the regular curriculum
- CLO 2 analyze and synthesize information gathered from different sources
- CLO 3 articulate their findings and conclusions
- CLO 4 give an exposition of their work in a written report

Assessment Methods
Examination
No Exam

No. of Hours
240

Assessment Methods to CLO Mapping
100 CLO 1,2,3,4

CLO 1 identify the key arguments in the proofs of various mathematical results concerning meromorphic functions
in the Mathematics/ Mathematics (Intensive), and Mathematics/Physics Majors.

CLO 2 formulate various classical existence problems on meromorphic functions and reduce them to analytic or
cohomological problems, being able to solve them in certain typical cases.

CLO 3 identify the key arguments in the proofs of various mathematical results concerning meromorphic functions
on compact Riemann surfaces or on plain domains and apply them in solving problems.

CLO 4 give an exposition of their work in a written report.

Grade Descriptors (A+ to F)
A
Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and
their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation
and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B
Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their
applications through correctly analysing problems, but with some minor inadequacies in applying the theorems through
incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

C
Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems,
but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and
presentation or a number of minor computational errors.

D
Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with

Course Contents & Topics
The earliest that a student is allowed to take this capstone course is their year 3 study.
### MATH7201

**Offering Department**: Mathematics  
**Course Co-ordinator**: TBC, Mathematics ()

#### Course Objectives

This course introduces to students a main area of differential geometry beyond the notion of manifolds and the calculus of differential forms and prepares them to study further and to do research in geometry.

- The topic varies according to the year and the instructor. For example, it can be one of (but not restricted to) the following:
  1. Riemannian geometry: affine and Levi-Civita connection, Riemann curvature tensor, spinor bundles, Laplace and Dirac operators, harmonic forms and spinors, applications in relativity;
  2. Symplectic geometry: symplectic vector spaces, symplectic manifolds, Lagrangian submanifolds, Hamiltonian group actions, moment maps, symplectic quotients, convexity theorems, localization;
  3. Vector bundles: vector bundles, connection and curvature, characteristic forms and classes, superconnections, transgression, topological K-theory, introduction to index theory.

#### Course Contents & Topics

- The course concludes with a choice of topics on analytic and geometric aspects of the theory of complex manifolds.
- It proceeds to introduce the theory of harmonic forms, establishing fundamental results on compact complex manifolds including Serre duality, the Kodaira Vanishing Theorem, the Kodaira Embedding Theorem and Hodge decomposition on compact Kahler manifolds.
- The course concludes with a choice of topics on analytic and geometric aspects of the theory of complex manifolds including Serre duality, the Kodaira Vanishing Theorem, the Kodaira Embedding Theorem and Hodge decomposition on compact Kahler manifolds.

#### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 have a working knowledge of the calculus of differential forms beyond the level of MATH3511
- CLO 2 understand the keys points of the particular subject chosen and be ready to learn other topics in Geometry

#### Required/recommended reading and online materials

R. Narasimhan: Complex Analysis in One Variable (Birkhauser, 2001, 2nd edition)  
O. Forster: Lectures on Riemann Surfaces (Springer-Verlag, 1981)  
J.B. Conway: Functions of One Complex Variable I (Springer-Verlag, 1995)  
K. Chandrasekharan: Elliptic Functions (Springer-Verlag, 1985)

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>Written midterm test and written/oral end-of-term assessment</td>
<td>100</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

#### Credit Units

Mathematics: 3 units

#### Course Type

Lecture-based course

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### MATH7202

**Offering Department**: Mathematics  
**Course Co-ordinator**: TBC, Mathematics ()

#### Course Objectives

This course aims to present the foundation of the theory of complex manifolds and to introduce students to a variety of research topics, focusing on compact complex manifolds.

- This course contains an introductory part on basic notions on complex manifolds including sheaf cohomology, cohomology theories in terms of differential forms, Hermitian and Kahler manifolds, and Hermitian holomorphic vector bundles.
- It proceeds to introduce the theory of harmonic forms, establishing fundamental results on compact complex manifolds including Serre duality, the Kodaira Vanishing Theorem, the Kodaira Embedding Theorem and Hodge decomposition on compact Kahler manifolds.
- The course concludes with a choice of topics on analytic and geometric aspects of the theory of complex manifolds.

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
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<th>Details</th>
<th>Weighting in final course grade (%)</th>
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<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td></td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td>CLO 1,2</td>
</tr>
</tbody>
</table>
manifolds. Examples of such topics include
(i) Siegel’s Theorem on the field of meromorphic functions on a compact complex manifold;
(ii) geometry of compact quotients of bounded symmetric domains and Hermitian symmetric manifolds;
(iii) an introduction to the deformation theory of compact complex submanifolds in a complex manifold;
(iv) an introduction to the deformation theory of complex structures on a compact complex manifold.

On successful completion of this course, students should be able to:

CLO 1 grasp the notion of holomorphic line bundles, understand various ways for establishing the existence of global holomorphic sections of line bundles, and to relate them to the embedding of compact complex manifolds

CLO 2 grasp the relationship between sheaf cohomology, de Rham cohomology and d-bar cohomology, and make use of the relationship to solve various existence problems by means of vanishing theorems on harmonic forms

CLO 3 grasp the basics of complex differential geometry such as notions of connections and curvature on Kahler manifolds and on Hermitian holomorphic vector bundles, and be able to relate various notions of positivity of curvature and apply them to vanishing and embedding theorems

CLO 4 be able to identify the key elements in the theoretic foundation of various additional topics covered in the course and to make use of them in solving problems

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in a first course in Complex Analysis such as MATH3403, a first course in Differential Geometry such as MATH4501, and approval by the course coordinator.

Offer in 2019 - 2020 N Offer in 2020 - 2021 : N Examination ---

Grade Descriptors

(A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.</td>
</tr>
</tbody>
</table>

Course Type

Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighing in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

K. Kodaira: Complex Manifolds and Deformation of Complex Structures (Grundlehren der mathematischen Wissenschaften 283, Springer-Verlag, Berlin-Heidelberg 1986)

MATH7217 Topics in financial mathematics (6 credits)

Offering Department Mathematics

Quota ---

Teachers Involved TBC, Mathematics (/)

Course Objectives This course aims at introducing students to fundamental knowledge in financial mathematics and risk management. It can help preparing students to research or take more advanced courses in those directions.

Course Contents & Topics

- Investment models and portfolio theory.
- Interest rate modeling.
- Mathematics of financial derivatives, pricing and hedging.
- Estimation and modeling of volatilities.
- Risk measures and risk management.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand and be able to utilize various models and results in investment and interest rate

CLO 2 grasp the methodology in derivative pricings and the modeling of volatilities

CLO 3 understand and be able to utilize the concept of risk measures and risk management, subject to the topics chosen that year

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in an advanced level mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) and subject to the approval of the course coordinator.

Offer in 2019 - 2020 N Offer in 2020 - 2021 : N Examination ---

Grade Descriptors

(A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
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</tr>
<tr>
<td>Fail</td>
<td>Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.</td>
</tr>
</tbody>
</table>
### MATH7224

**Topics in advanced probability theory (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Mathematics ()</td>
</tr>
</tbody>
</table>

**Course Objectives**

This course aims at introducing fundamental knowledge in probability theory to graduate students and senior undergraduate students. It can help preparing these students for advanced research in probability theory and its wide-range applications.

**Course Contents & Topics**

- Measure theory, law of large numbers, central limit theorems, random walks, martingales, Markov chains, ergodic theorems, Brownian motion.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: Demonstrate in-depth understanding of basic concepts and terminologies in probability theory.
### MATH7501

#### Topics in algebra (6 credits)

**Academic Year**: 2019

**Offering Department**: Mathematics

- **Quota**: ---

**Course Co-ordinator**: Dr Z Hua, Mathematics (huazheng@maths.hku.hk)

**Teachers Involved**: (Dr Z Hua, Mathematics)

**Course Objectives**: To provide students specializing in mathematics with the opportunity to study some topics in algebra in greater depth.

**Course Contents & Topics**: A selection of advanced topics in algebra such as group theory; rings and modules; Galois theory; quadratic forms; multilinear algebra; algebraic number theory; group representations; commutative algebra; Grobner basis theory; introduction to algebraic geometry. Topics may vary from year to year.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.
- Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
- Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
- Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

- Pass in MATH4302

**Offer in 2019 - 2020**: Y

- **Semester**: 1st sem

**Grade Descriptors (A+ to F)**

- **A**: Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.
- **B**: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
- **C**: Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
- **D**: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
- **Fail**: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>coursework assessments (may include presentations)</td>
<td>50</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Examination</td>
<td>One 1.5-hour written examination</td>
<td>50</td>
<td>CLO 1,2</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

- To be decided by the course instructor.

**Course Website**: [http://moodle.hku.hk/](http://moodle.hku.hk/)
Course Co-ordinator: Prof W Zang, Mathematics (wzang@maths.hku.hk)

Teachers Involved: Prof X Yuan, Mathematics

Course Objectives: This is a follow-up of the course MATH2600/MATH3600. It introduces students to some powerful linear algebra and probabilistic methods that have been used with striking success in discrete mathematics, and covers some of the most fundamental and beautiful results obtained by these methods.

Course Contents & Topics: 1. Linear algebra method: rank argument, eigenvalue technique, polynomial technique, general position method.
3. Additional techniques if time permits.

Course Learning Outcomes: On successful completion of this course, students should be able to:
- CLO 1 demonstrate knowledge and understanding of some research areas of applied discrete mathematics
- CLO 2 solve various discrete mathematics problems using linear algebra and probabilistic methods

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in MATH3301 or MATH3600, and approval of the course coordinator.

Offer in 2019 - 2020: N

Offer in 2020 - 2021: N

Examination: ---

Grade Descriptors (A+ to F):
- A: Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and to solve problems with some innovative approaches.
- B: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
- C: Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
- D: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
- Fail: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type: Lecture-based course

Course Teaching & Learning Activities:
- Activities: Details: No. of Hours
  - Lectures: 36
  - Reading / Self study: 100

Assessment Methods and Weighting:
- Methods: Details: Weighting in final course grade (%): Assessment Methods to CLO Mapping
  - Assignments: coursework assessment: 50: CLO 1,2
  - Examination: One 2.5-hour written examination: 50: CLO 1,2

Required/recommended reading and online materials: Instructor’s lecture notes.

Course Website: http://moodle.hku.hk/

MATH7503

Topics in mathematical programming and optimization (6 credits)

Offering Department: Mathematics

Course Co-ordinator: Prof X Yuan, Mathematics (xmyuan@hku.hk)

Teachers Involved: (Prof X Yuan,Mathematics)

Course Objectives: To learn a selection of advanced and up-to-date topics in mathematical programming and continuous optimization, including theory, numerical algorithms and applications.

Course Contents & Topics: Topics may include convex programming, nonconvex programming, stochastic programming, saddle point problems, variational inequalities, maximal monotone operator, optimization theory and algorithms suitable for applications in various areas such as machine learning, artificial intelligence, imaging and computer vision. The selection may vary from year to year.

Course Learning Outcomes: On successful completion of this course, students should be able to:
- CLO 1 understand the advanced concept and approach of the mathematical programming topic(s) and/or optimization approaches as appropriate in Scientific Computing, Operations Research, Data Science, etc
- CLO 2 demonstrate knowledge and understanding of the underlying theory and techniques of the various formulations and algorithms plus their extensions

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in MATH3901, MATH3904 and (MATH4902 or the approval of the course coordinator)

Offer in 2019 - 2020: Y

Grade Descriptors (A+ to F):
- A: Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and to solve problems with some innovative approaches.
- B: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
- C: Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
- D: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
- Fail: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type: Lecture-based course

Course Teaching & Learning Activities:
- Activities: Details: No. of Hours
  - Lectures: 36
  - Reading / Self study: include presentations: 100

788
### MATH7504: Real analysis (6 credits)

**Offering Department:** Mathematics  
**Offering Department:** Qula  
**Course Co-ordinator:** TBC, Mathematics  
**Course Objectives:**  
This course gives a geometric introduction to some of the methods of algebraic topology. The emphasis throughout will be on the geometric motivations and applications of the theory.

**Course Contents & Topics:**  

**Course Learning Outcomes:**  
On successful completion of this course, students should be able to:

- CLO 1 understand basic ideas and constructions which are important both in pursuing the deeper theories as well as in many applications in algebraic topology
- CLO 2 understand the ideas of attaching space, complexes, lifting and extension properties, and surgery on manifolds

**Pre-requisites**  
Pass in MATH3301 and MATH3401

**Offer in 2019 - 2020**  
N Offer in 2020 - 2021 : N

#### Grade Descriptors (A+ to F)

- **A**: Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argument and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.
- **B**: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
- **C**: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
- **D**: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.
- **Fail**: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>One assignment</td>
<td>10</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Essay</td>
<td>Two essays</td>
<td>20</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Presentation</td>
<td>Oral Presentation</td>
<td>20</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Project reports</td>
<td>Research Report Report</td>
<td>30</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Test</td>
<td>One written midterm</td>
<td>20</td>
<td>CLO 1,2</td>
</tr>
</tbody>
</table>

**Course Website**  
http://moodle.hku.hk/

**Additional Course Information**  
http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf

### MATH7505: Real analysis (6 credits)

**Offering Department:** Mathematics  
**Offering Department:** Qula  
**Course Co-ordinator:** Prof W S Cheung, Mathematics (wscheung@hku.hk)  
**Course Objectives:**  
The aim of the course is to introduce the basic ideas and techniques of measure theory and the Lebesgue integral.

**Course Contents & Topics:**  
- The Lebesgue Integral: The Lebesgue Integral, Modes of Convergence, Convergence Theorems.  
- Differentiation and Integration: Functions of Bounded Variation, Differentiation of an Integral, Absolute Continuity.  
- The L^p Spaces: The L^p spaces, Convergence and Completeness, Bounded Linear Functionals.  
- General Theory: Measurable Spaces, Measurable Functions, Integration, Convergence Theorems, Radon-Nikodym Theorem.

**Course Learning Outcomes:**  
On successful completion of this course, students should be able to:

- CLO 1 describe basic properties of Lebesgue measure and measurable functions and understand and apply various convergence theorems
CLO 2: construct the Lebesgue integral, elucidate its basic properties and appreciate the existence of other useful integration theories besides Riemann’s.

CLO 3: understand the basic properties of $L^p$ spaces.

A good grade in MATH3401 and approval by the course coordinator.

Pre-requisites (and Co-requisites and Impermissible combinations):

Offer in 2019 - 2020: 2nd sem
Offer in 2020 - 2021: Y

Examination: May

Grade Descriptors (A+ to F):

A: Demonstrate a thorough understanding of all concepts and ideas by being able to draw complex connections among various concepts and apply the theorems through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation, and with some innovative approaches to solving problems.

B: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, reasoning, identifying the appropriate theorems, applications, or presentation.

C: Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with acceptable argument and presentation.

D: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation.

Fail: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, and not being able to complete the solution.

Course Type: Lecture-based course

Course Teaching & Learning Activities:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>72</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/Recommended reading and online materials:

H.L. Royden: Real Analysis (Pearson)
W. Rudin: Real and Complex Analysis (McGraw Hill)

Course Website: http://moodle.hku.hk/

Additional Course Information:

Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/timetable1920_S2.pdf
### Course Objectives
This is an introductory course on astronomy, including both the observational aspect of the field and a descriptive survey of the solar system, the Sun, stars, galaxies and the universe. Selected special topics such as extrasolar planets, neutron stars, black holes and dark matter will also be included. The course will include observing sessions with telescopes (subject to weather conditions).

### Course Contents & Topics
Topics covered include the observational aspect of astronomy (including constellations and planets), the physics of our solar system, and our own Sun, stars and their evolution, galaxies, black holes, and cosmology. It also provides students with a basic understanding of the relationship of the science of astronomy to life, and how our nature works on the macroscopic level. The course will arrange for observing activities of the Sun and the night sky with telescopes.

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 identify and describe the major objects in our Solar System and our universe (including stars and galaxies), and explain their main properties
- CLO 2 use the celestial sphere model to describe the apparent trajectories of celestial objects
- CLO 3 review the evolution of the world-view from the geocentric model to the heliocentric model and the discovery of the expansion of the universe on our world-view
- CLO 4 apply quantitative physical laws, including Kepler’s three laws of planetary motion, Newton’s law of universal gravitation, Doppler shift formula and Hubble's law to calculate and solve simple astronomical problems
- CLO 5 explain the evolution of stars and the evolution of the universe
- CLO 6 communicate astronomical problems and solutions using appropriate astronomical terminology and good English

### Pre-requisites (and Co-requisites and Impermissible combinations)
Nil

### Offer in 2019 - 2020
N Offer in 2020 - 2021 : N

### Grade Descriptors (A to F)
- A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentation skills. Apply highly effective observation and data analysis skills. Critical use of data and results to draw appropriate and insightful conclusions.
- B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentation skills. Apply effective observation and data analysis skills and techniques. Correct use of data of results to draw appropriate conclusions.
- C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentation skills. Apply moderately effective observation skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.
- D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentation skills. Apply partially effective observation skills and techniques. Limited ability to use data and results to draw appropriate conclusions.
- Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply partially effective observation skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

### Course Teaching & Learning Activities
Lecture with laboratory component course

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory reports</td>
<td>Observations with telescope</td>
<td>10</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
<td></td>
</tr>
<tr>
<td>Assignments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Course Website
http://moodle.hku.hk
### PHYS1050

**Physics for engineering students (6 credits)**

**Academic Year**: 2019

**Offering Department**: Physics

**Quota**: ---

**Course Co-ordinator**: Dr C C Ling, Physics (ccling@hku.hk)

**Teachers Involved**: Dr C C Ling, Physics

**Course Objectives**: This course offers a comprehensive training of physics for engineers. It covers the major physical laws on mechanics, electricity and magnetism. A calculus-based approach is adopted.

**Course Contents & Topics**: This course will introduce and discuss the following topics:

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

<table>
<thead>
<tr>
<th>CLO</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>describe and explain the physical principles of mechanics, electricity and magnetism</td>
<td>35</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>2</td>
<td>apply these principles to situations of the physical and engineering world</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>3</td>
<td>analyze and solve basic problems using the calculus-based approach</td>
<td>15</td>
<td>CLO 1,4</td>
</tr>
</tbody>
</table>

**Pre-requisites (and Co-requisites and Impermissible combinations)**: Level 3 or above in HKDSE Physics or Combined Science with Physics components or equivalent; and (Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1011)

**Offer in 2019 - 2020**: N

**Course Type**: Lecture with laboratory component course

### Examination

**Assessment Methods**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>2-hour written exam</td>
<td>36</td>
</tr>
<tr>
<td>Examination</td>
<td>Laboratory reports</td>
<td>3</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>15</td>
<td>CLO 1,4</td>
</tr>
</tbody>
</table>

### Assessment Evidence

<table>
<thead>
<tr>
<th>CLO 1</th>
<th>CLO 2</th>
<th>CLO 3</th>
<th>CLO 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

### Course Website

http://moodle.hku.hk
## Course Objectives

In this course, we shall introduce to students the fundamentals of weather, climate and climate change, to arouse their interests in the scientific and technological advancements. The course covers the working principles and mechanisms of the things and phenomena around us. Logical thinking and appreciation of science are emphasized with mathematics kept at a minimum. Students are trained to develop scientific intuition and to understand that many "magical" things in everyday life can be predictable. Contents of the course are constantly updated to reflect the advances in modern science and technology.

## Course Contents & Topics

Topics include: the science in the household and the science of driving, sports and amusement. Daily applications are explored with simple and lucid explanations. Developments in optical recording, medical imaging for diagnosis and the magnetic levitated trains in public transportation are introduced as examples of the modern technology. Course Website: http://moodle.hku.hk

## Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
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<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>70</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>10</td>
<td>CLO 1,4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Pre-requisites

NIL

### Offer in 2019 - 2020

Y 2nd sem  Offer in 2020 - 2021 : Y  

### Grade Descriptors (A+ to F)

- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

- **B** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

- **C** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

- **D** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- **Fail** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
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### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials


Course Website: http://www.physics.hku.hk/~phys1055/
The course will encompass topics on: basic physical principles on weather phenomena like: wind, temperature, humidity, cold/warm fronts, thunderstorms and tropical cyclones; introductory weather analysis, forecast and climate. Through real life examples, students will get familiarized with the weather/climate science and interpretation of meteorological information, climatology and climate change. Experts from the Hong Kong Observatory (HKO) will participate in the course to cover aspects on daily weather forecasts, public weather services, local severe weather phenomena, tropical cyclones, climatology of Hong Kong, and climate change. Tentatively, there will be visit to the HKO to study the meteorological facilities and understand the operational activities on weather and climate.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** recall the basic principles of weather and climate
- **CLO 2** apply the principles to interpret weather / climate information, for example from the HKO web site, internet or media
- **CLO 3** identify and explain the differences of weather and climate in Hong Kong as compared to other parts of the world
- **CLO 4** explain the basic causes of climate change and its potential impacts
- **CLO 5** describe and discuss the daily operational activities in the HKO

**Pre-requisites (and Co-requisites and Impermissible combinations)**

NIL

**Offer in 2019 - 2020**

Y 1st sem Offer in 2020 - 2021 : Y Examination Dec

**Grade Descriptors (A+ to F)**

- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D** Demonstrate limited but necessary command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

- **Activities**
  - Lectures
  - Tutorials
  - Reading / Self study

- **Details**
  - No. of Hours
  - Lectures 36
  - Tutorials 8
  - Reading / Self study 80

**Assessment Methods and Weighting**

- **Methods**
  - Assignments
  - Examination
  - Test

- **Details**
  - Weighting in final course grade (%)
  - Assignment 25
  - Examination 50
  - Test 25

- **Assessment Methods to CLO Mapping**
  - CLO 1,2,3,4,5

**Required/recommended reading and online materials**

Lecture notes provided by Course Coordinator

**Course Website**

http://moodle.hku.hk

**PHYS1057**

**Offering Department**

Physics

**Course Co-ordinator**

Prof A B Djuric, Physics (dalek@hku.hk)

**Teachers Involved**

Prof A B Djuric, Physics

**Course Objectives**

The course aims to improve students' understanding of basic science behind the common daily activities related to food and cooking and to develop their critical thinking skills.

**Course Contents & Topics**

The course will introduce basic scientific concepts and principles necessary to understand different methods of food preparation, as well as kitchen tools. The introduced concepts will be illustrated in recipes and practical demonstrations. The topics include: basic food molecules (water, carbohydrates, fats, protein); foams and bubbles (various examples, beer, sodas, ice-cream); colloids, emulsions, gelation (various sauces, jelly); crystallization (sugar, sugar syrups, honey, chocolate); taste and flavor (herbs, spices); cooking processes and chemical reactions (Maillard reactions, caramelization, etc.); chemical reactions for rising dough with application to cakes, bread and cookies; fermentation (alcoholic beverages, fermented dairy products, tofu); pH values in cooking, natural and artificial food colorings, culinary curiosities; molecular gastronomy (novel flavors and textures); principles of operation of kitchen tools, such as non-stick cookware, pressure cookers, induction heating ranges, microwave ovens, etc.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** describe principles of operation of kitchen tools encountered in daily life
- **CLO 2** explain basic physical and chemical processes involved in food preparation
- **CLO 3** illustrate how preparation method affects the flavor and texture of food
- **CLO 4** apply the principles to interpret weather / climate information, for example from the HKO web site, internet or media
- **CLO 5** demonstrate how preparation method affects the flavor and texture of food

**Pre-requisites (and Co-requisites and Impermissible combinations)**

NIL

**Offer in 2019 - 2020**

N Offer in 2020 - 2021 : N Examination ---

**Grade Descriptors**

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability
PHYS1150 Problem solving in physics (6 credits)

Offering Department
Physics

Course Co-ordinator
Dr M K Yip, Physics (mankit@hku.hk)

Teachers Involved
(Dr M K Yip,Physics)

Course Objectives
This is the first course in our course series that introduces problem solving, mathematical and computational skills that are commonly used in the study of university-level physics. Instead of adopting a cookbook approach, we focus on training students how to think and work as physicists through tackling simple physics problems by both analytical and numerical means. After completion, interested students may take the second level courses in this series, namely, PHYS2150 and/or PHYS2155 and/or PHYS2160. (Knowledge of Module 1 or Module 2 in HKDSE Mathematics, or MATH1011, or equivalent is advantageous, though not required.)

Course Contents & Topics
This course trains students to think and act as physicists by introducing basic problem solving, mathematical and computational skills that are commonly used in the study of university-level physics. Topics include: the use of vectors and their operations, differentiation, integration, differential equations, several variables differentiation, matrix operation, complex numbers, and rudiment of numerical methods in tackling simple physics problems. Basic MATLAB commands will be introduced and used in this course.

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 state physical systems by the language of mathematics and employ mathematical logic and reasoning to read physics
- CLO 2 apply calculus to solve problems
- CLO 3 review the features of various solving tools in physics as well as plan and select appropriate tools when solving physical problems
- CLO 4 describe the connections between mathematical equations and physical problems
- CLO 5 formulate and operate physical problems both qualitatively and quantitatively
- CLO 6 interpret and judge the physical meaning of result after calculations

Pre-requisites (and Co-requisites and Impermissible combinations)
Level 3 or above in HKDSE Physics or equivalent, or Pass in PHYS1240

Offer in 2019 - 2020
Y 1st sem 2nd sem 2019-2020: Y

Grade Descriptors (A+ to F)

A
- Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B
- Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C
- Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail
- Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
Course Contents & Topics

This course aims at providing students a solid background and knowledge in physics as well as its connection with our daily life phenomena and activities. It is targeted to those with little physics background and is conducted with no descriptions in differential and integral calculus. After completing this course, interested students may move on to take PHYS1150 or PHYS1250.

Course Learning Outcomes

On successful completion of this course, students should be able to:
- CLO 1 describe and distinguish the concepts and principles in introductory study of physics
- CLO 2 recognize the underlying physical principles behind various daily life phenomena
- CLO 3 explain physical phenomena using proper physical laws and theories
- CLO 4 apply simple mathematical techniques for quantitative analysis in solving physics problems

Pre-requisites (and Co-requisites and Impermissible combinations)

NIL

Not for students who have passed in PHYS1050 or PHYS1150 or PHYS1250, or already enrolled in these courses; and
Not for students who have passed in any level 2 PHYS course or above.

Offer in 2019 - 2020

Y 2nd sem Offer in 2020 - 2021 : Y Examination May

Grade Descriptors (A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type

Lecture-based course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>including in-class quizzes (10%)</td>
<td>25</td>
<td>CLO 1.2.3.4</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1.2.3.4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>25</td>
<td>CLO 1.2.3.4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Lecture notes provided by Course Coordinator

Raymond A. Serway and Chris Vuille: College Physics (Brooks Cole, 2011, 9th edition)

Course Website

http://moodle.hku.hk
## Course Objectives

This is an introductory course in astronomy for students in all disciplines and all years. This is also the first course in our series of two compulsory courses to introduce basic astronomical knowledge, methods and recent advances. This is an introductory course in astronomy for students in all disciplines and all years. This is also the first course in our series of two compulsory courses to introduce basic astronomical knowledge, methods and recent advances.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1** identify and describe the major objects in our Solar System and our universe (including stars and galaxies), and explain their main properties.
- **CLO 2** use the celestial sphere model to describe the apparent trajectories of celestial objects.
- **CLO 3** review the evolution of the world-view from the geocentric model to the heliocentric model and the discovery of the expansion of the universe on our world-view.
- **CLO 4** apply quantitative physical laws, including Kepler’s three laws of planetary motion, Newton’s law of universal gravitation, Doppler shift formula and Hubble’s law to calculate and solve simple astronomical problems.
- **CLO 5** explain the evolution of stars and the evolution of the universe.
- **CLO 6** communicate astronomical problems and solutions using appropriate astronomical terminology and good presentation skills.

### Requirements/recommended reading and online materials

Lecture notes provided by Course Coordinator

Raymond A. Serway and John W. Jewett: Physics for Scientists and Engineers (Thomson, 2011, 8th edition)


### Course Website

http://moodle.hku.hk
This course aims at introducing students the essence of special relativity. It is designed as an elective for students in all disciplines and all years with science background. It is also a discipline elective for the physics major/minor and astronomy minor. Completion of this course is one of the pre-requisites for PHYS4653 and PHYS4654.

Course Contents & Topics
Topics include: "Common-sense" concepts of space and time versus Einstein's conceptions of space and time, Examples of time dilation and space contraction, Paradoxes of relativity including the famous twin paradox and the "pole-in-the-barn", Four vectors and Lorentz invariant, Some discussion on general relativity.

Assessment Methods and Weighting
On successful completion of this course, students should be able to:
- CLO 1: recall the setup and significance of Michelson-Morley experiment
- CLO 2: state the basic postulates and the spacetime concept of special relativity
- CLO 3: explain time dilation and length contraction
- CLO 4: describe Lorentz transformation and its applications
- CLO 5: state the resolution of the twin and pole-in-the-barn paradoxes

Grade Descriptors (A* to F)
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but limited command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective observation skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type: Lecture with laboratory component course

Required/recommended reading and online materials
- Lecture notes provided by Course Coordinator

Course Website: http://moodle.hku.hk
Department of Physics

PHYS2150

Methods in physics I (6 credits)

Offering Department: Physics
Course Co-ordinator: Dr F K Chow, Physics (judychow@hku.hk)
Teachers Involved: (Dr F K Chow, Physics)

Course Objectives
This is one of the second level courses in our series of courses that introduces problem solving, mathematical and computational skill sets that are commonly used in the study of university-level physics. Instead of the cookbook approach, we focus on training students how to think and work as physicists through tackling simple physics problems by both analytical and numerical means. After completion, interested students may take the other second level courses in this series PHYS2155 and/or PHYS2160 or the third level course in this series PHYS3150.

Course Contents & Topics
This course introduces the principles and theories of various mathematical methods and skills that are essential for studying university physics. Topics include: ordinary differential equations, partial differential equations, three-dimensional coordinate geometry, partial differentiation, multiple integration, vector functions and motion in space, and vector analysis. Applications to physical systems and various practical problems solving skills are discussed. Further MATLAB commands and basic MATLAB programming will be introduced and used in this course.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1: Review the theory and principles of mathematical methods and compare the features of various methods
CLO 2: Describe the connections between mathematical equations and physical problems
CLO 3: State and set up mathematical equations to describe the dynamics and evolution of physics systems
CLO 4: Demonstrate knowledge of choosing correct solution of mathematical equations
CLO 5: Solve various problems and operate the calculations with computer
CLO 6: Interpret and judge the physical meaning of result after calculations

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in MATH1113 or MATH1121 or MATH1851 or PHYS1150

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021: Y

Grade Descriptors (A to F)

A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply limited or barely effective organizational and presentational skills.
Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 80

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Including computational assignments 20 CLO 1,2,3,4,5,6
Examination 2-hour written exam 50 CLO 2,3,4
Test 30 CLO 2,3,4

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator
A. D. Downey: Physical Modeling in MATLAB (Green Tea Press, 2008)

Course Website
http://moodle.hku.hk

PHYS2155

Methods in physics II (6 credits)

Offering Department: Physics
Course Co-ordinator: Dr K M Lee, Physics (kmlee@lily.physics.hku.hk)
Teachers Involved: (Dr K M Lee, Physics)

Course Objectives
This is one of the second level courses in our series of courses that introduces problem solving, mathematical and computational skill sets that are commonly used in the study of university-level physics. Instead of the cookbook approach, we focus on training students how to think and work as physicists through tackling simple physics problems by both analytical and numerical means. After completion, interested students may take the other second level courses in this series PHYS2155 and/or PHYS2160 or the third level course in this series PHYS3150.

Course Contents & Topics
This course introduces the principles and theories of various mathematical methods and skills that are essential for studying university physics. Topics include: matrices and vector spaces, systems of linear algebraic equations and systems of linear differential equations, Line integrals, surface integrals and volume integrals, Fourier analysis, and further numerical computation techniques in physics. Applications to physical systems and various practical problems solving skills are discussed. Further MATLAB programming will be introduced and used in this course.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1: Review the theory and principles of mathematical methods and compare the features of various methods
CLO 2: Describe the connections between mathematical equations and physical problems

Academic Year
2019

Quota
---
CLO 3 state and set up mathematical equations to describe the dynamics and evolution of physics systems
CLO 4 demonstrate knowledge of choosing correct solution of mathematical equations
CLO 5 solve various problems and operate the calculations with computer
CLO 6 interpret and judge the physical meaning of result after calculations

<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Pass in MATH1013 or MATH1821 or MATH1851 or PHYS1150</th>
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<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 2nd sem Offer in 2020 - 2021 : Y</td>
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<tr>
<td>Grade Description</td>
<td>Examination</td>
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<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities Details</td>
</tr>
<tr>
<td></td>
<td>Lectures</td>
</tr>
<tr>
<td></td>
<td>Tutorials</td>
</tr>
<tr>
<td></td>
<td>Reading / Self study</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods Details</td>
</tr>
<tr>
<td></td>
<td>Assignments Including computational assignments</td>
</tr>
<tr>
<td></td>
<td>Examination 2-hour written exam</td>
</tr>
<tr>
<td></td>
<td>Test 30</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>Lecture notes provided by Course Coordinator</td>
</tr>
<tr>
<td></td>
<td>Allen B. Downey: Physical Modeling in MATLAB (Green Tea Press, 2008)</td>
</tr>
<tr>
<td></td>
<td>David Poole: Linear Algebra: A Modern Introduction (Cengage Learning, 2015, 4th edition)</td>
</tr>
<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></td>
</tr>
</tbody>
</table>

PHYS2160 Introductory computational physics (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr F K Chow, Physics (<a href="mailto:judychow@hku.hk">judychow@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr F K Chow, Physics)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This is one of the second level courses in the series of courses that introduces problem solving, mathematical and computational skill sets that are commonly used in the study of university-level physics. This course introduces computational tools, techniques, and methods in physics and related fields using the Python programming language. Students are expected to spend a substantial amount of time in writing computer programs to solve physical problems. After completion, interested students may take the sequel courses PHYS3151, PHYS4150 or PHYS4151 to further their studies in computational physics.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Topics include: basics of computer programming; Python programming for physicists; graphics and visualization with Python; introduction to object-oriented programming in Python; scientific programming with Matplotlib, NumPy, and SciPy; simple error analysis in scientific programming; solution of non-linear equations with application to projectile motion; Calculus and numerical methods with relevant examples in physics; numerical solution of ordinary differential equations with application to planetary motion; Monte Carlo simulations in physics.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td></td>
<td>CLO 1 demonstrate knowledge in basic computational techniques and methods in physics</td>
</tr>
<tr>
<td></td>
<td>CLO 2 apply Python programming language and relevant packages to solve simple physical problems</td>
</tr>
<tr>
<td></td>
<td>CLO 3 employ appropriate numerical methods for solving ordinary differential equations that commonly arise in physics</td>
</tr>
<tr>
<td></td>
<td>CLO 4 review the numerical methods for simulation of various physical systems</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in MATH1013 or MATH1821 or MATH1851 or PHYS1150</td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 2nd sem Offer in 2020 - 2021 : Y</td>
</tr>
<tr>
<td>Grade Description</td>
<td>Examination</td>
</tr>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Critical use of data and results to draw appropriate and insightful conclusions.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.</td>
</tr>
</tbody>
</table>
Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities | Details | No. of Hours
--- | --- | ---
Lectures | | 36
Laboratory | | 18
Project work | | 12
Reading / Self study | | 64

Assessment Methods and Weighting
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Examination | 2-hour written exam | 50 | CLO 1,2,3,4
Laboratory reports | | 20 | CLO 1,2
Presentation | | 10 | CLO 1,2,3,4
Project report | | 20 | CLO 1,2,3,4

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator
Nicholas J. Giordano and Hisao Nakaneishi: Computational Physics (Pearson, 2005, 2nd edition)
Matt A. Wood: Python and Matplotlib Essentials for Scientists and Engineers (Morgan & Claypool, 2015)
Course Website
http://moodle.hku.hk

PHYS2250
Introductory mechanics (6 credits)
Academic Year
2019

Offering Department
Physics
Quota
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Course Co-ordinator
Dr M K Yip, Physics (mankii@hku.hk)

Teachers involved
(Dr M K Yip, Physics)
(Dr Y J Tu,Physics)

Course Objectives
This calculus-based course covers the foundation of Newtonian mechanics in one semester. It is a core course for physics major, a discipline elective for physics minor, as well as an elective course for those who want to learn fundamental Newtonian mechanics concepts and to link them up with their studies in fields like engineering, chemistry and mathematics. Problem solving and analytical skills will be extensively used. They are supplemented by numerical skills occasionally. Upon completion, interested students may take PHYS3350 to continue their study in Lagrangian mechanics.

Course Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 describe and explain the fundamental physical principles
CLO 2 apply these principles, together with logical and mathematical reasoning, to situations of the physical world
CLO 3 analyse and solve problems with the aids of mathematics
CLO 4 acquire and interpret experimental data to examine the physical laws

Pre-requisites
Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENGG1300

Offer in 2019 - 2020
Y 1st sem 2nd sem Offer in 2020 - 2021 : Y
Examination Dec May

Grade Descriptors
(A+ to F)

A
Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.

B
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

C
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

D
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Fail
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Department of Physics
### PHYS2255

**Introductory electricity and magnetism (6 credits)**

**Offering Department**  
Physics

**Course Co-ordinator**  
Dr J C S Pun, Physics (jcspun@hku.hk)

**Teachers Involved**  
(Dr J C S Pun, Physics)

**Course Objectives**  
This calculus-based course covers the foundation of electricity and magnetism in one semester. It is a core course for physics major, a discipline elective for physics minor, as well as an elective course for those who want to learn fundamental electricity and magnetism concepts and to link them up with their studies in fields like engineering, chemistry and mathematics. Problem solving and analytical skills will be extensively used. They are supplemented by numerical skills occasionally. Upon completion, interested students may take PHYS3450 to further their study in electromagnetism.

**Course Contents & Topics**  
Topics include: electric force and electric field; Gauss’ law and electric conductors; electric potential energy and potential; capacitance and DC circuits; magnetic force; magnetic field and Ampere’s law; Faraday’s law of induction; Inductance and Lenz’s law; Maxwell’s equations; wave nature of light; diffraction and interference.

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

- CLO 1 describe and explain the fundamental physical principles
- CLO 2 apply these principles, together with logical and mathematical reasoning, to situations of the physical world
- CLO 3 analyse and solve problems with the aids of mathematics
- CLO 4 acquire and interpret experimental data to examine the physical laws

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENGG1310

**Offer in 2019 - 2020**  
Y 2nd sem  Offer in 2020 - 2021 : Y

**Examination**  
May

**Grade Descriptors (A+ to F)**

- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.

- **B** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

- **C** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

- **D** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

- **Fail** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

**Course Type**  
Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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</tr>
<tr>
<td>Laboratory</td>
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<td>6</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>80</td>
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</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Including computational assignments</td>
<td>10</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>15</td>
<td>CLO 1,4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>25</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

- **P. A. Tipler and G. Mosca: Physics for Scientists and Engineers (Freeman, 2008, 6th edition)**
- **R. D. Knight: Physics for Scientists and Engineers (Pearson, 2008, 2nd edition)**

**Course Website**  
http://moodle.hku.hk

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### PHYS2260

**Heat and waves (6 credits)**

**Offering Department**  
Physics

**Course Co-ordinator**  
Dr M Su, Physics (mensu84@hku.hk)

**Teachers Involved**  
(Dr M Su, Physics)

**Course Objectives**  
This course covers the foundation of heat and waves in one semester. It serves as a core course for students who...
are planning to take physics, astronomy, or mathematics/physics as major. It also serves students who intend to take physics as minor. Both conceptual ideas and mathematical treatment in heat and waves are emphasized.

Course Contents & Topics

Topics include: type of waves; Sinusoidal wave including transverse velocity and phase. Wave propagation through a stretched string as an example for transverse wave, Sound wave as an example for longitudinal wave, Wave equation, Energy in wave motion, The principle of superposition, Interference of waves, Standing waves and resonance, Beats, The Doppler Effect, Light wave as an electromagnetic wave, Reflection, Refraction, Double slit interference, Interference from thin films, Single slit diffraction, Multiple slit and grating, Polarization. Temperature and equilibrium, Ideal gas law, Molecular view of pressure, Mean free path, distributions of molecular speed and energy. Concept of heat. First law of thermodynamic. Work done on or by an ideal gas, Internal energy of an ideal gas. Molar heat capacities at constant volume and constant pressure. Different thermodynamic processes including adiabatic, isothermal, isochoric, constant-volume, cyclical and free expansion. Reversibility of process, definition of entropy change. The second law of thermodynamic. Carnot engine, Statistical view of entropy.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 describe and explain the fundamental physical principles
CLO 2 apply these principles, together with logical and mathematical reasoning, to situations of the physical world
CLO 3 analyse and solve problems with the aids of mathematics
CLO 4 acquire and interpret experimental data to examine the physical laws

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS1050 or PHYS1250

Offer in 2019 - 2020

N Offer in 2020 - 2021 : N

Grade Descriptors (A to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some, unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type

Lecture with laboratory component course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
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<tr>
<td>Examination 2-hour written exam</td>
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<tr>
<td>Laboratory reports</td>
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</tr>
<tr>
<td>Test</td>
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<td>CLO 1,2,3</td>
</tr>
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</table>

Required/recommended reading and online materials

P. A. Tipler and G. Mosca: Physics for Scientists and Engineers (Freeman, 2008, 6th edition)

PHYS2261

Introductory heat and thermodynamics (6 credits)

Academic Year: 2019

Offering Department: Physics

Course Co-ordinator: Dr S Z Zhang, Physics (szhong@hku.hk)

Teachers Involved: (Dr S Z Zhang, Physics)

Course Objectives

This calculus-based course covers the basics of thermodynamics and kinetic theory in one semester. It is a core course for physics major, a discipline elective for physics minor, as well as an elective course for those who want to learn fundamental thermodynamics concepts and to link them up with their studies in fields like engineering, chemistry and mathematics. Problem solving and analytical skills will be extensively used. They are supplemented by numerical skills occasionally. Upon completion, interested students may take PHYS3550 to further their study in thermodynamics and statistical mechanics.

Course Contents & Topics

Topics include: thermodynamic system, equilibrium state and its characterization; thermodynamic state function and equation of state and state transformation; first law of thermodynamics, adiabatic process, Carnot cycle; entropy and second law of thermodynamics; various thermodynamic potentials and their applications in phase equilibrium and mixtures, third law of thermodynamics and Nemst theorem. It also includes a discussion on kinetic theory.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 describe and explain the fundamental physical principles
CLO 2 apply these principles, together with logical and mathematical reasoning, to situations of the physical world
CLO 3 analyse and solve problems with the aids of mathematics
CLO 4 acquire and interpret experimental data to examine the physical laws

Pre-requisites (and Co-requisites and Impermissible)

Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENG1350
## Introductory Quantum Physics (6 credits)

### Course Co-ordinator
Dr F K Chow, Physics (judychow@hku.hk)

### Course Objectives
This calculus-based course covers the foundation of quantum physics in one semester. It is a core course for physics major, a discipline elective for physics minor, as well as an elective course for those who want to learn fundamental quantum physics and to link them up with their studies in fields like engineering, chemistry and mathematics. Problem solving and analytical skills will be extensively used. They are supplemented by numerical skills occasionally. Upon completion, interested students may take PHYS3351 to further their study in quantum mechanics.

### Course Contents & Topics
Topics include: the birth of modern physics; electromagnetic waves behaving as particles; matter behaving as waves; the Schrodinger equation; solutions of time-independent Schrodinger equation to bound and unbound systems; structure of the atom; the hydrogen atom; many-electron atoms.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 describe and explain the fundamental physical principles
- CLO 2 apply these principles, together with logical and mathematical reasoning, to situations of the physical world
- CLO 3 analyse and solve problems with the aids of mathematics
- CLO 4 acquire and interpret experimental data to examine the physical laws

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS1050 or PHYS1150 or PHYS2150 or PHYS3100

### Offer in 2019 - 2020

<table>
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<tr>
<th>Grade Descriptors (A+ to F)</th>
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<th>1st sem</th>
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<th>Examination</th>
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<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.</td>
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<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to their studies in fields like engineering, chemistry and mathematics. Problem solving and analytical skills will be extensively used. They are supplemented by numerical skills occasionally. Upon completion, interested students may take PHYS3351 to further their study in quantum mechanics.</td>
<td></td>
<td></td>
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<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.</td>
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<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited ability to use data and results to draw appropriate conclusions.</td>
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<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.</td>
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### Assessment Methods and Weighting

<table>
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<th>Methods</th>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>Including computational assignments</td>
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<td>CLO 1,2,3,4</td>
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<td>Examination</td>
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<td>Test</td>
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<td>CLO 3</td>
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<tr>
<td>Test</td>
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<td>CLO 1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
Lecture notes provided by Course Coordinator
Stephen J. Blundell and Katherine M. Blundell, Concepts in Thermal Physics, Oxford University Press, 2010
Herbert B. Callen, Thermodynamics and an Introduction to Thermostatistics, John Willey & Sons, Inc. (1985)

### Course Website
http://moodle.hku.hk/
### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
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<tbody>
<tr>
<td>Lectures</td>
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<td>Laboratory</td>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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### Assessment Methods and Weighting

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<td>Laboratory reports</td>
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</tr>
<tr>
<td>Test</td>
<td></td>
<td>25</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

Lecture notes provided by Course Coordinator
- Randy Harris: Modern Physics (Pearson, 2014, 2nd edition)

### Course Website

http://moodle.hku.hk

### PHYS2650

**Modern astronomy (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr J J L Lim, Physics (<a href="mailto:jjlim@hku.hk">jjlim@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr J J L Lim, Physics</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This is an intermediate course in astronomy for students in all disciplines and all years. This is also the second course in our series of two compulsory courses to introduce basic astronomy knowledge, methods and recent advances for astronomy minor. This course aims at deepening student knowledge of astronomy, with emphasis on the recent discoveries and modern techniques. After completing this course, interested students may take PHYS3653, PHYS3650, and PHYS3660, which are core or discipline elective courses for astronomy minor and astrophysics theme of physics major.</td>
</tr>
</tbody>
</table>

#### Course Contents & Topics

Topics include: exoplanets; general relativity; gravitational waves; neutrinos in astronomy; stellar physics; gamma-ray bursts; inflation and cosmology.

#### Course Learning Outcomes

On successful completion of this course, students should be able to:
- CLO 1: recall the various detection techniques of exoplanets
- CLO 2: state the basic ideas of general relativity and gravitational waves
- CLO 3: describe the significance of neutrinos in physics in astronomy
- CLO 4: recall the different aspects of gamma-ray bursts
- CLO 5: explain the principles of inflation and how it solves problems in cosmology

#### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS1650

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<th>2nd sem</th>
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<th>Y</th>
<th>Examination</th>
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<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
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<tr>
<td></td>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
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</tr>
<tr>
<td></td>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective organizational and presentational skills.</td>
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<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
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<tr>
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<td>Fail</td>
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</table>

### Required/recommended reading and online materials

Lecture notes provided by Course Coordinator

### Course Website

http://moodle.hku.hk

### PHYS2850

**Atomic and nuclear physics (6 credits)**

<table>
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<tr>
<th>Offering Department</th>
<th>Physics</th>
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</thead>
</table>

805
This course will introduce students to the fundamentals of atomic physics and rudimentary nuclear physics. It aims to provide a coherent and concise coverage of traditional atomic and nuclear physics. Important topics of current research interest will be also discussed, such as laser cooling and trapping which plays an important role in the realization of Bose-Einstein condensate in atomic vapors.

**Course Contents & Topics**

Topics include: Atomic structure of hydrogen and hydrogen-like atom, multi-electron atom, atom in electromagnetic field, spectroscopy, laser trapping and cooling; nuclear structure, shell model and nuclear reactions. Applications of the basic principles of atomic and nuclear physics will be mentioned when appropriate.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** apply general considerations of quantum physics to atomic and nuclear system; make general orders of magnitude of estimation of physical effects
- **CLO 2** explain how light interacting with atom; the working principle of laser trapping and cooling
- **CLO 3** recognize the general features of atomic/nuclear spectroscopy
- **CLO 4** apply quantum physics to understand the basic features of simple nuclei, binding of deuteron et al

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in PHYS2265

**Offer in 2019 - 2020**

<table>
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<th>Grade Descriptors (A+ to F)</th>
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<th>Examination</th>
</tr>
</thead>
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<td>A</td>
<td>N</td>
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</tbody>
</table>

**Assessment Methods and Weighting**

<table>
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
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<tr>
<td>Examination</td>
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<td>Test</td>
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</table>

**Course Website**

http://www.physics.hku.hk/~phy2628/

**PHYS3150**

**Theoretical physics (6 credits)**

**Academic Year**

2019

**Offering Department**

Physics

**Course Co-ordinator**

Dr S Z Zhang, Physics (shizhong@hku.hk)

**Course Objectives**

This course will introduce students to the fundamentals of atomic and nuclear physics. It aims to provide a coherent and concise coverage of traditional atomic and nuclear physics. Important topics of current research interest will be also discussed, such as laser cooling and trapping which plays an important role in the realization of Bose-Einstein condensate in atomic vapors.

**Course Contents & Topics**

Topics include: Atomic structure of hydrogen and hydrogen-like atom, multi-electron atom, atom in electromagnetic field, spectroscopy, laser trapping and cooling; nuclear structure, shell model and nuclear reactions. Applications of the basic principles of atomic and nuclear physics will be mentioned when appropriate.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** apply general considerations of quantum physics to atomic and nuclear system; make general orders of magnitude of estimation of physical effects
- **CLO 2** explain how light interacting with atom; the working principle of laser trapping and cooling
- **CLO 3** recognize the general features of atomic/nuclear spectroscopy
- **CLO 4** apply quantum physics to understand the basic features of simple nuclei, binding of deuteron et al

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in (PHYS2250 or PHYS2255 or PHYS2265) and (MATH2211 or PHYS2150)

**Offer in 2019 - 2020**

<table>
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<th>Grade Descriptors (A+ to F)</th>
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**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
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<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
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<tbody>
<tr>
<td>Lectures</td>
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<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
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</tbody>
</table>

**Required/recommended reading and online materials**

- W. Demtroder, Atoms, molecules and photons (Springer, 2nd, 2011)
- K. Krause, Introductory nuclear physics (John Wiley & Sons, 1988)
Machine learning in physics (6 credits)  

**Offering Department**  
Department of Physics  

**Course Co-ordinator**  
Dr Z Y Meng, Physics (zymeng@hku.hk)  

**Teachers Involved**  
Dr S C Y Ng, Physics  
Dr Z Y Meng, Physics  

**Course Objectives**  
Machine learning is a technique that enables computers to learn without being explicitly "programmed". It is an essential part of big data science and has been widely used in different fields of physics. This course introduces the basics of machine learning, from key concepts to practical algorithms, with a focus on real-world applications in physics. It is an elective course for the computational physics theme. This is also an essential course for those who plan to apply machine learning techniques in their postgraduate studies or in their future work.

**Course Contents & Topics**  
Principal component analysis, Singular value decomposition, Support vector machines, Clustering, K-Nearest Neighbors, Decision trees, Neural Networks, Deep Learning. Application of machine learning in physics research with examples drawing from fields such as astrophysics, particle physics and complex systems.

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge in essential methods and techniques for machine learning and its application in physics  
- CLO 2 apply the techniques of machine learning in data analysis  
- CLO 3 use Python machine learning packages to solve simple problems  
- CLO 4 use of effective written and verbal communication skills through oral presentation

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in MATH2014 or MATH201 or MATH221 or PHYS2155 or PHYS2160. Working knowledge of Python is needed (please talk to the course instructor in case of doubt).

**Required/recommended reading and online materials**  
Lecture notes provided by Course Coordinator  

**Assessment Methods and Weighting**  
<table>
<thead>
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<td>Assignments</td>
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<td>CLO 1,2,3,4,5</td>
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<td>Examination</td>
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**Course Type**  
Lecture-based course

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<tr>
<td>Tutorials</td>
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<td>Reading / Self study</td>
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<table>
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<tr>
<th>Course Type</th>
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<td>Activities</td>
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<td>Tutorials</td>
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</table>

**Grade Descriptors (A+ to F)**  
A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentation skills. Apply moderately effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining all the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective organizational and presentation skills. Apply moderately effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentation skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

D: Demonstrate general but incomplete command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply partially effective organizational and presentation skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentation skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.
### PHYS3350 Classical mechanics (6 credits)

**Offering Department**
Physics

**Course Co-ordinator**
Prof S Q Shen, Physics (sshen@hku.hk)

**Teachers Involved**
(Prof S Q Shen, Physics)

**Course Objectives**

Build on the foundation course PHYS2250, this course discusses classical mechanics in the advanced undergraduate level using Lagrangian formalism. It serves as a core course for physics major students as well as an elective core for those who are interested in gaining a deep understanding of classical mechanics and to apply related techniques in their own majors. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines. Both conceptual ideas and mathematical treatment are emphasized.

**Course Contents & Topics**

This course will be essentially divided into two parts. In the first part, fundamental concepts related to Lagrangian mechanics will be treated. Topics include the variational principle, conservation laws and its relation to Newtonian mechanics. In the second part, we shall discuss applications of the Lagrangian mechanics. Topics include the central force problem, the coupled harmonic oscillators and rigid-body dynamics. Lagrangian mechanics in non-inertial frame will also be discussed.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 understand the logical structure of Lagrangian mechanics and its advantage over the Newtonian formulation;
- CLO 2 write down the form of Lagrangian for a mechanical system and solve the dynamic equations in simple cases;
- CLO 3 understand the general feature of a many-body system and the role of center of mass frame in two-body, as well as many-body and rigid body dynamics

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in PHYS2250

**Offer in 2019 - 2020**
Y 1st sem Offer in 2020 - 2021 : Y

**Grade Descriptors (A+ to F)**

- **A**
  - Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presenational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.

- **B**
  - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presenational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

- **C**
  - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presenational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

- **D**
  - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presenational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

- **Fail**
  - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presenational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

**Course Type**

Lecture with laboratory component course

**Assessment Methods and Weighting**

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<td>20</td>
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<td>60</td>
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<td>Laboratory reports</td>
<td>10 CLO 3</td>
<td>10</td>
<td>CLO 3</td>
</tr>
<tr>
<td>Test</td>
<td>10 CLO 1, 2, 3</td>
<td>10</td>
<td>CLO 1, 2, 3</td>
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</tbody>
</table>

**Course Website**
http://moodle.hku.hk

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### PHYS3351 Quantum mechanics (6 credits)

**Offering Department**
Physics

**Course Co-ordinator**
Prof W Yao, Physics (wangyao@hku.hk)

**Teachers Involved**
(Prof W Yao, Physics)

**Course Objectives**

Build on the foundation course PHYS2265, this course discusses quantum mechanics in the advanced undergraduate level with rigorous mathematical treatment. It serves as a core course for physics major students as well as an elective core for those who are interested to gain a deep understanding of quantum mechanics and to apply related techniques in their own majors. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines. Both conceptual ideas and mathematical treatment are emphasized.

**Course Website**
http://moodle.hku.hk
Course Contents & Topics
Time-dependent Schrodinger equation; statistical interpretation of wave function; probability density; probability current and continuity equation; momentum; physical observable and expectation value; Heisenberg uncertainty principle; time-independent Schrodinger equation; Hamiltonian and stationary states; particle in a square well; transmission and reflection at a barrier; harmonic oscillator problem using ladder operators; free particle and wavepacket; delta function potential; Dirac notations; state vectors; Hilbert space; Hermitian operators; eigenstates and eigenvectors; generalized statistical interpretation; generalized uncertainty principle; angular momentum; hydrogen atom; atomic orbits; spin; non-degenerate perturbation theory.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 describe the statistical interpretation of quantum mechanical systems, and calculate expectation values and uncertainty of physical observables
CLO 2 formulate energy eigenvalue problems, and solve them in examples where potentials have simple analytical forms
CLO 3 formulate time evolution of the wavefunction and the expectation value of physical observables with known energy eigenfunctions
CLO 4 judge the applicability of time-independent perturbation theory and formulate leading order energy corrections in certain perturbations applied to the physical system
CLO 5 acquire and interpret experimental data to examine the physical laws

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS2265

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y

Grade Descriptors
A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.
B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.
C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.
D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited organizational and presentational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.
Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Laboratory 6
Tutorials 8
Reading / Self study 80

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 10 CLO 1,2,3,4
Examination 60 CLO 1,2,3,4
Laboratory reports 10 CLO 5
Test 20 CLO 1,2,3,4

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator

Course Website
http://moodle.hku.hk

PHYS3450 Electromagnetism (6 credits)

Offering Department Physics
Quota ---

Course Co-ordinator Prof X D Cui, Physics (xdcui@hku.hk)

Teachers Involved (Prof X D Cui,Physics)

Course Objectives
Build on the foundation course PHYS2255, this course discusses electromagnetism in the advanced undergraduate level with rigorous mathematical treatment. It serves as a core course for physics major students as well as an elective core for those who are interested to gain a deep understanding of electromagnetism and to apply related techniques in their own majors. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines. Both conceptual ideas and mathematical treatment are emphasized.

Course Contents & Topics
Topics include electric fields and potential, methods in electrostatics, conductors and dielectrics, magnetostatics and electromagnetic induction, magnetic properties of materials and Maxwell's equations.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 identify the fundamental physics in electrostatics and magnetism
CLO 2 apply mathematical tools to describe electrostatics and magnetism
CLO 3 use the Maxwell's equations to explain various electrostatic and magnetic phenomena
CLO 4 differentiate between electrostatics in vacuum and in dielectric materials
CLO 5 differentiate between magnetism in vacuum and in magnetic materials
CLO 6 apply essential skills of making measurements with appropriate instruments in physics, experiments; Interpret the experimental data and compare with the prediction of underlying physical principle

Pre-requisites (and Co-requisites)
Pass in PHYS2255
Department of Physics

PHYS3550

Statistics and Thermodynamics (6 credits)

Offering Department: Physics

Course Co-ordinator: Dr S Z Zhang, Physics (shizhong@hku.hk)

Course Objectives:

Build on the foundation course PHYS2260, this course discusses statistical mechanics and thermodynamics in the advanced undergraduate level with rigorous mathematical treatment. It serves as a core course for physics majors as well as an elective core for those who are interested to gain a deep understanding of statistical mechanics and thermodynamics and to apply related techniques in their own majors. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines. Both conceptual ideas and mathematical treatment are emphasized.

Course Contents & Topics:


Course Learning Outcomes:

On successful completion of this course, students should be able to:

- CLO 1 describe and explain the fundamental physical principles
- CLO 2 apply these principles, together with logical and mathematical reasoning, to situations of the physical world
- CLO 3 analyse and solve problems with the aids of mathematics
- CLO 4 acquire and interpret experimental data to examine the physical laws

Pre-requisites (and Co-requisites and Impermissible combinations):

Pass in PHYS2260

Offer in 2019 - 2020

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Required/recommended reading and online materials

Lecture notes provided by Course Coordinator


Course Website

http://moodle.hku.hk

Offering in 2020 - 2021

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Course Type: Lecture with laboratory component course

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Course Type: Lecture with laboratory component course

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Required/recommended reading and online materials

Lecture notes provided by Course Coordinator


Course Website

http://moodle.hku.hk
### PHYS3551
**Introductory solid state physics (6 credits)**

**Offering Department** Physics

**Course Co-ordinator** Prof J Gao, Physics (jugao@hku.hk)

**Teachers Involved**

**Course Objectives**
To provide a broad introduction to modern theories of the behaviour and properties of the solid state of matter. It is designed as a self-contained course which at the same time will serve as a basis for more advanced courses and projects in solid state physics.

**Course Contents & Topics**
- Crystal structures and symmetry. The formation of crystals. The reciprocal lattice and X-ray diffraction in crystals.
- Lattice vibrations and thermal properties. Free-electron theory of metals. Energy bands; metals, semiconductors, and insulators. If time permits, special topics such as superconductor will be briefly mentioned.
- Lattice vibrations and thermal properties. Free-electron theory of metals. Energy bands; metals, semiconductors, and insulators. If time permits, special topics such as superconductor will be briefly mentioned.
- Lattice vibrations and thermal properties. Free-electron theory of metals. Energy bands; metals, semiconductors, and insulators. If time permits, special topics such as superconductor will be briefly mentioned.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1: Demonstrate knowledge for crystal structures and characterization
- CLO 2: Describe the behavior of solid matter and explain the underlying physical concepts
- CLO 3: Apply physical principles and mathematical equations to discuss the physical properties of materials
- CLO 4: Apply essential skills of making measurements with appropriate instruments in physics experiments
- CLO 5: Interpret the experimental data and compare with the prediction of underlying physical principle

**Pre-requisites (and Co-requisites and Impermissible combinations)**
- Pass in PHYS2260 and PHYS2265

**Offer in 2019 - 2020** N Offer in 2020 - 2021: N

**Examination**

**Grade Descriptors (A+ to F)**

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**Fail**
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**Course Type** Lecture with laboratory component course

**Assessment Methods and Weighting**

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<td></td>
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<tr>
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<td>2-hour written exam</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>Laboratory reports</td>
<td>10</td>
<td>CLO 4,5</td>
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</tr>
<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1,2,3</td>
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</tbody>
</table>

**Required/recommended reading and online materials**


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### PHYS3650
**Observational astronomy (6 credits)**

**Offering Department** Physics

**Course Co-ordinator** Dr. J. J. L. Lim, Physics (jjlim@hku.hk)

**Teachers Involved** (Dr. J. J. L. Lim, Physics)

**Course Objectives**
An introduction to tools of contemporary observation astronomy, with a focus on those used at optical wavelengths,
as well as an introduction to observational aspects of stars and galaxies at optical wavelengths. An emphasis is placed on a hands-on approach for students to gain experience in doing astronomical observations and data reduction.

### Course Contents & Topics
Topics include: properties and configurations of optical telescopes; properties of light, atmospheric effects on observations; properties of astronomical detectors (PMT, CCD); astronomical imaging and magnitude system; astronomical spectroscopy; observations of stars and galaxies including blackbody radiation, color-magnitude system, emission and absorption spectrum, and astronomical redshifts.

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- **CLO 1**: describe and explain the workings of astronomical telescopes and modern astronomical detectors at optical wavelengths.
- **CLO 2**: describe the effects of the properties of light and Earth’s atmosphere on astronomical observations.
- **CLO 3**: explain how the methods of astronomical photometry and spectroscopy are applied to the observations of stars, galaxies, and the universe.
- **CLO 4**: operate a small optical telescope to conduct simple day and night sky observations.

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS1650 and (PHYS2250 or PHYS2265)

### Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y

### Course Type
Lecture with laboratory component course

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
<td>CLO 1.2, 3</td>
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<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1.2, 3</td>
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<tr>
<td>Laboratory reports</td>
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</tr>
<tr>
<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1.2, 3</td>
</tr>
</tbody>
</table>

### Reading / Self study
- Frederick R. Chromey: To Measure the Sky

### Required/recommended reading and online materials
Lecture notes provided by Course Coordinator

### Required / Recommended reading and online materials
- The physical universe (6 credits)
- Department of Physics
- Dr K M Lee, Physics (kmlee@lily.physics.hku.hk)
- To introduce basic physical principles of astronomy and build a foundation in modern astrophysics.
- Topics include: the sky and celestial coordinates, spherical geometry, optics and telescopes, basic celestial mechanics, two-body problem, radiative transfer, and blackbody radiation.
- On successful completion of this course, students should be able to:
- **CLO 1**: calculate the transformation between different celestial coordinate systems.
- **CLO 2**: describe the formation of spectral lines and basic structures of telescopes.
- **CLO 3**: derive the orbits in two body problem from first principle.
- **CLO 4**: recall the radiative transfer equation.
- Pass in PHYS1650 and (PHYS2250 or PHYS2265)

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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</table>
This course is a beginner course in astrophysics - the application of physics in astronomy, so as to interpret and understand astronomical objects and phenomena. Emphasis is placed on basic observational aspects and/or some familiar objects/phenomena in astronomy that either form the foundation or are at the forefront of modern astrophysics. It is one of the core electives for astronomy minor and an elective course for the astrophysics program. Show limited ability to apply knowledge to solve problems. Organization and presentional skills are minimally effective or ineffective.
Course Contents & Topics

Topics include: special relativity, Doppler effect, and relativistic beaming; interaction of light and matter, atomic physics, quantum mechanics; single-dish telescopes and interferometers; binary stars and stellar parameters, exoplanets; physics of stellar spectra.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 describe and explain the physical principles introduced
CLO 2 relate the correct physical principles to a given astronomical phenomenon
CLO 3 perform computations to demonstrate competence on and understanding of the physical principles related to a given astronomical phenomenon

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS2250 or PHYS2265 or PHYS2650

Offer in 2019 - 2020

N Offer in 2020 - 2021 : Y Examination ---

Grade Descriptors

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities Details No. of Hours

- Lectures 5 chapters 36
- Tutorials 6 sessions 10
- Reading / Self study 80

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

- Assignments 2-hour written exam 40 CLO 1,2,3
- Examination 60 CLO 1,2,3

Required/recommended reading and online materials

An Introduction to Modern Astrophysics, by Bradley Carroll & Dale A. Ostlie

Course Website

http://www.physics.hku.hk/~phys3653/

PHYS3660 Astronomy laboratory (6 credits)

Offering Department Physics Academic Year 2019

Course Co-ordinator Dr S C Y Ng, Physics (ncy@astro.physics.hku.hk)

Teachers Involved

Course Objectives

This course trains students with basics of extracting scientific information with astronomical observations. The focus is on practical experience in operating telescopes, data acquisition and reduction, and interpretation of the results rather than verification of known astronomical theories. It is one of the core electives for astronomy minor and an elective course for the astrophysics and experimental physics themes. Upon completion, interested students may apply the techniques learnt here in observational astronomy related capstone courses.

Course Contents & Topics

This course will cover the following topics: basics working principles of optical telescopes and CCDs; setting up and hands-on operations of small optical telescopes; error analysis and basic statistics related to the astronomy laboratories; introduction to the magnitude system and celestial coordinates, the color magnitude diagram, and blackbody radiation; observations and data reduction techniques in multi-wavelength astronomy; introduction to data analysis software packages.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 acquire astronomy observation techniques
CLO 2 conduct observations to verify the physical principle(s) in astronomy
CLO 3 apply analytical methods required to interpret and analyze results, and draw conclusions from the data
CLO 4 use of effective written and verbal communication skills through written laboratory reports and oral presentation

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in (PHYS2261 or PHYS2650); and Pass in PHYS3650, or already enrolled in this course.

Offer in 2019 - 2020

N Offer in 2020 - 2021 : Y Examination ---

Grade Descriptors

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Critical use of data and results to draw appropriate and insightful conclusions.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, with but limited analytical and critical abilities. Show limited ability to apply
PHYS3750  Laser and spectroscopy (6 credits)  Academic Year 2019
Offering Department Physics  Quota ---
Course Co-ordinator Prof S J Xu, Physics (sjxu@hku.hk)
Teachers Involved

### Course Objectives
The course aims at providing a broad introduction to major types of lasers and modern laser spectroscopy.

### Course Contents & Topics
- On successful completion of this course, students should be able to:
  - CLO 1 restate the properties of fundamental optical processes
  - CLO 2 describe fundamental operation principle of modern lasers
  - CLO 3 demonstrate solid knowledge of modern laser spectroscopic techniques
  - CLO 4 identify main components of modern optical spectroscopic instruments
  - CLO 5 employ laser photoluminescence setup to measure low-temperature photoluminescence spectra of solid samples
  - CLO 6 interpret the experimental data and compare with the prediction of underlying physical principle

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS3551, or already enrolled in this course.

### Offer in 2019 - 2020 N Offer in 2020 - 2021: Y

### Examination ---

#### Grade Descriptors (A+ to F)

<table>
<thead>
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</tr>
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<tbody>
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#### Course Type
Lecture with laboratory component course

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<th>Details</th>
<th>No. of Hours</th>
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<td>Lectures</td>
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<tr>
<td>Laboratory</td>
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<tr>
<td>Tutorials</td>
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<td>Laboratory reports</td>
<td></td>
<td>20 CLO 5,6</td>
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#### Required/recommended reading and online materials
Lecture Notes provided by Course Coordinator
### PHYS3751: Physics of Nanomaterials (6 credits)

**Offering Department:** Physics

**Course Co-ordinator:** TBC, Physics

**Teachers Involved:** TBC (Physics)

**Course Objectives:**
This course is designed to let senior undergraduate students and fresh postgraduate students know fundamental concepts and physical properties of nanomaterials including two-dimensional quantum wells, one-dimensional quantum wires and zero-dimensional quantum dots.

**Course Contents & Topics:**
- Introduction to nanomaterials and quantum size effect. Dimensionalities and density of states of various nanomaterials. Optical and transport properties of quantum wells, superlattices and two-dimensional electron gas.
- Physical properties of carbon nanotubes and semiconductor nanowires. Physical properties of quantum dots and nanocrystals. Fundamental principles of scanning tunneling microscopy and advanced thin-film growth techniques such as molecular beam epitaxy and metalorganic chemical vapor deposition.
- This course is designed to let senior undergraduate students and fresh postgraduate students know fundamental concepts and physical properties of nanomaterials including two-dimensional quantum wells, one-dimensional quantum wires and zero-dimensional quantum dots.

**Course Learning Outcomes:**
- On successful completion of this course, students should be able to:
  - CLO 1 recall basic concepts and knowledge of dimensionality, density of states, quantum size effect
  - CLO 2 identify and compare optical and transport properties of quantum wells, superlattices and two-dimensional electron gas
  - CLO 3 recognise the fundamental principles of scanning tunneling microscopy and advanced thin-film growth techniques such as molecular beam epitaxy and metalorganic chemical vapor deposition
  - CLO 4 describe the basic physics of carbon nanotubes and semiconductor nanowires
  - CLO 5 explain physical properties of zero-dimensional quantum dots and nanocrystals

**Pre-requisites (and Co-requisites and Impermissible combinations):**
- Pass in PHYS3351; and Pass in PHYS3551, or already enrolled in this course.

**Offer in 2019 - 2020:** N

**Examination:** ---

**Grade Descriptors (A+ to F):**
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of the knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities, reasoned logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations using effective organizational and presentation skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective observation skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems using limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type:** Lecture-based course

**Course Teaching & Learning Activities:**
- Activities: Details
- No. of Hours

**Assessment Methods and Weighting:**
- Methods: Details
- Weighting in final course grade (%)
- Assessment Methods to CLO Mapping

**Required/recommended reading and online materials:**
- TBC

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### PHYS3760: Physics Laboratory (6 credits)

**Offering Department:** Physics

**Course Co-ordinator:** Prof X D Cui, Physics (xdcui@hku.hk)

**Teachers Involved:**

**Course Objectives:**
This course trains students with experimental knowledge and skills, as well as the understanding on how to prove physics principles with measurements. The focus is on advanced lab techniques and skills, including data acquisition, and data analysis by computers rather than verification of known physical theories. It is one of the core electives for physics major and a required course for the experimental physics theme. Upon completion, interested students may apply the techniques learnt here in experiment-oriented capstone courses.

**Course Contents & Topics:**
This course equips students with the necessary experimental techniques commonly used in advanced university level physics experiments drawn from classical mechanics, electromagnetism, statistical mechanics and thermodynamics, and quantum mechanics. After introducing the basics in a few lectures, students have to work all the way from experimental setup, data acquisition to data analysis, possibly with the aid of a computer, either in a small group or an individual. In addition to eight labs, they also have to conduct a small experimental project and present their result orally. Contents of the experiments and small projects may vary from year to year.

**Course Learning Outcomes:**
- On successful completion of this course, students should be able to:
  - CLO 1 acquire advanced physics experimental techniques
  - CLO 2 design and conduct experiments to verify the physics principle(s) commonly used in advanced university-level physics courses
  - CLO 3 apply analytical methods required to interpret and analyze results, and draw conclusions from the data
  - CLO 4 make use of effective written and verbal communication skills through written laboratory reports and oral presentation

**Pre-requisites (and Co-requisites and Impermissible combinations):**
- Pass in any two of the following courses: PHYS3350, PHYS3351, PHYS3450, PHYS3550

**Offer in 2019 - 2020:** N

**Examination:** ---

**Grade Descriptors (A+ to F):**
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.
Department of Physics

B
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

C
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Correct use of data and results to draw appropriate conclusions. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

D
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

Fail
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>Working principle of equipment, Experimental Skills, Data analysis, Writing skills</td>
<td>8</td>
</tr>
<tr>
<td>Laboratory</td>
<td>8 standard labs and 1 project</td>
<td>28</td>
</tr>
<tr>
<td>Project work</td>
<td>Presentation and preparation</td>
<td>20</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>64</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory reports</td>
<td>8 lab reports</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Presentation</td>
<td>1 oral presentation</td>
<td>15</td>
<td>CLO 2,3</td>
</tr>
<tr>
<td>Project report</td>
<td>1 full project report</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Lab manuals provided by Course Coordinator

Python tutorial at https://www.python.org/about/gettingstarted/

PHYS3850
Waves and optics (6 credits)

Offering Department
Physics

Course Co-ordinator
Dr D K Ki, Physics (dkki@hkbu.hk)

Teachers Involved
Dr D K Ki (Physics)

Course Objectives
To give a coherent introduction to the development of modern physical optics, with particular attention to the wave properties of light and optical applications.

Course Contents & Topics
Mathematical theory of wave motion and the electromagnetic theory of light; the propagation of light and the laws of reflection and refraction; superposition and Fourier analysis of waves; theories, experimental observation and applications of polarization, interference and diffraction, thick lenses.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 explain and calculate the properties of waves including propagation, reflection, refraction, polarization, interference and diffraction by using the theory of waves
- CLO 2 apply the theory of optics to calculate the geometrical parameters of thick lenses and design optical devices
- CLO 3 apply essential theories to design anti-reflection and reflection-enhancement films

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS2255 and PHYS2260

Offer in 2019 - 2020
Y 1st sem

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of the knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities, reasoned logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities, reasoned logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Correct use of data and results to draw appropriate conclusions. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.</td>
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Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

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<tr>
<th>Activities</th>
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<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>80</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
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<tr>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>
### Course Objectives
This course will introduce students to the fundamentals of atomic physics and nuclear physics. It will also discuss nuclear astrophysics and applications of atomic and nuclear science. It aims to provide students a conceptual framework of atomic and nuclear physics and serves as an elective course to better prepare students for graduate studies in relevant subjects.

### Course Contents & Topics
Properties of Atoms and Nuclei, Nuclear Composition, Liquid Drop Model, Shell Model in Atoms and Nuclei, Particle & Gamma Decay, Nuclear Reactions, Radiation Detectors, Nuclear Astrophysics, Frontier research and applications in atomic and nuclear science.

### Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1. describe and explain the basic features of atoms and nuclei
  - CLO 2. apply general considerations of quantum mechanics to atomic and nuclear system
  - CLO 3. make general orders of magnitude in estimation of physical effects in atoms and nuclei
  - CLO 4. describe nuclear decay processes and nuclear reactions in nucleosynthesis

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS3351, or already enrolled in this course

### Course Website
http://moodle.hku.hk

### Grade Descriptors (A+ to F)
- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.

- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

### Assessment 80

<table>
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<tr>
<th>Activities</th>
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</thead>
<tbody>
<tr>
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<td>Laboratory</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td>80</td>
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</tbody>
</table>

### Methods and Weighting

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<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>10</td>
<td>CLO 1</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
- K. Krane: Introductory nuclear physics (John Wiley & Sons, 1988)

### PHYS3999
**Directed studies in physics (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quota</td>
<td>---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Dr F C C Ling, Physics (<a href="mailto:ccding@hku.hk">ccding@hku.hk</a>)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Teachers Involved</th>
<th>(Various teachers in the department,Physics)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>This capstone course is offered to students majoring in physics, physics (intensive), math/physics or astronomy. It should be taken normally in their final year of study. It provides students with the opportunity to study a small problem by themselves, either theoretical, experimental or numerical, under the supervision of an academic staff using the subject materials the student has learn in all years of his/her major study. The available projects range from small scale research, critical literature review and comment, and to development of university-level physics or astronomy teaching tools.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Course Contents &amp; Topics</th>
<th>Students interested in taking this course should contact their prospective supervisors in May to determine the contents and the nature of their projects in the coming academic year. They must get the approval from both the prospective supervisor and the course coordinator to take this course. Students will receive training in research literature reading and reviewing, under the supervision of a staff member. For theoretical project, students may need to fill in mathematical gaps of some sophisticated derivations</th>
</tr>
</thead>
</table>

| Course Website          | http://moodle.hku.hk |

<table>
<thead>
<tr>
<th>Examinations</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory reports</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
</tr>
</tbody>
</table>

| Assessment 80 |

<table>
<thead>
<tr>
<th>No. of Hours</th>
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<tbody>
<tr>
<td>36</td>
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<td>6</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>80</td>
</tr>
</tbody>
</table>

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and the critically analyze the research methods used in the field. For numerical projects, students need to use computers to reproduce existing numerical or simulation results. For experimental projects, students have to understand the design of the experiment, carrying it out and analyze the sources of errors.

### Course Learning Outcomes

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>Review the knowledge of a physics or astronomy problem in depth through literature review of books and research journals based on what they have learnt in their majors</td>
</tr>
<tr>
<td>CLO 2</td>
<td>Criticize existing approaches for solving the selected physics or astronomy problem</td>
</tr>
<tr>
<td>CLO 3</td>
<td>Describe and explain connections between the physical principles and the study problem</td>
</tr>
<tr>
<td>CLO 4</td>
<td>(for theoretical or computational projects) identify the key issues of the problem and solve them independently either by analytical or numerical means, and compare the results with predictions or existing solutions</td>
</tr>
<tr>
<td>CLO 5</td>
<td>(for experimental projects) propose and execute physics experiments or astronomical observations, analyze results and sources of errors of the experiment or observation in comparison with predictions</td>
</tr>
<tr>
<td>CLO 6</td>
<td>(for projects involving team work) collaborate and communicate effectively in the team, which may comprise of people of different culture, gender and nationality</td>
</tr>
</tbody>
</table>

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in at least 24 credits of advanced level (3XXX level or above) disciplinary core/elective courses of the Physics Major, Physics (Intensive) Major, Mathematics/Physics Major or Astronomy Major curriculum. This capstone course is for Astronomy, Mathematics/Physics, Physics, and Physics (Intensive) Majors students only.

The earliest that a student is allowed to take this capstone course is their year 3 study.

### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2019 - 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y 1st sem 2nd sem Summer Offer in 2020 - 2021: Y Examination No Exam</td>
</tr>
<tr>
<td>B</td>
<td>Pass in any three of the following courses: PHYS3350, PHYS3351, PHYS3450, PHYS3550</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete grasp of the subject. Show some evidence of logical and independent thinking. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Show limited evidence of logical and independent thinking. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>E</td>
<td>Fail</td>
</tr>
</tbody>
</table>

### Course Type

- Project-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting with supervisor</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>84</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral presentation</td>
<td>including supervisor's comments (10%)</td>
<td>30</td>
<td>CLO 1,3,4,5</td>
</tr>
<tr>
<td>Research report</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

To be provided by individual project supervisor.

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**PHYS4150 Computational physics (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof J Wang, Physics (<a href="mailto:jianwang@hku.hk">jianwang@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof J Wang, Physics</td>
</tr>
</tbody>
</table>

| Course Objectives | The aim of the course is to show how the power of computers enables to computational approach to solving physics problems to be adopted, which is distinct from, and complimentary to, traditional experimental and theoretical approaches. The material covered will be found useful in any project or problem solving work that contains a strong computational or data analysis element. The course is designed such that a significant fraction of the student's time is spent actually programming specific physical problems rather than learning abstract techniques. |

| Course Contents & Topics | The course will cover the following problems: Introductory computational physics and computer algebra, integration and differentiation, interpolation and extrapolation, ordinary differential equation such as those of classical mechanics, partial differential equations (such as the Maxwell's equation, the diffusion equation, and the Schrodinger equation), matrix methods (such as systems of equations and eigenvalue problems applied to Poisson's equation and electronic structure calculations), Monte Carlo (Metropolis algorithm) and other simulation methods (such as molecular dynamics), and several physics projects. |

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>On successful completion of this course, students should be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>Demonstrate knowledge in essential methods and techniques for numerical computation in physics</td>
</tr>
<tr>
<td>CLO 2</td>
<td>Apply Monte Carlo method and other simulation methods to solve deterministic as well as probabilistic physical problems</td>
</tr>
<tr>
<td>CLO 3</td>
<td>Employ appropriate numerical method to interpolate and extrapolate data collected from physics experiments</td>
</tr>
<tr>
<td>CLO 4</td>
<td>Use appropriate numerical method to solve the differential equations governing the dynamics of physical systems</td>
</tr>
</tbody>
</table>

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in (MATH3301 or MATH3401 or MATH3403 or MATH3405 or PHYS2160 or PHYS3150); and Pass in any of the three following courses: PHYS3350, PHYS3351, PHYS3450, PHYS3550

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Y 1st sem Offer in 2020 - 2021</td>
<td>A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course</td>
</tr>
</tbody>
</table>

| Examination | Dec |
Course Type
Lecture with laboratory component course

Assessment Methods and Weighting

<table>
<thead>
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<td>20</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>40</td>
<td>CLO 1,3,4</td>
</tr>
<tr>
<td>Presentation</td>
<td>15</td>
<td>CLO 1</td>
<td></td>
</tr>
<tr>
<td>Project report</td>
<td>25</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>

Course Contents & Topics
Topics include basic data analysis techniques, linear and non-linear fitting, determining the goodness of the fit, basic hypothesis testing techniques, modeling physical and related systems via differential (ordinary and/or partial), difference equations as well as discrete models such as cellular automata, introduction to complex systems, complex adaptive systems and nonlinear dynamics, the use of computer package such as Matlab in modeling and data analysis. The emphasis is on the basic principles and concepts rather than the use of specific packages. This course provides a solid foundation for students who intended to do computational physics and complex systems research. It also prepares students to work in related industries.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 describe and explain state-of-the-art modeling methods used in physics
- CLO 2 apply basic modeling techniques, together with logical and mathematical reasoning, to situations of the physical world
- CLO 3 analyse and solve problems with the aid of computer packages such as Matlab

Pre-requisites (and Co-requisites and Impermissible combinations)
Passes in (MATH3301 or MATH3401 or MATH3403 or MATH3405 or PHYS2160 or PHYS3150); and Pass in any of the following courses: PHYS3350, PHYS3351, PHYS3450, PHYS3550

Grade Descriptors (A to F)

- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective computer modeling skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.

- **B** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

- **C** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

- **D** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentional skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

- **Fail** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of coherent and logical thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.
Advanced classical mechanics (6 credits)  

**Offering Department**  
Physics  

**Course Co-ordinator**  
Prof S Q Shen (sshen@hku.hk)  

**Teachers Involved**  
(Prof S Q Shen, Physics)  

Build on the advanced undergraduate level course PHYS3350, this course further discusses concepts and mathematical techniques in classical mechanics through special topics and applications. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.

**Course Contents & Topics**  
Topics include: Hamiltonian principles, Lagrangian formulation of dynamics, nonlinear problems, many-body systems, variational principle, generalized coordinates, simple application of Lagrangian equation.

**Required/recommended reading and online materials**  
Lecture notes provided by Course Coordinator  

**Assessment Methods and Weighting**  
- Assignments: 20 CLO 1,2,3,4  
- Examination: 3-hour written exam 60 CLO 1,2,3,4  
- Project report: 20 CLO 1,2,3,4

**Course Objectives**  
- CLO 1: explain the difference between Newtonian mechanics and analytical mechanics  
- CLO 2: solve the mechanical problems using Lagrangian formalism  
- CLO 3: discuss the connection between classical mechanics and quantum mechanics from Hamiltonian formalism  
- CLO 4: apply the variational principle to real physical situations

**Offer in 2019 - 2020**  
N Offer in 2020 - 2021: Y

**Course Grade Descriptors (A+ to F)**  
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of the knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**  
Lecture-based course

**Assessment**  
- Lectures: 36  
- Tutorials: 12  
- Reading / Self study: 80

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in PHYS3350

**Course Website**  
http://moodle.hku.hk

---

Advanced quantum mechanics (6 credits)  

**Offering Department**  
Physics  

**Course Co-ordinator**  
Prof W Yao (wangyao@hku.hk)

**Teachers Involved**  
(Prof W Yao, Physics)

Build on the advanced undergraduate level course PHYS3351, this course further discusses concepts and mathematical techniques in quantum mechanics through special topics and applications. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.

**Course Contents & Topics**  
Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 review the perturbation theory and some other approximation methods on various quantum systems
CLO 2 apply physics principles to describe the physical properties of various quantum systems
CLO 3 demonstrate knowledge and discuss the underlying physical concepts associated with the selected quantum systems

Pre-requisites (and Co-requisites and Impermissible combinations) Pass in PHYS3351

Offer in 2019 - 2020 Y 2nd sem Offer in 2020 - 2021 : Y Examination May

Grade Descriptors (A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type Lecture-based course

Course Teaching & Learning Activities Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 80

Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 20 CLO 1.2,3
Examination 3-hour written exam 60 CLO 1.2,3
Test 20 CLO 1.2,3


Course Website http://www.physics.hku.hk/~phys4351/

PHYS4450
Advanced electromagnetism (6 credits)

Offering Department Physics
Academic Year 2019
Quota ---

Course Co-ordinator Prof X D Cui, Physics (xdcui@hku.hk)
Teachers Involved (Prof X D Cui,Physics)

Course Objectives Build on the advanced undergraduate level course PHYS3450, this course further discusses concepts and mathematical techniques in electromagnetism through special topics and applications. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.

Course Contents & Topics Topics include Maxwell's Equations, Pointing theorem, wave equations, reflection and transmission of waves, wave guides, retarded potentials, gauge transformations, dipole radiation, special theory of relativity.

Course Learning Outcomes On successful completion of this course, students should be able to:

CLO 1 review and discuss the fundamental physics in classical electrodynamics
CLO 2 apply Maxwell's equations to analyze complicated electrostatic and magnetic phenomena
CLO 3 evaluate how special relativity is incorporated in the study of electromagnetism
CLO 4 formulate and solve problems in electromagnetism using appropriate mathematical techniques

Pre-requisites (and Co-requisites and Impermissible combinations) Pass in PHYS3450

Offer in 2019 - 2020 Y 1st sem Offer in 2020 - 2021 : Y Examination Dec

Grade Descriptors (A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type Lecture-based course

Course Teaching & Learning Activities Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 80

Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
PHYS4550

Advanced statistical mechanics (6 credits)

Offering Department
Physics

Course Co-ordinator
Dr Y J Tu, Physics (yanjuntu@hku.hk)

Teachers Involved
(Dr Y J Tu, Physics)

Course Objectives
Build on the advanced undergraduate level course PHYS3550, this course further discusses concepts and mathematical techniques in statistical mechanics through special topics and applications. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.

Course Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 describe and explain the fundamental physical principles
CLO 2 apply these principles, together with logical and mathematical reasoning, to situations of the physical world
CLO 3 analyses and solve problems with the aids of mathematics

Pre-requisites
Pass in PHYS3550

Offer in 2019 - 2020
N Offer in 2020 - 2021 : Y

Grade Descriptors
(A+ to F)

A
Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presenational skills.

C
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presenational skills.

Fail
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presenational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities
Lectures 36
Tutorials 12
Reading / Self study 80

Assessment Methods and Weighting
Methods
Assignments 20 CLO 1,2,3
Examination 50 CLO 1,2,3
Test 30 CLO 1,2,3

Required/recommended reading and online materials
Lecture notes provided by Course Co-ordinator

PHYS4551

Solid state physics (6 credits)

Offering Department
Physics

Course Co-ordinator
Prof M H Xie, Physics (mhxie@hku.hk)

Teachers Involved
(Prof M H Xie, Physics)

Course Objectives
This course covers a broad introduction to modern theory of the solid state physics. Some selected advanced topics will also be discussed. This is an elective course for the theoretical and experimental physics themes. This is also an essential course for those who plan to pursue postgraduate studies in condensed matter, solid state physics and material science or to work in related industries.

Course Contents & Topics
Crystal structures and symmetry; the reciprocal lattice and X-ray diffraction; lattice vibration and thermal properties; free electron of metals; band structures and Bloch theory; nearly free electrons and tight binding model; electronic and optical properties; semi-classical model of electron dynamics; if time permits, topics of semiconductor physics, Quantum Hall effect, superconductivity will also be covered.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 demonstrate knowledge for crystal structures and characterization
CLO 2 describe the behavior of solid matter and explain the underlying physical concepts
CLO 3 apply physical principles and mathematical equations to discuss the physical properties of materials
CLO 4 discuss the physics of semiconductors, Quantum Hall effect and superconductivity

Pre-requisites
Pass in (PHYS2255 or PHYS2260) and PHYS3351

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y

Grade Descriptors
(A to F)

A
Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and
Course Type
Lecture-based course

Course Teaching & Learning Activities

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<tbody>
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<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
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<tr>
<td>Reading / Self study</td>
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Assessment Methods and Weighting

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<th>Assessment Methods to CLO Mapping</th>
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</thead>
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<tr>
<td>Assignments</td>
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<td>20</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
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</table>

Required/recommended reading and online materials
Lecture notes provided by course coordinator.

### PHYS4650

**Offering Department:** Physics  
**Academic Year:** 2019  
**Quota:** ---

**Course Co-ordinator:** Dr S C Y Ng, Physics (ncy@bohr.physics.hku.hk)

**Course Objectives**
To introduce the basic theory of stellar structure and evolution. It follows a vigorous mathematical treatment that stresses on the underlying physical processes. Knowledge in quantum mechanics and statistical mechanics will be advantageous.

**Course Contents & Topics**

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1: describe what is stars and to classify different types of stars
- CLO 2: analytically calculate and solve problems related to the structure and evolution of stars including the use of stellar structure equations and Saha equations
- CLO 3: critically examine the physical processes occurring in stars and how these processes affect the evolution of stars
- CLO 4: assess selected research papers in the field of stellar astrophysics

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in PHYS3351 and PHYS3651

**Offer in 2019 - 2020**
Y 2nd sem Offer in 2020 - 2021 : Y

**Grade Descriptors (A to F)**

- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**
Lecture-based course

**Course Teaching & Learning Activities**

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<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
Lecture notes provided by Course Coordinator
### PHYS4651

**Selected topics in astrophysics (6 credits)**

**Offering Department**  
Physics

**Teachers Involved**  
Prof K S Cheng, Physics (hrspksc@hku.hk)

**Course Objectives**  
To introduce students some current topics in astrophysics. It may be taken as a self-contained course or as background work in astrophysics.

**Course Contents & Topics**  

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

CLO 1. Apply physics principles to describe the physical properties of various astrophysical systems.

CLO 2. Explain the observed phenomena of some selected astrophysical objects.

CLO 3. Demonstrate knowledge and discuss the underlying physical concepts associated with the astrophysical systems and their dynamic interactive processes.

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in PHYS3351 or PHYS3450 or PHYS3550 or PHYS3651

**Offer in 2019 - 2020**  
Y 1st sem  
Offer in 2020 - 2021 : N

**Grade Descriptors (A+ to F)**  

<table>
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<th>Grade</th>
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<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
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<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
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<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
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<tbody>
<tr>
<td>Assignments</td>
<td>8</td>
<td>CLO 1.2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1.2,3</td>
<td></td>
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<tr>
<td>Laboratory reports</td>
<td>7</td>
<td>CLO 1.2,3</td>
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<tr>
<td>Presentation</td>
<td>15</td>
<td>CLO 1.2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>20</td>
<td>CLO 1.2,3</td>
<td></td>
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**Course Type**  
Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
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<tr>
<th>Activities</th>
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<td>36</td>
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<tr>
<td>Laboratory</td>
<td></td>
<td>8</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>80</td>
</tr>
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</table>

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1. Describe key aspects of our Solar System and extrasolar planetary systems acquired through observations and experiments.
- CLO 2. Explain essential elements of the processes governing the properties of planetary bodies.
- CLO 3. Apply physical principles to construct models for some basic aspects of the structure, formation and evolution of planetary bodies.

**Required/recommended reading and online materials**

- Lecture notes provided by Course Coordinator

**Course Website**  
http://moodle.hku.hk

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### PHYS4652

**Planetary science (6 credits)**

**Offering Department**  
Physics

**Teachers Involved**  
Dr M H Lee, Physics (mihlee@hku.hk)

**Course Objectives**  
This course provides students with a modern advanced-level understanding of the properties of our Solar System and planetary systems around other stars and of the physical, chemical, and geological processes that govern them.

**Course Contents & Topics**  
Terrestrial planets, giant planets, moons and minor bodies in our Solar System; planetary dynamics; energy transport; planetary atmospheres, surfaces, and interiors; planet formation; extrasolar planets.

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

CLO 1. Describe key aspects of our Solar System and extrasolar planetary systems acquired through observations and experiments.

CLO 2. Explain essential elements of the processes governing the properties of planetary bodies.

CLO 3. Apply physical principles to construct models for some basic aspects of the structure, formation and evolution of planetary bodies.

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in PHYS3651 or (PHYS3350 and PHYS3550)

**Offer in 2019 - 2020**  
Y 2nd sem  
Offer in 2020 - 2021 : N

**Grade Descriptors (A+ to F)**  

<table>
<thead>
<tr>
<th>Grade</th>
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<tr>
<td>A</td>
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<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
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**Assessment Methods and Weighting**

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<td>Assignments</td>
<td>8</td>
<td>CLO 1.2,3</td>
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<tr>
<td>Examination</td>
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<td>Laboratory reports</td>
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<td>Presentation</td>
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<td>Test</td>
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**Course Type**  
Lecture with laboratory component course

**Course Teaching & Learning Activities**

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<td>36</td>
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<td>Laboratory</td>
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<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>80</td>
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**Course Website**  
http://www.physics.hku.hk/~phys4650/
Cosmology (6 credits)

B. Prof K S Cheng, Physics

CLO 1, 2, 3

Course Contents

Course Objectives

The course aims to provide an introduction to cosmology, to familiarize students with the mathematical formulation used to model the evolution and dynamics of the universe, and to provide an up-to-date discussion of the big bang theory and structure and galaxy formation.

Course Contents & Topics


Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: Apply physics principles to describe the observational/experimental aspects of cosmology
- CLO 2: Explain the observed phenomena of cosmology
- CLO 3: Demonstrate knowledge and discuss the underlying physical concepts associated with the cosmological evolution of the universe and with the dynamic interactive processes that take place in the universe

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS3651 or PHYS3652

Offering Department

Physics

Teachers Involved

Prof K S Cheng, Physics (hrspksc@hku.hk)

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk

Course Type

Lecture-based course

Assessment Methods and Weighting

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<td>Assignments</td>
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<td></td>
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Grade Descriptors

(A+ to F)

A. Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B. Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C. Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D. Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail. Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type

Lecture with laboratory component course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>8</td>
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<td>Examination</td>
<td></td>
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<td>CLO 1, 2, 3</td>
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<td>Laboratory reports</td>
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<td>CLO 1, 2, 3</td>
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<td>Presentation</td>
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<td>15</td>
<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Test</td>
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<td>20</td>
<td>CLO 1, 2, 3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Course Website: http://moodle.hku.hk

PHYS4654 General relativity (6 credits)  Academic Year: 2019
Offering Department: Physics  Quota: ---
Course Co-ordinator: Dr M Su (mengsu84@hku.hk)
Teachers Involved: (Dr M Su,Physics)
Course Objectives: To introduce students to the field of general relativity. To provide conceptual skills and analytical tools necessary for astrophysical and cosmological applications of the theory.
Course Learning Outcomes: On successful completion of this course, students should be able to:
CLO 1 apply the mathematical and physical ideas of the theory of general relativity for the study of various systems in astrophysics and cosmology
CLO 2 explain the observational effects at the scale of the Solar System that cannot be described by Newtonian gravity from a general relativistic point of view
CLO 3 demonstrate knowledge and discuss the dynamic interactive physical processes in astrophysics by using a general relativistic approach

Pre-requisites (and Co-requisites and Impermissible combinations) Pass in PHYS2055 and PHYS3350
Offer in 2019 - 2020: Y 1st sem  Offer in 2020 - 2021: Y  Examination: Dec

Grade Descriptors (A+ to F)

A  Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentional skills.
B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentional skills.
C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentional skills.
D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentional skills.
Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentional skills are minimally effective or ineffective.

Course Type: Lecture-based course
Course Teaching & Learning Activities:
Activities | Details | No. of Hours
--- | --- | ---
Lectures |  | 36
Tutorials |  | 12
Reading / Self study |  | 80

Assessment Methods and Weighting:
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Assignments |  | 20 | CLO 1,2,3
Examination | 2-hour written exam | 60 | CLO 1,2,3
Test |  | 20 | CLO 1,2,3

Reading / Self study:
Lecture notes provided by Course Co-ordinator
B. Schutz: A First Course in General Relativity (Cambridge University Press, 2009)

Course Website: http://moodle.hku.hk

PHYS4655 Interstellar medium (6 credits)  Academic Year: 2019
Offering Department: Physics  Quota: ---
Course Co-ordinator: Dr M H Lee, Earth Sciences (mhlee@hku.hk)
Teachers Involved: (Dr M H Lee,Earth Sciences)
Course Objectives: This course provides students with an advanced-level understanding of the processes responsible for the absorption and emission of continuum and line radiation from gas and dust in stellar atmospheres and interstellar space, and their astrophysical applications and implications.
Course Contents & Topics: Gas, dust, atoms, molecules, radiation; physical and radiative properties of hydrogen, helium and heavier elements; hydrogen clouds, molecular clouds; HI regions, nebulae, supernovae.
Course Learning Outcomes: On successful completion of this course, students should be able to:
CLO 1 express what exists between stars in spiral and elliptical galaxies
CLO 2 apply physical principles to describe excitation/ionization and de-excitation/recombination of atoms and ions
CLO 3 recognize which process or processes occur or dominate in which object or phase of the interstellar medium

Pre-requisites (and Co-requisites and Impermissible combinations) Pass in PHYS3651 or (PHYS3351 and PHY3550)

Grade Descriptors (A+ to F)

A  Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability
to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B  
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C  
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D  
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail  
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

PhYS4656  
Advanced astrophysics (6 credits)

Offering Department  
Physics

Course Co-ordinator  
TBA, Physics ()

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
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<tr>
<td>Essay</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
</tr>
<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1,2,3</td>
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</table>

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS3651 or PHYS3653 or (PHYS3351 and PHYS3450)

Assessment Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

<table>
<thead>
<tr>
<th>Methods</th>
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<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>60</td>
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<tr>
<td>Presentation</td>
<td>10</td>
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</tr>
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</table>

Course Type  
Lecture-based course

Grade Descriptors (A+ to F)

A  
Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B  
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C  
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D  
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail  
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
### PHYS4750

**Experimental physics (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Physics</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(TBC, Physics)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>TBC</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>TBC</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
</tbody>
</table>

- **Pre-requisites (and Co-requisites and Impermissible combinations):** TBC

#### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
</tr>
</thead>
</table>

- **Offer in 2020 - 2021:** N
- **Examination:** ---

- **Quota:** ---

#### Course Objectives

This course discusses both theoretical and experimental aspects of particle physics. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.

#### Course Contents & Topics

Topics include: fundamental particles and interactions, symmetry and conservation law, tree level Feynman diagrams, gauge theory SU(3)xSU_L(2)xU_Y(1), Higgs mechanism (basic idea of the spontaneous symmetry breaking and the goldstone boson equivalence theorem), particle accelerator and detector, Higgs discovery experiment.

#### Course Learning Outcomes

On successful completion of this course, students should be able to:
- CLO 1 describe and explain the fundamental physical principles for the standard model of particle physics.
- CLO 2 apply these principles, together with logical and mathematical reasoning, to analyze particle physics processes.
- CLO 3 capture the frontier and progress of particle physics.

#### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS3351

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
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<tbody>
<tr>
<td>2nd sem Offer in 2020 - 2021 :</td>
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</tr>
<tr>
<td>Examination</td>
<td>May</td>
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</table>

#### Course Type

Lecture-based course

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
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<td>CLO 1,2,3</td>
<td></td>
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<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

#### Course Teaching & Learning Activities

- **Activities Details No. of Hours**
  - Reading / Self study: 80
  - Tutorials: 12
  - Lectures: 36
  - Lecture with laboratory component course

#### Grade Descriptors

- Pass
- Marginal
- Credit
- Credit Plus
- Distinction
- Excellent

#### Grade Description

- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

### PHYS4850

**Particle physics (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr Y J Tu. Physics (<a href="mailto:yajanjuntu@hku.hk">yajanjuntu@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr Y J Tu, Physics)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course discusses both theoretical and experimental aspects of particle physics. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Topics include: fundamental particles and interactions, symmetry and conservation law, tree level Feynman diagrams, gauge theory SU(3)xSU_L(2)xU_Y(1), Higgs mechanism (basic idea of the spontaneous symmetry breaking and the goldstone boson equivalence theorem), particle accelerator and detector, Higgs discovery experiment.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
</tbody>
</table>

- **Pre-requisites (and Co-requisites and Impermissible combinations):** Pass in PHYS3351

#### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
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</thead>
</table>

- **Offer in 2020 - 2021:** Y
- **Examination:** May

- **Quota:** ---

#### Course Objectives

This course discusses both theoretical and experimental aspects of particle physics. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.

#### Course Contents & Topics

Topics include: fundamental particles and interactions, symmetry and conservation law, tree level Feynman diagrams, gauge theory SU(3)xSU_L(2)xU_Y(1), Higgs mechanism (basic idea of the spontaneous symmetry breaking and the goldstone boson equivalence theorem), particle accelerator and detector, Higgs discovery experiment.

#### Course Learning Outcomes

On successful completion of this course, students should be able to:
- CLO 1 describe and explain the fundamental physical principles for the standard model of particle physics.
- CLO 2 apply these principles, together with logical and mathematical reasoning, to analyze particle physics processes.
- CLO 3 capture the frontier and progress of particle physics.

#### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS3351

<table>
<thead>
<tr>
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<tr>
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<td>Y</td>
</tr>
<tr>
<td>Examination</td>
<td>May</td>
</tr>
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</table>

#### Course Type

Lecture-based course

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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</tr>
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<tbody>
<tr>
<td>Assignments</td>
<td>20</td>
<td>CLO 1,2,3</td>
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</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
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#### Course Teaching & Learning Activities

- **Activities Details No. of Hours**
  - Reading / Self study: 80
  - Tutorials: 12
  - Lectures: 36
  - Lecture-based course

#### Grade Descriptors

- Pass
- Marginal
- Credit
- Credit Plus
- Distinction
- Excellent

#### Grade Description

- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

### Additional Resources

- Shapiro and S. A. Teukolsky Longair High Energy Astrophysics 3rd ed
- Francis, LeBlanc, An Introduction to Stellar Astrophysics (Wiley, 2010)
- Shapiro and S. A. Teukolsky Longair High Energy Astrophysics 3rd ed
- Shapiro and S. A. Teukolsky Longair High Energy Astrophysics 3rd ed
- Francis, LeBlanc, An Introduction to Stellar Astrophysics (Wiley, 2010)
PHYS4966  
**Offering Department:** Physics  
**Course Co-ordinator:** Dr J C S Pun, Physics (jcspun@hku.hk)  
**Teachers Involved:** (NIL,Physics)  
**Course Objectives:** This capstone course is offered to students majoring in physics, physics (intensive), math/physics or astronomy. It should be taken normally in the final year of study. It provides students with the opportunity to gain working experience in the field of physics or astronomy through intern placement. Students are expected to use what they have learnt in their majors in this intern.  
**Course Contents & Topics:** Students will work as an intern for at least 160 hours within the University or outside the University in a company, government department or NGO. The work nature must be related to physics or astronomy. The internship should be arranged by the Department or obtained by students themselves. In the latter case, it must be approved before the commencement of the internship.  
**Course Learning Outcomes:** On successful completion of this course, students should be able to:  
- CLO 1 apply physics or astronomy knowledge that students have learnt in their majors to real working environment  
- CLO 2 help to create, propose or design part of the project that they are working on during the internship  
- CLO 3 employ effective technical and inter-personal communication skills to people of different background, culture, gender and nationality  
**Pre-requisites (and Co-requisites and Impermissible combinations):** Pass in at least 24 credits of advanced level (3XXX level or above) disciplinary core/elective courses of the Physics Major, Physics (Intensive) Major, Mathematics/Physics Major or Astronomy Major curriculum. This capstone course is for Astronomy, Mathematics/Physics, Physics, and Physics (Intensive) Majors students only. The earliest that a student is allowed to take this capstone course is their year 3 study.  
**Offer in 2019 - 2020**  
- **Grade Descriptors (Pass /Fail):**  
  - **Pass:** Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of "Distinction".  
  - **Fail:** Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.  
**Course Type:** Internship  
**Course Teaching & Learning Activities:**  
- **Activities:** Internship work  
  - it is expected that students are to work at least 160 hours (or the equivalent of 4 weeks full-time)  
  - **No. of Hours:** 160  
**Assessment Methods and Weighting:**  
- **Methods:** Written report  
  - written report, employer's feedback and oral presentation  
  - **Weighting in final course grade (%):** 100  
- **Assessment Methods to CLO Mapping:**  
  - CLO 1,2,3  
**Required/recommended reading and online materials:** To be provided by individual project supervisor  
**Additional Course Information:** Satisfactory completion of this course can be counted towards the Capstone requirement. Details of internship will be recorded on the student's transcript. This course will be assessed on "Pass/Fail" basis. Students who are interested to enrol in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

PHYS4999  
**Offering Department:** Physics  
**Course Co-ordinator:** Dr J L Lim, Physics (jlim@hku.hk)  
**Teachers Involved:** (Various teachers in the department,Physics)  
**Course Objectives:** This capstone course is offered to students majoring in physics, physics (intensive), math/physics or astronomy. It is designed for those who are interested in tackling a research project in physics and/or astronomy. It should be taken normally in their final year of study. It provides students with the opportunity to study a specific problem by themselves, either theoretical, experimental or numerical, under the supervision of an academic staff using the knowledge the student gained in all years of his/her major study. The available projects are close to postgraduate level research in physics and/or astronomy.  
**Course Contents & Topics:** Students interested in taking this course should contact their prospective supervisors in May to determine the contents and the nature of their projects in the coming academic year. They must get the approval from both the prospective supervisor and the course coordinator to take this course.  
For theoretical and numerical projects: Students will receive training in research literature reading and reviewing, and make investigation which is close to research work in nature, under the supervision of a staff member. The student may need to perform some original calculations, to fill in mathematical gaps of some sophisticated derivations, or a combination of both. For numerical projects, students also need to use computers to find numerical or simulation results.  
For experimental projects: Students will carry out experiments in research labs under the supervision of a staff member. The student will receive a comprehensive training in advanced experimental techniques, including preparation of samples, determination of physical properties, measurement of small signals obscured by noise, laser, high-vacuum and low-temperature techniques and so on. Wide reading of the relevant scientific literature
<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>On successful completion of this course, students should be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>plan and execute a theoretical, numerical or experimental research project on a topic in physics or astronomy</td>
</tr>
<tr>
<td>CLO 2</td>
<td>review the knowledge of a physics or astronomy problem in depth through literature review of books and research journals based on what they have learnt in their majors</td>
</tr>
<tr>
<td>CLO 3</td>
<td>criticize existing approaches for solving the selected physics or astronomy problem</td>
</tr>
<tr>
<td>CLO 4</td>
<td>describe and explain connections between the physical principles and the study problem</td>
</tr>
<tr>
<td>CLO 5</td>
<td>(for theoretical or computational projects) identify the key issues of the problem and solve them independently either by analytical or numerical means, and compare the results with predictions or existing solutions</td>
</tr>
<tr>
<td>CLO 6</td>
<td>(for experimental projects) propose and execute physics experiments or astronomical observations, analyze results and sources of errors of the experiment or observation in comparison with predictions</td>
</tr>
<tr>
<td>CLO 7</td>
<td>(for projects involving team work) collaborate and communicate effectively in the team, which may comprise of people of different culture, gender and nationality</td>
</tr>
</tbody>
</table>

| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in at least 24 credits of advanced level (3XXX level or above) disciplinary core/elective courses of the Physics Major, Physics (Intensive) Major, Mathematics/Physics Major or Astronomy Major curriculum. This capstone course is for Astronomy, Mathematical/Physics, Physics, and Physics (Intensive) Majors students only. The earliest that a student is allowed to take this capstone course is their year 3 study. |

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
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<th>Year long</th>
<th>Offer in 2020 - 2021 : Y</th>
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<tr>
<td>Grade Descriptors (A+ to F)</td>
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<td>Examination</td>
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<table>
<thead>
<tr>
<th>Course Type</th>
<th>Project-based course</th>
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</thead>
<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
</tr>
<tr>
<td>Meeting with supervisor</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>including supervisor's comments (10%)</td>
</tr>
<tr>
<td>Research report</td>
<td>70</td>
</tr>
</tbody>
</table>

| Required/recommended reading and online materials | To be provided by individual project supervisor |

<table>
<thead>
<tr>
<th>PHYS7350</th>
<th>Graduate classical mechanics (6 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Physics</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Physics (J)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(TBC,Physics)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>TBC</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>TBC</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in PHYS4350</td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>N</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td></td>
</tr>
</tbody>
</table>

<p>| Course Type | Lecture-based course |</p>
<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Required/recommended reading and online materials | TBC |

<table>
<thead>
<tr>
<th>PHYS7351</th>
<th>Graduate quantum mechanics (6 credits)</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Physics</td>
<td>Quota</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof S Q Shen, Physics (<a href="mailto:sshen@hku.hk">sshen@hku.hk</a>)</td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof S Q Shen, Physics</td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course introduces postgraduates and senior undergraduates to theory and advanced techniques in quantum mechanics, and their applications to select topics in condensed matter physics.</td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>The course will cover the following topics: Dirac notation, quantum dynamics, the second quantization, symmetry and conservation laws, permutation symmetry and identical particles, perturbation and scattering theory, introduction of relativistic quantum mechanics.</td>
<td></td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to: CLO 1 formulate and solve problems in quantum mechanics using Dirac notation CLO 2 examine and predict the properties of identical quantum particles CLO 3 argue the importance of symmetry and conservation laws in quantum mechanics CLO 4 explain physical phenomena in the modern language of quantum mechanics CLO 5 analyse physical system in a quantum mechanical way CLO 6 recognise the connection between relativity and quantum mechanics</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in PHYS4351</td>
<td></td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 2nd sem Offer in 2020 - 2021 : Y</td>
<td>Examination</td>
</tr>
<tr>
<td>Grade Descriptors</td>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Demonstrate substantial command of the knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td></td>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
<td></td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
</tr>
<tr>
<td></td>
<td>Assignments</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Examination</td>
<td>70</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>Lecture notes provided by Course Coordinator</td>
<td>J. J. Sakurai: Modern Quantum Mechanics (Addison-Wesley, 1994)</td>
</tr>
<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetism (6 credits)</td>
<td>Academic Year</td>
</tr>
<tr>
<td>Offering Department</td>
<td>Physics</td>
<td>Quota</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof Z D Wang, Physics (<a href="mailto:zwang@hku.hk">zwang@hku.hk</a>)</td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof Z D Wang, Physics</td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>The aim of this course is to provide students with the advanced level of comprehending on the theory of classic electromagnetic field, enabling them to master key analytical tools for solving real physics problems.</td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>This course will introduce and discuss the following topics: Boundary-value problems in electrostatics and Green Function method, Electrostatics of Media, Magnetostatics, Maxwell's equations and conservation laws, Gauge transformations, Electromagnetic waves and wave guides.</td>
<td></td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to: CLO 1 analyse and solve various electrostatic and magnetostatic problems with Green's Function CLO 2 comprehend and explain many electromagnetic phenomena CLO 3 recognise and comprehend the important concepts of conservation laws and gauge transformations, which should be very helpful for doing research in future</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in PHYS4450</td>
<td></td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 1st sem Offer in 2020 - 2021 : Y</td>
<td>Examination</td>
</tr>
</tbody>
</table>
| Grade Descriptors | A | Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability
### Course Objectives

To provide students with an understanding of more advanced topics in selected areas of solid state physics.

### Teachers Involved

Prof J Wang, Physics (jianwang@hku.hk)

### Course Contents

- Statistical mechanics of interacting systems. Some topics in the theory of phase transition may be selected.

- Reading and online materials:
  - J.D. Jackson: Classical Electrodynamics (John Wiley & Sons, 1999)

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>3-hour written exam</td>
<td>70</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

- Lecture notes provided by Course Coordinator
- R.K. Pathria: Statistical mechanics
- M. Plischke and B. Berghersen: Equilibrium statistical physics

### Grade Descriptors

- **Fail:** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

- **D:** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

- **C:** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective organizational and presentational skills.

- **B:** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

- **A:** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

### Offering Department

Physics

### Grade Descriptors Details

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail</td>
<td>Demonstrates little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrates partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrates general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>A</td>
<td>Demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
</tbody>
</table>

### Course Type

Lecture-based course

### Assessment Methods Details

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>3-hour written exam</td>
<td>70</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Course Descriptions

To provide students with an understanding of more advanced topics in selected areas of solid state physics.

### Course Contents

- Bloch theory. Nearly free electrons and tight binding model. Band structure calculations for realistic systems. The
**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 discuss various methods to calculate the band structures and the major approximations that have been used
- CLO 2 discuss various minimization methods
- CLO 3 discuss the concepts of density functional theory
- CLO 4 explain the concept of first principle calculation and various approximations used

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in PHYS3551 and PHYS4351

**Offer in 2019 - 2020**

N Offer in 2020 - 2021 : N

**Course Grade Descriptors (A+ to F)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of the knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective observation skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems using limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
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</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Lecture notes provided by Course Coordinator C. Kittel: Introduction to Solid State Physics (John Wiley, 1996)

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

Activities | Details | No. of Hours |
-----------|---------|--------------|
Lectures   |         | 36           |
Tutorials  |         | 12           |
Reading / Self study |     | 80           |

**Course Type**

Lecture-based course

**Required/recommended reading and online materials**

TBC

**Course Type**

Lecture-based course

**Required/recommended reading and online materials**

TBC

**Pre-requisites (and Co-requisites and Impermissible combinations)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
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</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective observation skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems using limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

**Course Type**

Lecture-based course
**Course Title:** Environmental radiation (6 credits)  
**Academic Year:** 2019

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>Offer in 2020 - 2021</th>
<th>Grade Descriptors (A to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>N</td>
<td>A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting:**
- **Methods:** Assignments, Essay, Examination  
- **Details:** Weighting in final course grade (%)  
- **Weighting:** 10, 20, 70  
- **Assessment Methods to CLO Mapping:** CLO 1, 2, 3, 4, 5

**Course Type:** Lecture-based course  
**Course Teaching & Learning Activities:** Lectures, Tutorials, Reading / Self study  
**No. of Hours:** 36, 12, 80

**Course Contents & Topics:**  
- The course will cover various kinds of radiations in the environment, the experimental techniques to detect them, and to assess their hazard to the environment, and the ways to reduce the hazard in events of nuclear accidents or incidents.  
- **Course Learning Outcomes:** On successful completion of this course, students should be able to:  
  - CLO 1: realise sources and transport of radionuclides in the environment  
  - CLO 2: explain and assess the impact to the environment from the use of nuclear energies  
  - CLO 3: detect and measure low level radioactivities in environmental samples  
  - CLO 4: justify, optimize, and assess the risk of using radiation and nuclear technologies  
  - CLO 5: compare and contrast the environmental impacts from nuclear energy and other forms of energy

**Pre-requisites:** Pass in CHEM2041 or ENV2001 or ENV2002 or PHYS2265

**Course Content & Topics:**  
- In this course, students will learn about various kinds of radiations in the environment, the experimental techniques to detect them, and to assess their hazard to the environment, and the ways to reduce the hazard in events of nuclear accidents or incidents.  
- **Course Learning Outcomes:** On successful completion of this course, students should be able to:  
  - CLO 1: realise sources and transport of radionuclides in the environment  
  - CLO 2: explain and assess the impact to the environment from the use of nuclear energies  
  - CLO 3: detect and measure low level radioactivities in environmental samples  
  - CLO 4: justify, optimize, and assess the risk of using radiation and nuclear technologies  
  - CLO 5: compare and contrast the environmental impacts from nuclear energy and other forms of energy

**Pre-requisites:** Pass in CHEM2041 or ENV2001 or ENV2002 or PHYS2265

**Offer in 2019 - 2020:** N (Offer in 2020 - 2021 : N)

**Grade Descriptors:** A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. 

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**Offering Department:** Physics  
**Offer in 2019 - 2020:** N  
**Offer in 2020 - 2021:** N  
**Quota:** ---

**Course Co-ordinator:** Prof J K C Leung (jkcleung@hku.hk)  
**Teachers Involved:** (Dr J K C Leung, Physics)

**Course Staff:**  
- Prof S J Xu, Physics (sjxu@hku.hk)  
- (Dr J K C Leung, Physics)

**Department of Physics**
### ENVS3010 Sustainable energy and environment (6 credits)

**Offering Department:** Physics  
**Course Co-ordinator:** Prof A B Djurisic, Physics (dalek@hku.hk)  
**Teachers Involved:** Prof A B Djurisic,Physics  
**Course Objectives:** In this course, the students will learn about sustainability and environmental impact of different energy technologies, including conventional energy sources as well as renewable and/or clean energy sources. The technological challenges, potential for future development, and environmental impacts (community, regional, and global) will be discussed.  
**Course Contents & Topics:** The course will cover energy production and use, environmental impact of energy use, fossil fuels and methods for making them more sustainable, clean fuels, electricity generation, renewable energy technologies (with emphasis on biomass, wind and solar energy), hydrogen, energy storage, and energy conservation. The course will also cover the challenges and potential for development of various energy technologies.  
**Course Learning Outcomes:** On successful completion of this course, students should be able to:  
- CLO 1: Define the concept of sustainable development  
- CLO 2: Explain the challenges and potential for development of various energy technologies  
- CLO 3: Compare the environmental impact of conventional and new energy technologies  
**Pre-requisites (and Co-requisites and Impermissible combinations):** Pass in CHEM2041 or ENVIS2001 or ENVIS2002 or PHYS2280  
**Offer in 2019 - 2020:** Y  
**Grade Descriptors (A+ to F):**  
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.  
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.  
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.  
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.  
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.  
**Required/recommended reading and online materials:**  
**Course Website:** [http://moodle.hku.hk](http://moodle.hku.hk)
<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture notes provided by Course Coordinator</td>
<td></td>
</tr>
<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></td>
</tr>
</tbody>
</table>
## Professional and leadership development (6 credits)

**Offering Department:** Faculty  
**Course Co-ordinator:** Dr R Law, Faculty (rockylaw@hku.hk)  
**Teachers Involved:** (Ms J Lloyd, CEDARS)  
**Course Objectives:**  
1. Students to develop an entrepreneurial mindset and be better prepared for entering into any entrepreneurial environment.  
2. Students to further sharpen their communication skills, such as presentation and pitching of ideas.  
3. Students to further enhance their networking skills, such as in social events.  
4. Students to understand how different personalities and working / leadership styles fit into team work.  

**Course Contents & Topics:** This course aims at increasing students' awareness of some important entrepreneurial competencies and providing them with platforms to hone essential skills necessary to succeed as a leader in operating an entrepreneurial venture.

One of the course components will also allow students to self-reflect and develop practical sense on how different personalities and work styles can help build leadership capacity as well as foster stronger team collaboration.

**Course Learning Outcomes:** On successful completion of this course, students should be able to:

- **CLO 1** acquire basic knowledge about how different personalities and working / leadership styles fit into team work.  
- **CLO 2** gain insight into the fundamentals of starting and operating a business by meeting industry practitioners.  
- **CLO 3** sharpen their communication and career preparation skills in CV and cover letter writing, interview, networking, presentation, negotiation, group discussion, case analysis and problem solving.  
- **CLO 4** recognize and adapt work style differences to establish stronger relationships at workplace in a startup company.

**Pre-requisites (and Co-requisites and Impermissible combinations):** Any level 1 undergraduate course.

**Offer in 2019 - 2020:** Y  
**Grade Descriptors:**  
- **A** - Candidate has consistently demonstrated a thorough understanding and skills required for attaining all the course learning outcomes. S/he has shown the ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. S/he has demonstrated highly effective organizational and presentation skills.
- **B** - Candidate has frequently demonstrated an understanding and skills required for attaining at least most of the course learning outcomes. S/he has shown the ability to apply knowledge to familiar and unfamiliar situations. S/he has demonstrated effective organizational and presentation skills.
- **C** - Candidate demonstrated general but incomplete understanding and skills required for attaining most of the course learning outcomes. Some of the responses are well organized, clear but with insufficient elaboration – there is significant room for improvement to achieve a more satisfactory level. S/he has demonstrated moderately effective organizational and presentation skills.
- **D** - Candidate demonstrated partial but limited understanding and skills required for attaining some of the course learning outcomes. Solutions to questions and problems contain unstructured but relevant observations. Candidate has shown marginal interest in the subject. S/he has demonstrated limited or barely effective organizational and presentation skills.

**Exam:** No Exam  
**Course Type:** Lecture-based course  
**Course Teaching & Learning Activities:**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Project work</td>
<td></td>
<td>43</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>42</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting:**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Include in class and home assignments</td>
<td>40</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Essay</td>
<td>Experiential learning activities and reflective journal</td>
<td>10</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Project reports</td>
<td>Include Job Application Review &amp; Mock Interview and Group Presentation</td>
<td>50</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials:**  
Business and Administrative Communication by Kitty Locker and Donna Kienzler  
Organizational Behavior by Stephen P. Robbins and Timothy A. Judge  
Group Dynamics by Donelson R. Forsyth  
Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds by Carmine Gallo

**Additional Course Information:** This course is opened up for year 2 students or beyond. However, priority will be given to year 3 students.

## Science-based innovation development (6 credits)

**Offering Department:** Faculty  
**Course Co-ordinator:** Dr M Kotaka, Biomedical Sciences (masayo@hku.hk)  
**Teachers Involved:** (Dr A C Koon, Biomedical Sciences)  
(Prof M Kotaka, Biomedical Sciences)  

**Course Objectives:**  
1. Stimulate students to contemplate how business opportunities can be generated from science and technology.  
2. Teach students the process of translating scientific ideas to commercial products and/or services and the challenges therein.  
3. Help students to understand the different regulatory requirements for science and technology-based business opportunities, including the different stages of clinical trial required for biomedical-related products/services.  
4. Inspire students to identify potential business ideas from science and technology research and to synthesise a feasible action plan for a start-up company.

**Course Contents & Topics:** Topics will include identification of business opportunities from science and technology, the stages involved in translation of science into a commercial product, understanding the challenges of translating scientific ideas into products, understanding the regulatory requirements for technology-based products.

**Course Learning Outcomes:** On successful completion of this course, students should be able to:

- **CLO 1** demonstrate an understanding on how science and technology can generate business opportunities.
CLO 2 acquire knowledge of the process and stages involved in translating a scientific idea into a commercial product.
CLO 3 identify the challenges encountered in translating scientific ideas into product and understand how to generate solutions to those challenges.
CLO 4 have a clear understanding of the different regulatory requirements for different technology-based products, as well as the different stages of clinical trials required for the development of biomedical-related products.
CLO 5 demonstrate the ability to critically evaluate cases of science-based business success or failures in written assessments.
CLO 6 evaluate cutting-edge science and technology research to identify potential business opportunities and to devise and deliver a feasible action plan to bring the science into product in the form of an oral presentation with visual or digital aid.

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### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in IIMT1611 and ENTR2001

### Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y
Examination No Exam

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Candidate has consistently demonstrated a thorough understanding and skills for attaining all the course learning outcomes. She/He has shown the ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. She/He has demonstrated highly effective organizational and presentation skills.</td>
</tr>
<tr>
<td>B</td>
<td>Candidate frequently demonstrated a substantial understanding and skills required for attaining at least most of the course learning outcomes. She/He has shown the ability to apply knowledge to familiar and unfamiliar situations. She/He has demonstrated effective organizational and presentation skills.</td>
</tr>
<tr>
<td>C</td>
<td>Candidate demonstrated general but incomplete understanding and skills required for attaining most of the course learning outcomes. Some of the responses are well organized, clear but with insufficient elaboration – there is significant room for improvement to achieve a more satisfactory level. She/He has demonstrated moderately effective organizational and presentation skills.</td>
</tr>
<tr>
<td>D</td>
<td>Candidate demonstrated partial but limited understanding and skills required for attaining some of the course learning outcomes. Solutions to questions and problems contain unstructured but relevant observations. Candidate has shown marginal interest in the subject. She/He has demonstrated limited or barely effective organizational and presentation skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Candidate showed little or no evidence of basic familiarity with the subject, nor demonstration of sufficient effort to basic project and course requirement. Organizational and presentation skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

### Course Type
Lecture-based course

### Course Teaching & Learning Activities
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Project work</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>40</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Project report, Presentations, Discussions and student performance in tutorials</td>
<td>100</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
Entrepreneurship: An Innovator’s Guide to Startups and Corporate Ventures by Marc H. Meyer
Winning at New Products: Creating Value Through Innovation by Robert G. Cooper
Regulatory Affairs for Biomedical, and Medical Devices edited by Stephen F. Amato and Robert M. Ezzell Jr
Online Articles

### Additional Course Information
Further to what has been described in the assessment section, participation and engagement in the class and tutorial is required in this course.

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### ENTR3002
Customer analysis and strategic marketing (6 credits)

#### Offering Department
Faculty

#### Course Co-ordinator
Dr R Law, Faculty (rockyLaw@hku.hk)

#### Teachers Involved
Course Objectives
This course is to provide opportunity for:
1. Students to master techniques to identify customers’ needs and market situations.
2. Students to learn how to define strategies to satisfy customers’ needs and to capture market shares.
3. Students to learn how to develop systematic approaches for commercializing an innovation from the result of analyzing the current market condition and customers’ need.
4. Students to evaluate local and international cases on disruptive/market driven innovation.
5. Students to synthesize and implement their own approaches to invent for the need and develop a business proposal to commercialize such an innovation.

Course Contents & Topics
This course focuses on data collection and analysis of market and customers’ need, through which innovation and commercial opportunities could be identified together with systematic approaches addressing them. The students will learn about practical way of data collection and analysis and about how data-driven business decision will be made wisely. Local and international case studies on disruptive/market driven innovation will also be analyzed and evaluated.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 to master techniques of data collection and analysis particular for market and customer analysis
CLO 2 to acquire knowledge of interpretation of the result of market and customer analysis, and then to define a solution to address the need by an innovative idea/new product
CLO 3 to synthesize systematic approaches to commercialize an innovation with regard to the existing market condition and customers’ need
CLO 4 to analyze local and international cases on disruptive/market driven innovation
CLO 5 to integrate principles discussed in this course via synthesizing and implementing systematic approaches to commercialize an innovation
CLO 6 to draft a business proposal

#### Pre-requisites
Pass in IIMT1611 and ENTR2001
## ENTR4966

### Entrepreneurship internship (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr R Law, Faculty (<a href="mailto:rockylaw@hku.hk">rockylaw@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(All academic staff in Faculty of Science,)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course is to provide opportunity for students: 1. To practice what they learned related to entrepreneurship through prior university coursework in real-life work environment. 2. To acquire first-hand experience in industries for the preparation of their own business ventures.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Students taking this course will work as an intern for at least 160 hours in at least 20 working days within the University or outside the University in a company (preference technology based startup company). The internship may be arranged by the Faculty or obtained by students themselves. 1. Within the university: The student will be supervised by a staff member (Supervisor), working on a project or various tasks as instructed by the Supervisor. 2. Outside the university: The student will be supervised under a staff member of the external agency (the External Supervisor) and a staff member of the Faculty/School /Department of the student (the Internal Supervisor).</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to: CLO 1 to integrate and apply knowledge gained in coursework in a real-life setting CLO 2 to experience the culture of a real organization and challenges encountered in entrepreneurship CLO 3 to further improve problem-solving and collaborative skills in a real-life setting CLO 4 to gain hand-on experience from external startup companies or internal research group about their daily operation and special activities that will help them to prepare for their own startup venture in the near future</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in ENTR3001 and ENTR3002 Students must be in their Year 3 study or beyond, as well as minoring in Science Entrepreneurship.</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>30</td>
<td>CLO 1,2,3,4,5,6</td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td>50</td>
<td>CLO 1,2,3,4,5,6</td>
<td></td>
</tr>
</tbody>
</table>

### Course Website

http://moodle.hku.hk
Students will be briefed with materials appropriate to the individual internship assignment by the internship supervisor(s) and/or the corresponding Faculty members.

Supervisor's feedback: Students are expected to work for at least 160 hours, supervised by a Faculty member. Students are to submit a written report of no more than 2000 words, together with a presentation about their internship experience.

**ENTR4999**

**Entrepreneurship project (6 credits)**

**Offering Department**: Faculty

**Course Co-ordinator**: Dr R Law, Faculty (rockylaw@hku.hk)

**Course Objectives**

This course is to provide opportunity for students to:

1. Apply entrepreneurship-related knowledge gained through prior university coursework and hand-on experiences gained from prior Internship course to carry out in-depth business potential evaluation and to develop start-up proposals.
2. Students to further develop leadership and teamwork experience via collaboration in multi-disciplinary environments.

**Course Contents & Topics**

This course is offered to students as the final course in the minor programme in Science Entrepreneurship. Under the supervision and guidance of an academic staff, students are to use the knowledge they have gained in all years of study to practice entrepreneurship. This can be achieved by conducting technology trend, market analysis and product identification for defining market-product fit solutions. Students are expected to participate, with the result from their hands-on experience in projects, competitions (such as the HKU DreamCatchers initiative, various Hackathon activities and "Challenge Cup" National Competition... etc.) and to develop start-up companies thereafter.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

CLO 1. to integrate and apply theoretical knowledge in a real-life setting
CLO 2. to adopt appropriate tools to analyze real-life entrepreneurship issues
CLO 3. to further improve presentation, problem-solving and collaborative skills in tackling real-life problems
CLO 4. to build a team, with members from different specialized areas, that is ready for business venture
CLO 5. to prepare a viable business plan that is ready for fund raising activities

**Pre-requisites**

Pass in ENTR3001 and ENTR3002

**Offer in 2019 - 2020**

**Grade Descriptors (A to F)**

A Candidate has consistently demonstrated a thorough understanding and skills required for attaining all the course learning outcomes. S/he has shown the ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. S/he has demonstrated highly effective organizational and presentation skills.

B Candidate frequently demonstrated a substantial understanding and skills required for attaining at least most of the course learning outcomes. S/he has shown the ability to apply knowledge to familiar and unfamiliar situations. S/he has demonstrated effective organizational and presentation skills.

C Candidate demonstrated general but incomplete understanding and skills required for attaining most of the course learning outcomes. Some of the responses are well organized, clear but with insufficient elaboration – there is significant room for improvement to achieve a more satisfactory level. S/he has demonstrated moderately effective organizational and presentation skills.

D Candidate demonstrated partial but limited understanding and skills required for attaining some of the course learning outcomes. Solutions to questions and problems contain unstructured but relevant observations. Candidate has shown marginal interest in the subject. S/he has demonstrated limited or barely effective organizational and presentation skills.

Fail Candidate showed little or no evidence of basic familiarity with the subject, nor demonstration of sufficient effort to basic project and course requirement. Organizational and presentation skills are minimally effective or ineffective.

**Course Type**

Project-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting with supervisor</td>
<td>Supervisor meet students in the beginning, middle and the end of this course for briefing and coaching purpose.</td>
<td>15</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Students will be working on their projects with guidance from the supervisor to build a business proposal</td>
<td>120</td>
</tr>
<tr>
<td>Assessment Presentation</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissertation</td>
<td>Research report</td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Oral presentation</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Offering Department**: Faculty

**Course Co-ordinator**: Dr R Law, Faculty (rockylaw@hku.hk)

**Course Objectives**

The objectives are to give students a holistic view of the science discipline in terms of its nature, concepts and
Course Contents & Topics

Part I: The nature and methodology of science
- Demarcation between science and non-science
- Shared features of the sciences
- Scientific method
- The role of mathematics in the historical development of science

Part II: Quantitative reasoning
a. Mathematics with topics selected from
   - Foundation of mathematics,
   - Mathematics and advancement of science - an introduction,
   - Mathematical modelling - an introduction,
   - Guesstimation,
   - Difference equations,
   - Linear algebra and matrices,
   - Calculus and differential equations, and/or
   - Fractals and Chaos.

b. Statistics
   - Probability rules
   - Probabilistic methods
   - Statistical inference
   - Confidence intervals estimation
   - Hypothesis testing
   - Decision making with statistics
   - Statistical modelling, and use and misuse of statistics

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 describe key aspects of scientific methodology
CLO 2 describe the key elements of the foundation of mathematics and statistics
CLO 3 identify the mathematics that underlies scientific problems
CLO 4 apply logical and quantitative reasoning to re-formulate both real life and scientific problems in mathematical terms, and to interpret their solutions

Pre-requisites (and Co-requisites and Impermissible combinations)
NIL
(This course is compulsory for all students taking a Science major offered by the Faculty of Science. Students should take this course in their first year.)

Offer in 2019 - 2020
Y 1st sem 2nd sem  Y 2020 - 2021 : Y

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments coursework includes projects, class tests, and participation in tutorials 60 CLO 1,2,3,4
Examination 2-hour examination 40 CLO 1,2,4

Required/recommended reading and online materials
TBC

SCNC1112 Fundamentals of modern science (6 credits)

Academic Year 2019

Offering Department Faculty Quota ---

Course Co-ordinator Dr J C S Pun, Physics (jcspun@hku.hk)

Teachers Involved
(Pr E K M Leung, Faculty of Science)
(Pr H Y Au-Yeung, Chemistry)
(Pr J C S Pun, Physics)
(Pr J D Gaitan-Espitia, Biological Sciences)
(Pr L Ashton, Biological Sciences)
(Pr M H Lee, Earth Sciences)

Course Objectives
This course aims to provide students an overview of the vast web of knowledge that makes up science. This course adopts an integrated approach and encompasses physics, astronomy, earth sciences, chemistry, and biology, and focuses on the general principles and unifying concepts of science used in various disciplines to impact on civilization and society; to equip students with basic skills of logical and quantitative reasoning; and to introduce students to mathematical and statistical methods for science studies and research.
describe the diverse phenomena and objects in the natural world. The fundamental laws of each discipline, the historical developments and the modern frontiers, and the interconnectedness of different science disciplines will be introduced and highlighted.

**Course Contents & Topics**

<table>
<thead>
<tr>
<th>Description</th>
<th>Course Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Universal principles and unifying concepts of science</td>
<td>(2) Fundamental structure of matter</td>
</tr>
<tr>
<td>- Structure of matter</td>
<td>- The quantum world</td>
</tr>
<tr>
<td>- Atomic particles and standard model</td>
<td>(3) Atoms and molecules</td>
</tr>
<tr>
<td>- MATTERS AND ATOMS: THE PERIODIC TABLE</td>
<td>- Chemical bonds and chemical reactions</td>
</tr>
<tr>
<td>- Important molecules: water, carbon, molecular cluster</td>
<td>(4) DNA/Genetic</td>
</tr>
<tr>
<td>- Nanoscience and nanotechnology</td>
<td>- Molecules of life</td>
</tr>
<tr>
<td></td>
<td>- Genomics and DNA: Genetics and inheritance</td>
</tr>
<tr>
<td></td>
<td>(5) Cells and systems</td>
</tr>
<tr>
<td></td>
<td>(6) Organism and environment</td>
</tr>
<tr>
<td></td>
<td>- The origin and evolution of life</td>
</tr>
<tr>
<td></td>
<td>- Ecology and environment</td>
</tr>
<tr>
<td></td>
<td>(7) Earth and Beyond</td>
</tr>
<tr>
<td></td>
<td>- Solid Earth, Earth’s atmosphere and hydrosphere</td>
</tr>
<tr>
<td></td>
<td>- Earth’s motion in space</td>
</tr>
<tr>
<td></td>
<td>- Planets, the Sun, and the solar system</td>
</tr>
<tr>
<td></td>
<td>- Cosmology</td>
</tr>
</tbody>
</table>

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: Acquire an understanding of the historical development of modern science, the essence and spirit of scientific inquiry methods, and the role of science in the advancement of civilization over time.
- CLO 2: Understand and be familiar with the fundamental scientific principles and concepts.
- CLO 3: Appreciate and critically appraise received ideas and established knowledge.
- CLO 4: Critically and creatively appraise received ideas and established knowledge.
- CLO 5: Develop an understanding of the diverse phenomena and objects in the natural world.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

NIL

(This course is compulsory for all students taking a Science major offered by the Faculty of Science. Students should take this course in their first year.)

**Offer in 2019 - 2020**

Y 1st sem 2nd sem Offer in 2020 - 2021: Y Examination Dec May

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Details</td>
<td>Demonstrate thorough mastery of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate conclusions. Apply effective organizational and presentational skills.</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and correct use of data and results to draw appropriate conclusions. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical abilities, but with limited ability to apply knowledge to solve problems. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
<tr>
<td>No. of Hours</td>
<td>36</td>
<td>12</td>
<td>94</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

- Activities: Details and No. of Hours
  - Lectures: 36
  - Tutorials: 12
  - Reading / Self study: 94
  - Assessment: 1 hour in-class quiz

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorials and homework</td>
<td>Assignments</td>
<td>tutorials and homework</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>Examination</td>
<td>project presentation</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Presentation</td>
<td>Presentation</td>
<td>project presentation</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**SCNC1113**

The big history of our planet: a scientific perspective on everything that has ever happened (6 credits)

**Offering Department**

Faculty

**Course Co-ordinator**

Dr W M Y Cheung, Faculty (willmyc@hku.hk) (willmyc@hku.hk)

**Teachers Involved**

Dr H F Yu, Physics

Prof Q A Parker, Physics

**Academic Year**

2019

**Quota**

50

843
Course Objectives
By exploring the Big History of our planet; from the Big Bang of the Universe, the synthesis of different chemical substances, through the evolution of various species on Earth, to the establishment of modern human society, the course aims to:
(1) discuss the process of scientific discovery, and how our current body of knowledge about Nature was established;
(2) develop students’ understanding of the multi-disciplinary nature of science;
(3) develop students’ understanding of the importance of science and technology to our society, in formulating policies in the society, and solving the future problems of our planet;
(4) increase scientific literacy.

Course Contents & Topics
Part I: From the Cosmos to the Atom
Main theme: How fundamental interactions between the building blocks of matter shape the Universe today as we know it;
Topics include: Big bang, nucleosynthesis, cosmic expansion, cooling of the universe, star formation, and thermal equilibrium of our planet Earth.

Part II: From the Atom to Life
Main theme: How we understand the transition from non-living matter to the diversified biosphere on earth today;
Topics include: Origin of life, evolution, natural selection and tree of life.

Part III: From Life to Mind to Society
Main theme: How our modern civilised society emerges through the development of intelligence and accumulation of knowledge; how science, technology, human society and environment influence one another;
Topics include: Neural network and the emergence of intelligence, historical development of modern science, the role of science in human civilisation and the contemporary world.

Part IV: Looking into the Future
Main theme: Outlook on the future of science, technology, human society and environment; key challenges to be faced by humankind that could be addressed by science and technology;
Topics include: Students will attend one of several parallel modules on topics that suit their interests, such as nano-

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 appreciate and elaborate on the significance of major events in the development and formation of our Universe, our Earth system and our modern society
CLO 2 explain, with some level of depth and details, how a number of major theories allows us to understand the workings of the world
CLO 3 understand how different science disciplines fit and emerge from one another as a collective effort of the humankind to understand Nature
CLO 4 critically assess the mutual influence between science and human society, the role of science in our society as well as the making of science policy in our local region
CLO 5 evaluate some of the major challenges faced by humankind, and discuss solutions from a multi-disciplinary perspective
CLO 6 test claims and engage in historical analysis based on theories and practices from multiple disciplines

Pre-requisites (and Co-requisites and Impermissible combinations)
Level 3 or above in at least one science subject at the pre-university level (HKDSE Physics, Chemistry, Biology, Combined/Integrated Science or equivalent)
This course is not offered to students in the 6901 BSc or 6119 BEd&BSc programmes.

Offer in 2019 - 2020
N Offer in 2020 - 2021 : Y Examination ---

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply knowledge to a wide range of familiar and unfamiliar situations. Carry out computations correctly and carefully. Apply highly effective organizational and presentational skills.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Carry out computations mostly in a careful and correct way, but commit some minor computational errors. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Commit a number of minor computational errors. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Commit some substantial computational errors. Apply limited or barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Commit serious computational errors. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments About 3 reading assignments will be given. Students will then be assessed in various forms such as drawing mind maps, short quizzes or reflective journals. 40 CLO 1,2,3,4,5,6
Presentation Tutorial participation 10 CLO 1,2,3,4,5,6
Project reports Test 30 CLO 1,3,4,5,6 20 CLO 1,2,3,4,6

Required/recommended reading and
Steven Weinberg: The First Three Minutes: A Modern View of the Origin of the Universe (Basic Books)
Charles Darwin: The Origin of Species
SCNC2121 Sustainable food production (6 credits) Academic Year 2019

Offering Department
Faculty

Course Co-ordinator
Dr H S El-Nezami, Biological Sciences (elnezami@hku.hk)

Teachers Involved
(Dr DeLisa Lewis,UBC Faculty of Land and Food Systems)
(Chr H S El-Nezami,Biological Sciences)

Course Objectives
This course is designed to provide students with the opportunity to experience the inner-workings of a sustainable, campus farming operation, and to make connections between the ecosystems that nourish the thriving, urban communities surrounding the farm. Students will participate in plenary sessions with course instructors and guest lecturers from the UBC Faculty of Land and Food Systems, in guided group discussions, field trips on and off-campus, and in a variety of seasonal, hands-on farming activities.

Course Contents & Topics
The MacMillan building, home of the UBC Faculty of Land and Food Systems, will be the site of the plenary sessions, guest speaker lectures, and morning group discussion sessions. The south campus farm in UBC is the site of the majority of farming activities, including afternoon group discussions, harvest Fridays and market Saturdays. Students will have a chance to explore the UBC campus sustainability hot-spots, including the LFS orchard garden, the world-class CIRS green building, Place Vanier, home of an innovative campus chef, Steve Golieb, and the wiggle worm project in the Student Union Building/SUB. Students will also venture off-campus to two the Vancouver Farmers’ Market and to Granville Island Public Market to provide a comparative view of marketing systems and the regionally grounded food system context.

The main approach to learning with this course is student-centered learning and hands-on experience. To meet course learning objectives, students are expected to attend and participate in all sessions, to contribute to group discussions and the group oral presentation, and to complete a series of reflective journals on each of the four main course themes-soils, biodiversity, seeds, marketing.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 connect underlying agroecosystem concepts and soil science fundamentals with principles and practices of sustainable farming
- CLO 2 observe and compare multiple models of agricultural food production in an urban and campus farm setting
- CLO 3 identify multiple strategies for creating on-farm biodiversity
- CLO 4 demonstrate a basic understanding of composting fundamentals
- CLO 5 demonstrate the ability to perform a select set of basic crop maintenance, harvest, washing, and packing techniques in a sustainable campus farm setting
- CLO 6 demonstrate best practices with post-harvest handling and food safety protocols

Pre-requisites (and Co-requisites and Impermissible combinations)
Students are expected to have passed at least 30 credits of level 1 and/or level 2 science courses. Students will also need to pass an interview in order to be enrolled in the course.

Offer in 2019 - 2020
N Offer in 2020 - 2021 ; Y Examination ----

Grade Descriptors (A+ to F)
A Clear understanding of the basics from sustainable farming to marketing strategies used by sustainable farming operations. Ability to perform crop maintenance, harvest, washing, and packing in a sustainable campus farm setting. Ability to demonstrate solid team-based skills for performance of fieldwork, and distinct performance in different assessment components. Ability to synthesize the lessons learned during the course and articulate individual learning objectives for further studies in agriculture, food and human health.

B Clear understanding of the basics from sustainable farming to marketing strategies used by sustainable farming operations. Ability to perform crop maintenance, harvest, washing, and packing in a sustainable campus farm setting. Ability to demonstrate solid team-based skills for performance of fieldwork, and distinct performance in different assessment components.

C Understanding of the basics from sustainable farming to marketing strategies used by sustainable farming operations. Ability to perform crop maintenance, harvest, washing, and packing in a sustainable campus farm setting. Satisfactory demonstration of team-based skills for performance of fieldwork, and satisfactory performance in different assessment components.

D Knowing some of the basics of sustainable farming. Active participation in team-based fieldwork, and satisfactory performance in different assessment components.

Failing Students will follow the basics of sustainable farming as demonstrated by unsatisfactory performance in assignments and/or fieldwork.

Course Type
Field camps

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Field work</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Presentation</td>
<td>Group discussion / Project</td>
<td>10</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Assessment</td>
<td>End of trip report</td>
<td>30</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>To be announced by UBC Faculty of Land and Food Systems</td>
<td>40</td>
<td>CLO 1,2,4,5</td>
</tr>
<tr>
<td>Report</td>
<td>Students will divide into groups of 3-4. Each group will submit a 7-10 pages report (not including the references). Please refer to Remarks for format requirements.</td>
<td>60</td>
<td>CLO 3,5,6</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
UBC Faculty of Land and Food Systems will give reading materials to students.

Course Website

Additional Course Information
Please note: Students have to cover their own travel costs and course fees charged by the hosting institution (prices to be announced). This course will be offered subject to a minimum enrollment number and availability of teachers.
### Marine Life Science: A North East Pacific Perspective (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Course Co-ordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty</td>
<td>Dr. T. Vengatesen, Biological Sciences (<a href="mailto:rajan@hku.hk">rajan@hku.hk</a>)</td>
</tr>
<tr>
<td></td>
<td>(Dr. T. Vengatesen, Biological Sciences)</td>
</tr>
<tr>
<td></td>
<td>(Prof. G. A. Williams, Biological Sciences)</td>
</tr>
<tr>
<td></td>
<td>(Prof. R. S. S. Wu, Biological Sciences)</td>
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<tr>
<td></td>
<td>(Prof. S. Kwock, Earth Sciences)</td>
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</tbody>
</table>

#### Course Objectives
- Marine Life Science is an integrated study of how the oceans influence large and small scale patterns of marine biology through biophysical interactions. By studying the temperate cold waters of the NE Pacific Ocean, students will learn marine habitats as habitable planet, to appreciate the dynamics of marine biodiversity, the complex interactions between the physical and biological components, fishery, and the services the coastal oceans provide to human. This course will provide an excellent opportunity for students to experience the diversity of marine life on the other side of the Pacific.
- The course will also introduce the commercial aspects of marine life, i.e., eel-grass, aquaculture and climate change. The students will also learn marine habitats as habitable planet, to appreciate the dynamics of marine biodiversity, the complex interactions between the physical and biological components, fishery, and the services the coastal oceans provide to human. This course will provide an excellent opportunity for students to experience the diversity of marine life on the other side of the Pacific.
- Students will be exposed to a different learning environment involving not only HKU teachers and students but also UBC teachers and students, bringing diverse range of expertise, cultures, and learning opportunities from both sides of the Pacific.

#### Course Contents & Topics
- Lectures from both HKU and UBC teachers will introduce “marine life science”; with a focus on biodiversity, abundance and distribution of species, productivity, coastal pollution, fisheries, aquaculture and climate change. The course will also introduce the commercial aspects of marine life, i.e., eel-grass, aquaculture and climate change mitigation through management of coastal ecosystems. All these lectures will be discussed through a series of field observations, presentations from guest lecturers and group discussions. There will be an excellent opportunity to touch and learn about Canada’s wonderful marine life diversity in the Vancouver Aquarium, and northern Vancouver Fish Hatchery.
- Students will be learning Canada’s coastal plankton biodiversity through visiting the Marine (Reed point marine) and the Sea-grass habitat. There will also be several opportunities to explore the intertidal zone, exposed and protected coastal habitats, sandy beaches and estuaries in the Vancouver Island.

#### Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - **CLO 1** understand the basics of marine life science and the marine habitable planet
  - **CLO 2** explain the major types, causes, and effects of marine threats such as pollution, overfishing, global warming and ocean acidification, and invasive species, as well as describe the consequences of these threats for marine communities and ecosystem services.
  - **CLO 3** describe the difference between coastal marine biodiversity and harbors in Hong Kong and Canada
  - **CLO 4** discover the reasons why marine biodiversity and ecosystem services in Hong Kong are so different from the North Pacific coastal ecosystems

#### Pre-requisites (and Co-requisites and Impermissible combinations)
- Students are expected to have passed at least 30 credits of level 1 and/or level 2 science courses. Students will also need to pass an interview in order to be enrolled in the course.

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>B</td>
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<tr>
<td></td>
<td>C</td>
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<tr>
<td></td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail</td>
</tr>
</tbody>
</table>

#### Course Type & Course Teaching & Learning Activities
- **Field camps**
- **Activities**
  - Lectures: 10 sessions x 2.5 hours
  - Field work: Field observation and work: about 5 to 6 field study
  - Presentation: Group discussion / Project: 1 group project with presentation
  - Reading / Self study:

#### Assessment Methods and Weighting
- **Methods**
  - Assignments: Group project work (30-mins presentation)
  - Report: 2-hour written examination
  - Test: Field observation (group activities & reports)

<table>
<thead>
<tr>
<th>Methods</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>25</td>
<td>CLO 2</td>
</tr>
<tr>
<td>Report</td>
<td>50</td>
<td>CLO 1.4</td>
</tr>
<tr>
<td>Test</td>
<td>25</td>
<td>CLO 3.4</td>
</tr>
</tbody>
</table>
### Course Objectives

- To introduce the research being done by our Faculty's professors
- To broaden and enrich students' scientific knowledge in and outside of their chosen major
- To foster intellectual discussions between our research professors and students
- To observe how research is done and note the thinking processes and paths that lead to scientific discoveries
- To enhance students' awareness of the importance of science to solve some of the problems facing the society
- To collaborate with and learn from peers from different academic backgrounds in a scientific setting
- To develop essential written and spoken communication skills
- To serve as a potential mentor-mentee matching platform for faculty members and students
- To develop an awareness of research ethics

### Course Contents & Topics

Professors from different departments will be featured in the honours seminar course, and they will discuss their latest research with students. The topics will span the areas of Biological Sciences, Chemistry, Earth Sciences, Physics, as well as Mathematics/Statistics & Actuarial science. In addition, the following topics to prepare students for conducting and communicating research will also be introduced: Introduction to Different Search Engines for Scientific Journals and/or Decoding a Scientific Paper and/or Effective Communication for Scientists (Writing, Oral and Poster Presentations).

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: describe and discuss in an informed manner the fields of research of some of our research professors
- CLO 2: identify how professors with different scientific training solve their research problems
- CLO 3: apply literature search skills to identify and develop a research topic
- CLO 4: practice and master scientific writing and presentation skills
- CLO 5: demonstrate interpersonal skills in collaborating with their peers in a scientific setting
- CLO 6: devise a research proposal and evaluate their peers' works

### Pre-requisites

Pass in SCNC1111, SCNC1112 and a level 2 science course. Students who participated or will participate in ORF/SRF must take this course.

### Assessment

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>A series of writing and reflection assignments will be given</td>
<td>40</td>
<td>CLO 1, 2, 4</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>Students will give a 30-minute group presentation during the last week of the instruction</td>
<td>40</td>
<td>CLO 3, 4, 5, 6</td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td>In-class formative assessment: activities for students to work in groups</td>
<td>20</td>
<td>CLO 1, 2, 4, 5</td>
<td></td>
</tr>
</tbody>
</table>

### Course Type

Lecture-based course

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Lecture-based course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Lectures</td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
</tr>
</tbody>
</table>

### Additional Information

- Reference reading materials will be put on Moodle.
- The course will be offered subject to a minimum enrollment number and availability of teachers.
- Enrolment of this course is not conducted via the online course selection system. Students will be enrolled manually by the Faculty after approval has been obtained from the course coordinator.
- This course will be offered in 2019 - 2020 and 2020 - 2021.
- Enrolment of this course is not conducted via the online course selection system. Students will be enrolled manually by the Faculty after approval has been obtained from the course coordinator.

### Course Schedule

- Lectures 36
- Tutorials 12
- Reading / Self study 100

### Course Information

- Offered Department: Faculty
- Quota: 120
- Offered in Academic Year: 2019 - 2020
- Course Coordinator: Dr R K W Lui, Faculty of Science
- Teachers Involved: (Dr R K W Lui, Faculty of Science) (Dr E K M Leung, Faculty of Science) (Dr R K W Lui, Faculty of Science) (Dr W M Y Cheung, Faculty of Science)

### Reference Reading Materials

Reference reading materials will be put on Moodle.
STAT1600 Elementary statistical methods (6 credits)  Academic Year 2019

Offering Department Statistics & Actuarial Science
Course Co-ordinator Dr C W Kwan, Statistics & Actuarial Science (ckwan@hku.hk)
Teachers Involved (Dr C W Kwan, Statistics & Actuarial Science)
(Dr Y K Chung, Statistics & Actuarial Science)

Course Objectives
The course aims at providing a broad overview of statistics for students who aspire to major in Statistics or Risk Management. It focuses on the roles of statistics as a scientific tool with applications to a wide spectrum of disciplines, and as a science of reasoning which has revolutionized modern intellectual endeavours. It lays a panoramic foundation for a formal study of statistics at the university level.

Course Contents & Topics
- Data collection: observational studies versus designed experiments
- Data presentation: tables; graphs; frequency distributions; correlations; trends
- Probability: randomness; probability models; distributions; measures of central tendency and dispersion
- Inference: estimation; tests of significance and hypotheses; confidence intervals; regression; prediction
- Further issues: controversies; misuse of statistics; ethics.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand the role of statistics as a tool for scientific reasoning
CLO 2 present data in a useful and informative way
CLO 3 acquire basic concepts and perspectives of statistical modelling and inference
CLO 4 distinguish between good and bad statistical practices
CLO 5 pursue a major study in Statistics or Risk Management with a well-established conceptual foundation

Pre-requisites
Not for students who have passed in any of the following courses: STAT1602, STAT1603, STAT3902.

Offer in 2019 - 2020 Y 1st sem 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Organization and presentational skills are minimal effective or ineffective.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimal effective or ineffective.

Course Type Lecture-based course

Assessment Methods and Weighting
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments, class test(s) and project(s))</td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Course Website http://moodle.hku.hk
### Course Objectives

The discipline of statistics is concerned with situations involving uncertainty and variability. Variability greatly affects the interpretation of data. Thus statistics forms an important descriptive and analytical tool. This elementary course, which is taught without much technical mathematics, presents many standard situations of data analysis and interpretation with emphases on business examples. The statistical tests of these situations are presented. Microsoft Excel might be used to carry out some statistical analyses.

### Course Contents & Topics

The course will introduce and discuss the following topics: Presentation of Data, Measures of Central Tendency, Measures of Variability and Uncertainty, Elementary Probability Rules and Basic Probability Distributions such as Binomial, Normal, Poisson, Hyper-geometric and Geometric, Random Sampling, the Normal Sampling Theorem, Point Estimation, Confidence Intervals and Sample Size Determination, Hypothesis Testing Involving Inferences for Means and Proportions as well as the Chi-square tests, Simple Regression and Correlation, Elementary Time Series and Index Numbers.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand the methods for describing sets of data
- CLO 2 perform statistical analysis with calculator and Microsoft Excel, draw conclusions from data using numerical summaries
- CLO 3 understand and apply basic concepts of probability
- CLO 4 gain familiarity with the fundamental concepts of random variables
- CLO 5 make inferences on a population based on sample data
- CLO 6 determine the most appropriate statistical method to use for a given statistical problem
- CLO 7 gain familiarity with the fundamental concepts of statistical inference as they apply to a variety of problems
- CLO 8 understand the basic principles of simple linear regression and correlation and their applications to practical problems in today's society

### Pre-requisites (and Co-requisites and Impermissible combinations)

Not for students who have passed or already enrolled in any of the following courses: STAT2901, STAT1602, STAT2601, STAT1603, ECON280

### Offer in 2019 - 2020

- **Offer in 2020 - 2021:** N

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

### Course Type

Lecture-based course

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examinations</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>25</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td></td>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

- Chiu W. K.: Basic Statistics (Pearson (Asia), 2007)
- Berk, K.N. & Carey, P.: Data Analysis with Microsoft EXCEL (Duxbury press, Update Office 2007)

### Course Website

http://moodle.hku.hk

### Additional Course Information

Calculator: CASIO fx-50FH (This model has SD-MODE, REG-MODE, nCr and Normal Probability Function which is very suitable for this course.)

### STAT1602 Business statistics (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Business statistics (6 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic Year</strong></td>
<td><strong>Quota</strong></td>
</tr>
<tr>
<td>2019</td>
<td>---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Offering Department</strong></th>
<th>Statistics &amp; Actuarial Science</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Co-ordinator</strong></td>
<td>Dr R W L Wong, Statistics &amp; Actuarial Science (<a href="mailto:rwong@hku.hk">rwong@hku.hk</a>)</td>
</tr>
<tr>
<td><strong>Teachers Involved</strong></td>
<td>Dr R W L Wong, Statistics &amp; Actuarial Science</td>
</tr>
</tbody>
</table>

| **Course Objectives** | The discipline of statistics is concerned with situations involving uncertainty and variability. Variability greatly affects the interpretation of data. Thus statistics forms an important descriptive and analytical tool. This elementary course, which is taught without much technical mathematics, presents many standard situations of data analysis and interpretation with emphases on business examples. The statistical tests of these situations are presented. Microsoft Excel might be used to carry out some statistical analyses. |

| **Course Contents & Topics** | The course will introduce and discuss the following topics: Presentation of Data, Measures of Central Tendency, Measures of Variability and Uncertainty, Elementary Probability Rules and Basic Probability Distributions such as Binomial, Normal, Poisson, Hyper-geometric and Geometric, Random Sampling, the Normal Sampling Theorem, Point Estimation, Confidence Intervals and Sample Size Determination, Hypothesis Testing Involving Inferences for Means and Proportions as well as the Chi-square tests, Simple Regression and Correlation, Elementary Time Series and Index Numbers. |

<table>
<thead>
<tr>
<th><strong>Course Learning Outcomes</strong></th>
<th>On successful completion of this course, students should be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>understand the methods for describing sets of data</td>
</tr>
<tr>
<td>CLO 2</td>
<td>perform statistical analysis with calculator and Microsoft Excel, draw conclusions from data using numerical summaries</td>
</tr>
<tr>
<td>CLO 3</td>
<td>understand and apply basic concepts of probability</td>
</tr>
<tr>
<td>CLO 4</td>
<td>gain familiarity with the fundamental concepts of random variables</td>
</tr>
<tr>
<td>CLO 5</td>
<td>make inferences on a population based on sample data</td>
</tr>
<tr>
<td>CLO 6</td>
<td>determine the most appropriate statistical method to use for a given statistical problem</td>
</tr>
<tr>
<td>CLO 7</td>
<td>gain familiarity with the fundamental concepts of statistical inference as they apply to a variety of problems</td>
</tr>
<tr>
<td>CLO 8</td>
<td>understand the basic principles of simple linear regression and correlation and their applications to practical problems in today's society</td>
</tr>
</tbody>
</table>

### Pre-requisites (and Co-requisites and Impermissible combinations)

Not for students who have passed or already enrolled in any of the following courses: STAT1601, STAT2601, STAT1603, STAT2901 or ECON1280

(This course is available to students pursuing a major/minor in Business only.)

<table>
<thead>
<tr>
<th><strong>Offer in 2019 - 2020</strong></th>
<th><strong>Offer in 2020 - 2021:</strong> Y</th>
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<tr>
<td><strong>Grade Descriptors</strong></td>
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<td>B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
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<table>
<thead>
<tr>
<th><strong>Examination</strong></th>
<th><strong>Dec May</strong></th>
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</thead>
<tbody>
<tr>
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<td>Dec May</td>
</tr>
</tbody>
</table>

849
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**Course Type**  
Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
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</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4,5,6,7,8</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Gerald Keller: Managerial Statistics (Cengage Learning, 2009, 8th edition)  
Berk, K.N. & Carey, P.: Data Analysis with Microsoft EXCEL (Duxbury press, Update Office 2007)  

**Course Website**  
http://moodle.hku.hk

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**STAT1603 Introductory statistics (6 credits)**  
**Offering Department**  
Statistics & Actuarial Science  
**Course Co-ordinator**  
Dr K P Wat, Statistics & Actuarial Science (watkp@hku.hk)  
**Teachers Involved**  
(Dr K P Wat, Statistics & Actuarial Science)  
(Mrs G M Jing, Statistics & Actuarial Science)

**Course Objectives**

The discipline of statistics is concerned with situations involving uncertainty and variability. The interpretation of data needs special techniques when variability plays a role, as it usually does. Thus statistics forms an important descriptive and analytical tool of many scientific disciplines. Candidates with a mathematical background will find this course suitable, because the language of mathematics allows the subject of statistics to be presented with economy and clarity.

**Course Contents & Topics**


**Course Learning Outcomes**

On successful completion of this course, students should be able to:
- CLO 1 compute different measures of central tendency and dispersion
- CLO 2 make use of the basic probability theory and techniques to solve practical problem
- CLO 3 know how to construct confidence intervals and use hypotheses testing to carry out inference on the population
- CLO 4 use linear regression and correlation methods to solve problems in science and in social and business environment

**Pre-requisites (and Co-requisites and Impermissible combinations)**

(Level 2 or above in HKDSE Mathematics Extended Module 1 or 2 or equivalent) or (Pass or already enrolled in any of these courses: MATH1009, MATH1011, MATH1013, MATH1851, MATH1853); and Not for students who have passed or already enrolled in any of these courses: STAT1601, STAT1602, STAT2601, STAT2901

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>Y</th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Offer in 2020 - 2021: Y</th>
<th>Examination</th>
<th>Dec</th>
<th>May</th>
</tr>
</thead>
</table>

**Grade Descriptors (A+ to F)**

A  
Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B  
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C  
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D  
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail  
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

---

**Course Type**  
Lecture-based course

**Course Teaching & Learning Activities**

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**Assessment Methods and Weighting**

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<td>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


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850
### Course Website
http://moodle.hku.hk

### Additional Course Information
Students who intend to major in "Decision Analytics" or "Risk Management" or "Statistics" should take STAT2601 instead of this course. Other references:

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### STAT2601
**Probability and statistics I (6 credits)**

#### Offered in 2019 - 2020
- **Y** 1st sem
- **Y** 2nd sem

#### Grade Descriptors (A+ to F)
- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

#### Exam
- **One 2-hour written examination**

#### Assessment Methods
- **Assignments**: Coursework (assignments, tutorials, and class test(s))
- **Examination**: One 2-hour written examination

#### Course Type
- Lecture-based course

#### Course Teaching & Learning Activities
- **Activities**: Details
  - Lectures: 36
  - Tutorials: 12
  - Reading / Self study: 10

#### Assessment Methods and Weighting
- **Assignments**: Weighting in final course grade (%)
- **Examination**: CLO 1.2,3

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### STAT2602
**Probability and statistics II (6 credits)**

#### Offered in 2019 - 2020
- **Y** 1st sem
- **Y** 2nd sem

#### Grade Descriptors (A+ to F)
- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

#### Exam
- **One 2-hour written examination**

#### Assessment Methods
- **Assignments**: Coursework (assignments, tutorials, and class test(s))
- **Examination**: One 2-hour written examination

#### Required/recommended reading and online materials

#### Course Website
http://moodle.hku.hk

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### Additional Course Information
Students who intend to major in "Decision Analytics" or "Risk Management" or "Statistics" should take STAT2601 instead of this course. Other references:

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### Statistics & Actuarial Science

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### Course Website
http://moodle.hku.hk

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### Additional Course Information
Students who intend to major in "Decision Analytics" or "Risk Management" or "Statistics" should take STAT2601 instead of this course. Other references:
## Course Objectives
This course builds on STAT2601, introducing further the concepts and methods of statistics. Emphasis is on the two major areas of statistical analysis: estimation and hypothesis testing. Through the disciplines of statistical modeling, inference and decision making, students will be equipped with both quantitative skills and qualitative perceptions essential for making rigorous statistical analysis of real-life data.

## Course Contents & Topics
1. Overview: random sample; sampling distributions of statistics; moment generating function; large-sample theory; laws of large numbers and Central Limit Theorem; likelihood; sufficiency; factorisation criterion;
2. Estimation: estimator; bias; mean squared error; standard error; consistency; Fisher information; Cramer-Rao Lower Bound; efficiency; method of moments; maximum likelihood estimator;
3. Hypothesis testing: types of hypotheses; test statistics; p-value; size; power; likelihood ratio test; Neyman-Pearson Lemma; generalized likelihood ratio test; Pearson chi-squared test; Wald tests;
4. Confidence interval: confidence level; confidence limits; equal-tailed interval; construction based on hypothesis tests.

## Course Learning Outcomes
On successful completion of this course, students should be able to:
- **CLO 1**: apprehend the objectives of statistics and its relation to probability theory
- **CLO 2**: relate a real-life problem to a formal framework for statistical inference
- **CLO 3**: conduct standard parametric statistical inference by means of estimation and hypothesis testing
- **CLO 4**: reckon the general applicability of statistics in a broad range of subject areas

## Pre-requisites
- Pass in STAT2601; and
- Not for students who have passed in STAT3902, or already enrolled in this course.

## Offer in 2019 - 2020
<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Y 1st sem</th>
<th>2nd sem</th>
<th>Offer in 2020 - 2021</th>
<th>Y Examination</th>
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<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
<td>5</td>
<td>Proc Append; present data in a readable way by PROC TABULATE; produce high-resolution graphics</td>
<td>5</td>
<td></td>
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<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
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<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
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<td></td>
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<tr>
<td>C</td>
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<td>3</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Fail</td>
<td>2</td>
<td>No evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
<td>2</td>
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</table>

## Course Type
Lecture-based course

## Course Teaching & Learning Activities
<table>
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<th>Activities &amp; Learning Activities</th>
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<td>Examination</td>
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<td>75</td>
<td>CLO 1,2,3,4</td>
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</table>

## Required/recommended reading and online materials

## Course Website
http://moodle.hku.hk

## STAT2603
Data management with SAS (6 credits)

### Offering Department
Statistics & Actuarial Science

### Course Co-ordinator
Dr G C S Lui, Statistics & Actuarial Science (csglui@hku.hk)

### Teachers Involved
Dr G C S Lui, Statistics & Actuarial Science

### Course Objectives
This course is designed for students who want to learn the statistical software (SAS) for data management and elementary data analysis. This course focuses on using SAS to manage data set input and output, work with different data types, manipulate and transform data, perform random sampling and descriptive data analysis, and create summary reports and graphics.

### Course Contents & Topics

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- **CLO 1**: access online help and document
- **CLO 2**: use Data Step to create data files
- **CLO 3**: summarize data by PROC MEANS, PROC FREQ, and PROC UNIVARIATE
- **CLO 4**: work with numeric, character, and date variables and functions in Data Step
- **CLO 5**: perform conditional processing in Data Step
- **CLO 6**: perform iterative processing in Data Step including the following: work with arrays in Data step; restructure SAS data sets by Data Step and PROC TRANSPOSE; subset and merge data sets by Data Step and PROC APPEND; present data in a readable way by PROC TABULATE; produce high-resolution graphics by PROC SGPLOT, HTML output by ODS; procedure SQL for structured query language

### Pre-requisites
Pass in STAT1600 or MATH1821, or already enrolled in this course
Course Objectives

This course is designed to provide a first-level introduction to the popular and powerful statistical programming language R. This course focuses on learning the basic programming skills in R with examples and applications in elementary statistical analysis. The programming skills involved can be applied to input and output of data sets, work with different data types, manipulation and transformation of data, random sampling, descriptive data analysis, and production of professional summary reports with high-quality graphs.

Course Contents & Topics

1. R basics: first steps; language essentials.
2. The R environment: session management; the graphics subsystem; R programming; data entry.
3. Probability and distributions: random sampling; probability calculations and combinatorics; discrete distributions; continuous distributions; the built-in distributions in R.
4. Descriptive statistics and graphics; summary statistics for a single group; graphical display of distributions; summary statistics by groups; graphics for grouped data; graphical display of tables.
5. Simple linear regression: residuals and fitted values; prediction and confidence bands; correlation.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1. access online help and documents for R
CLO 2. use R to input data, perform data transformation and merging, output data
CLO 3. summarize data in tables and graphs for descriptive data analysis
CLO 4. work with numeric, character, and other unstructured data types
CLO 5. be able to write functions, loops and control flows
CLO 6. perform data management using SQL language in R
CLO 7. perform Monte Carlo simulations to validate statistical concepts

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk

Grade Descriptors (A+ to F)

A  Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited application of effective organizational and presentational skills.

Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods and Weighting

Assignments  Coursework (assignments, tutorials, and class test(s)) 40 CLO 1,2,3,4,5,6
Examination  One 2-hour written examination 60 CLO 1,2,3,4,5,6

Assessment Methods to CLO Mapping

CLO 1: describe and discuss knowledge and skills required for attaining the course learning outcomes.
CLO 2: demonstrate command of knowledge and skills required for attaining all the course learning outcomes.
CLO 3: demonstrate command of knowledge and skills required for attaining most of the course learning outcomes.
CLO 4: demonstrate command of knowledge and skills required for attaining some of the course learning outcomes.
CLO 5: demonstrate knowledge and skills required for attaining the course learning outcomes.
CLO 6: demonstrate knowledge and skills required for attaining the course learning outcomes.
CLO 7: demonstrate knowledge and skills required for attaining the course learning outcomes.

Reading / Self-study

http://moodle.hku.hk
STAT2605

Demographic and socio-economic statistics (6 credits)

Offering Department
Statistics & Actuarial Science

Course Co-ordinator
Ms L M S Kwan, Statistics & Actuarial Science (lucykwan@hku.hk)

Teachers Involved
(Ms L M S Kwan, Statistics & Actuarial Science)

Course Objectives
The course covers the major methods for studying demographic and socio-economic statistics, with a quantitative evidence-based approach to understand the socio-economic well-being of residents in a territory. The course aims to provide students with 1) essential underlying principles and the pertinent methods behind internationally adopted statistical indicators; and 2) skills in the statistical descriptions and further analysis for application to planning, policy-making and commercial endeavours of a territory.

Course Contents & Topics
Demographic statistics on population structure, fertility, mortality, migration, life tables, population projections; Socio-economic statistics on housing, labour, and social equity; Economic statistics on external trade, innovation, prices and GDP measurements (with emphasis on methods pertaining to some important economic sectors in the case of GDP).

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 describe and interpret major official & other publicly disseminated socio-economic statistics of a territory
- CLO 2 further appraise and analyse the socio-economic well-being of a territory with particular reference to Hong Kong, neighbouring economies or comparable economies
- CLO 3 predict a future situation by extrapolating or referencing from appropriate statistics

Pre-requisites
(Level 2 or above in HKDSE Mathematics or Level 2 or above in HKDSE Mathematics Extended Module 1 or 2 or equivalent); and Pass or already enrolled in BIOL2102, ECON1280, STAT1601, STAT1602, STAT2601, STAT1603, STAT2901

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors
(A+ to F)
A
- Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
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C
- Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar situations. Apply moderately effective organizational and presentational skills.
D
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
F
- Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework (assignments, tutorials, and class test(s)) 50 CLO 1,2,3,4,5,6,7
Examination One 2-hour computer lab-based examination 50 CLO 1,2,3,4,5,6,7

Required/recommended reading and online materials
- There are also many on-line learning materials that fit well the contents of this course (details provided by the course instructor).

Course Website
http://moodle.hku.hk

STAT2901

Probability and statistics: foundations of actuarial science (6 credits)

Offering Department
Statistics & Actuarial Science

Course Co-ordinator
Prof S M S Lee, Statistics & Actuarial Science (amslee@hku.hk)

Teachers Involved
(Prof S M S Lee, Statistics & Actuarial Science)

Course Objectives
The purpose of this course is to develop knowledge of the fundamental tools in probability and statistics for...
quantitatively assessing risk. Applications of these tools to actuarial science problems will be emphasized. Students will have a thorough command of probability topics and the supporting calculations.

1. General probability
   - Basic elements of probability in set notation
   - Mutually exclusive events
   - Addition and multiplication rules
   - Independence of events
   - Combinatorial probability
   - Conditional probability and expectations
   - Bayes theorem / Law of total probability
   - Random variables
2. Univariate probability distributions (including binomial, negative binomial, geometric, hypergeometric, Poisson, uniform, exponential, chi-square, beta, Pareto, lognormal, gamma, Weibull and normal) and bivariate normal distribution
   - Probability functions and probability density functions
   - Cumulative distribution functions
   - Mode, median, percentiles and moments
   - Variance and measures of dispersion
   - Central limit theorem
3. Sampling distributions and introduction of estimation

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the mathematical theory underlying the modern practice of statistics
CLO 2 develop skills in probabilistic analysis for problems involving randomness
CLO 3 apply techniques in probability and statistics to solve actuarial science problems

Pre-requisites
Not for students who have passed or enrolled in any of these courses: STAT1601, STAT1602, STAT1603, STAT2601
Pass in MATH11013 or already enrolled in this course [for students outside the BSc(ActuarSc) programme]; and
Pass in MATH1821 [for BSc(ActuarSc) students] or already enrolled in this course, or
Pass in STAT2901, or already enrolled in this course; and
Pass in MATH1821 [for BSc(ActuarSc) students] or already enrolled in this course, or
Not for students who have passed in STAT3615, or already enrolled in this course.

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors
A+ to F

Grade Descriptors
(A+ to F)

Course Type
Lecture-based course

Course Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials tutorials/example classes 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework (assignments, tutorials, and a class test) 25 CLO 1,2,3
Examination 3-hour written examination 75 CLO 1,2,3

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk

STAT2902

Offering Department
Statistics & Actuarial Science

Course Co-ordinator
Prof K C Yuen, Statistics & Actuarial Science (kcyuen@hku.hk)

Teachers Involved
(Prof K C Yuen, Statistics & Actuarial Science)

Course Objectives
This course introduces the fundamental concepts of financial mathematics which plays an important role in the development of basic actuarial techniques. Practical applications of these concepts are also covered.

Course Contents
Key topics include: measurement of interest, annuities certain; discounted cash flow analysis; yield rates; amortization schedules and sinking funds; bonds and related securities; practical applications such as real estate mortgage and short sales; stochastic approaches to interest; and key terms of financial analysis such as yield curves, spot rates, forward rates, duration, convexity, and immunization.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand basic concepts of financial mathematics
CLO 2 understand and formulate elementary financial problems
CLO 3 apply compound interest theory to tackle some practical financial problems
CLO 4 show an understanding of the term structure of interest rates
CLO 5 show an understanding of simple stochastic models for investment returns

Pre-requisites
Pass in STAT2901, or already enrolled in this course; and
Not for students who have passed in STAT3615, or already enrolled in this course.
# STAT3600 Linear statistical analysis (6 credits)

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<thead>
<tr>
<th>Offering Department</th>
<th>Statistics &amp; Actuarial Science</th>
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</thead>
<tbody>
<tr>
<td>Academic Year</td>
<td>2019</td>
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## Course Co-ordinator
Prof T W K Fung, Statistics & Actuarial Science (wingfung@hku.hk)

## Teachers Involved
(Dr T W Y Li, Statistics & Actuarial Science)
(Prof T W K Fung, Statistics & Actuarial Science)

## Course Objectives
The analysis of variability is mainly concerned with locating the sources of the variability. Many statistical techniques investigate these sources through the use of "linear" models. This course presents the theory and practice of these models.

## Course Contents & Topics

1. Simple linear regression: least squares method, analysis of variance, coefficient of determination, hypothesis tests and confidence intervals for regression parameters, prediction.
2. Multiple linear regression: least squares method, analysis of variance, coefficient of determination, reduced vs full models, hypothesis tests and confidence intervals for regression parameters, prediction, polynomial regression.
3. One-way classification models: one-way ANOVA, analysis of treatment effects, contrasts.
4. Two-way classification models: interactions, two-way ANOVA for balanced data structures, analysis of treatment effects, contrasts, randomised complete block design.
5. Universal approach to linear modelling: dummy variables, 'multiple linear regression' representation of one-way and two-way (unbalanced) models, ANCOVA models, concomitant variables.
6. Regression diagnostics: leverage, residual plot, normal probability plot, outlier, studentised residual, influential observation, Cook's distance, multicollinearity, model transformation.

## Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 understand linear regression model with one or multiple independent variables
- CLO 2 understand ANOVA models for one and two factors
- CLO 3 understand general linear model with categorical and continuous independent variables

## Pre-requisites and Co-requisites
Pass in STAT2602, and
Not for students who have passed in STAT3907, or have already enrolled in this course.

## Course Type
Lecture-based course

## Assessment Methods
- **Methods**: Details, Weighting in final course grade (%), Assessment Methods to CLO Mapping
- **Assignments**: Coursework, (assignments, tutorials, and class test(s)) 25 CLO 1, 2, 3, 4, 5
- **Examination**: One 3-hour written examination 75 CLO 1, 2, 3, 4, 5

## Pre-requisites
- Pass in STAT2602, and
- Not for students who have passed in STAT3907, or have already enrolled in this course.

## Course Website
http://moodle.hku.hk/hky
### Course Objectives

On successful completion of this course, students should be able to:

- CLO 1: gain thorough insight into the essentials of statistical inference.
- CLO 2: build a solid foundation for future research studies in statistics and related areas.
- CLO 3: gain thorough insight into the essentials of statistical inference.

### Course Contents & Topics

1. Decision problem - frequentist approach: loss function; risk; decision rule; admissibility; minimaxity; unbiasedness; Neyman's rule.
2. Decision problem - Bayesian approach: prior and posterior distributions, Bayesian inference.
3. Estimation theory: exponential families; likelihood; sufficiency; minimal sufficiency; completeness; UMVU estimators; information inequality; large-sample theory of maximum likelihood estimation.
4. Hypothesis testing: uniformly most powerful test; monotone likelihood ratio; UMP unbiased test; large-sample theory of likelihood ratio; confidence set.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: form a panoramic view of classical developments in mathematical statistics.
- CLO 2: gain thorough insight into the essentials of statistical inference.
- CLO 3: build a solid foundation for future research studies in statistics and related areas.

### Pre-requisites

Pass in STAT2602 or STAT3902

### Course Website

http://moodle.hku.hk

### Required/recommended reading and online materials


### Course Website

http://moodle.hku.hk
states, Poisson process, distribution of inter-arrival time and waiting time, conditional distribution of the arrival time, Brownian Motion, hitting time and maximum variable, geometric Brownian motion, the Black-Scholes option pricing formula, Gaussian bridge, and stationary processes. Birth-and-death process, branching process and renewal process may also be covered (if time permits).

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: apply the conditioning method to calculate the mean and probability
- CLO 2: understand the essentials of Markov chains, the Poisson process, and Brownian motion
- CLO 3: understand how stochastic models can be applied to the study of real-life phenomena

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in STAT2601; and

Not for students who have passed in MATH3603, or have already enrolled in this course; and

Not for students who have passed in STAT3903, or have already enrolled in this course.

**Offer in 2019 - 2020**

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<tr>
<td>Y 1st sem</td>
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**Grade Descriptors (A to F)**

- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

**Activities**

- Lectures: 36 hours
- Reading / Self study: 12 hours

**Assessment Methods and Weighting**

- Assignments: Coursework (assignments, tutorials, and a class test) 25% CLO 1,2,3
- Examination: One 2-hour written examination 75% CLO 1,2,3

**Required/recommended reading and online materials**

S. M. Ross: Introduction to Probability Models (9th edition)

**Course Website**

http://moodle.hku.hk

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**STAT3604**

Design and analysis of experiments (6 credits)

**Offering Department**

Statistics & Actuarial Science

**Academic Year**

2019

**Course Co-ordinator**

TBC, Statistics & Actuarial Science (/)

**Teachers Involved**

(Dr Z Liu, Statistics & Actuarial Science)

**Course Objectives**

Scientific research often requires proper design and analysis of experiments. This course aims to introduce the basic principles of experimental design; to explain the concepts and to develop the statistical skills in model-based analysis of experiment.

**Course Contents & Topics**

Basic principles and guidelines for designing experiments. Analysis for experiments with a single factor, randomised block, crossed and nested factorial structure. Balanced incomplete factorial experiments. Latin squares and related designs. Fitted/random effects models.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: develop a conceptual understanding of experimental design
- CLO 2: acquire the fundamental statistical tools of experimental design and the understanding to use them appropriately
- CLO 3: select appropriate experimental designs for different problems
- CLO 4: select appropriate statistical model and to know how to validate the model

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in STAT2602 or STAT3611 or STAT3902

**Offer in 2019 - 2020**

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<tr>
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<td>Dec</td>
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**Grade Descriptors (A+ to F)**

- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
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- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

**Activities**

- Lectures: 36 hours
Quality control and management (6 credits)

Offering Department: Statistics & Actuarial Science
Course Co-ordinator: TBC, Statistics & Actuarial Science
Teachers Involved: Ms O T K Choi, Statistics & Actuarial Science
Course Website: http://moodle.hku.hk

Course Objective:
The successful control of quality in production is a matter of primary importance to a company's prosperity. This course provides an overview of quality compromise which involves both the producer and the consumer. It presents a variety of statistical solutions including control charts, acceptance and sequential sampling plans, reliability, and life-testing. Contemporary quality management systems such as total quality control, zero defects, six-sigma, and ISO-9000 will be introduced. The student is brought to the forefront of today's quality control and management ideas.

Course Contents & Topics:

Course Learning Outcomes:
- On successful completion of this course, students should be able to:
  - CLO 1: appreciate the practicality of statistical concepts and methods in general
  - CLO 2: understand how certain specific statistical methods can benefit various production situations
  - CLO 3: know the traditional and modern systems of quality management
  - Possess in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or STAT2602 or (STAT1603 and any University level 2 course) or STAT3902

Grade Descriptors (A+ to F):
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods and Weighting:
- Assignments: Coursework (assignments, tutorials, and a class test) 25 CLO 1.2,3
- Examination: One 2-hour written examination 75 CLO 1.2,3

Required/recommended reading and online materials:
- D. R. Cox: Planning of Experiments (Wiley, 1958)
- P. W. M. John: Statistical Design and Analysis of Experiments (Macmillan, 1971)

Course Website: http://moodle.hku.hk
## Course Objectives
Modern business corporations are increasingly using logistics as a management tool, for example, in capital budgeting problems, production planning, scheduling, transportation, inventory control and queuing problems.

## Course Contents & Topics
In this course, students will apply the analytical skills with aid of computer techniques in solving the business logistic problems. Topics include optimization techniques applied in allocation of resources, financial planning, transportation, assignment, inventory control and queuing problems.

## Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 solve linear programming with Graphical approach, Simplex method and hands-on Excel Solving function
- CLO 2 set up and solve network flow problems using least-cost approach, MODI method and Vogel's approximation.
- CLO 3 understand decision theory and its applications
- CLO 4 evaluate the cost and effectiveness of service systems

## Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2901; and Not for students who have passed MATH3901, or have already enrolled in this course.

## Grade Descriptors (A+ to F)
- **A**
  - 1st sem Offer in 2020 - 2021: Y
  - Examination: Dec
  - Pass: demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**
  - Pass in STAT2602 or STAT3902
  - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**
  - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**
  - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**
  - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

## Course Type
Lecture-based course

## Course Teaching & Learning Activities
<table>
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<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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## Assessment Methods and Weighing
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<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments, tutorials and a test)</td>
<td>25</td>
<td>CLO 1, 2, 3, 4</td>
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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1, 2, 3, 4</td>
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## Required/recommended reading and online materials
F. S. Hillier and G. J. Lieberman: An Introduction to Operations Research
Robert F. V. Anderson, Holt, Rinehart and Winston: Introduction to Linear Algebra

## Course Website
http://moodle.hku.hk

## STAT3607
Statistics in clinical medicine and bio-medical research (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Statistics &amp; Actuarial Science</th>
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</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof G Yin, Statistics &amp; Actuarial Science (<a href="mailto:gyin@hku.hk">gyin@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof G Yin, Statistics &amp; Actuarial Science (<a href="mailto:gyin@hku.hk">gyin@hku.hk</a>)</td>
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## Course Objectives
In clinical research, medical data are often observed which motivates the application of statistical methodology to the clinical observational and decision-making process. Also, statistical problems often arise from clinical trial designs. It involves phase I, II, III and IV clinical trial designs, both Bayesian and frequentist approaches, sample size and power calculation. No knowledge in biology or medicine is assumed; the course provides the necessary biomedical background when the statistical problems are introduced.

## Course Contents & Topics
The contents of the course include contingency tables, regression models, survival analysis, categorical data analysis, Bayesian designs, dose-finding methods, sample size and power calculation, phase I, II and III trial designs, hypothesis testing, adaptive designs.

## Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand the basic concepts in medical statistics
- CLO 2 design clinical trials and compute sample sizes
- CLO 3 conduct statistical inference and apply regression models
- CLO 4 solve medical problems by using various statistical tests

## Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT2602 or STAT3902

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<thead>
<tr>
<th>Offer in 2019 - 2020</th>
<th>N Offer in 2020 - 2021: Y</th>
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<tbody>
<tr>
<td>Examination</td>
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</table>

## Grade Descriptors (A+ to F)
- **A**
  - Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**
  - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**
  - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**
  - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**
  - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
### Course Type
- Lecture-based course

### Course Teaching & Learning Activities

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### Assessment Methods and Weighting

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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Required / recommended reading and online materials

### Course Website
- http://moodle.hku.hk

### Additional Course Information
- Other references:
  - S. J. Pocock: Clinical Trials: A Practical Approach (Chichester: John Wiley & Sons, 1991)

### Course Objectives
- This course aims to provide students with a fundamental knowledge of DNA profiling in human identification and forensic DNA and genetic problems.

### Course Contents & Topics
- This course will cover the following topics: background of genetics; Mendelian inheritance; Hardy-Weinberg equilibrium; linkage equilibrium; chi-square test; likelihood ratio test; exact test; match probability; paternity testing and kinship analysis; DNA mixed stain; relatedness; population structure; gene mapping; parametric linkage analysis; non-parametric linkage analysis; linkage disequilibrium; association designs; case-control analysis; family-based association study; quantitative traits.

### Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1 understand the fundamental principles in statistical DNA forensics and genetic epidemiology
  - CLO 2 know the usefulness and possible limitations of statistical methodology in human identification and gene mapping
  - CLO 3 provide statistical solutions to specific problems in the field

### Pre-requisites (and Co-requisites)
- Pass in STAT2602 or STAT3902

### Offer in 2019 - 2020
- Offer in 2020 - 2021: Y

### Grade Descriptors (A+ to F)
- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
STAT3609

Course Title: The statistics of investment risk (6 credits)

Offering Department: Statistics & Actuarial Science
Course Co-ordinator: Dr K P Wat, Statistics & Actuarial Science (watkp@hku.hk)

Course Objectives:
Most investments involve some risk. The decision to invest or not is usually made against a background of uncertainty. Whilst prediction of the future is difficult, there are statistical modelling techniques which provide a rational framework for investment decisions, particularly those relating to stock markets and the markets for interest rates, commodities and currencies. Building upon research, both in Hong Kong and abroad, this course presents the prevailing statistical theories for prices and price-change in these vital markets.

Course Contents & Topics:
Concept of market efficiency, mean-variance portfolio theory, capital asset pricing model, arbitrage pricing theory, portfolio performance and management, behavioural finance.

Course Learning Outcomes:
On successful completion of this course, students should be able to:
- CLO 1 measure risk and return of portfolios
- CLO 2 apply different approaches in constructing optimal investment portfolios
- CLO 3 explain and apply asset pricing models and evaluate investment performance
- CLO 4 explain the concepts of market efficiency and apply appropriate testing procedures to assess different forms of market efficiency

Pre-requisites (and Co-requisites and Impermissible combinations):
- Not for students who have passed in FINA2320, or have already enrolled in this course; and
- Pass in STAT2602, or already enrolled in this course, or
- Not for students who have passed in STAT2602, or already enrolled in this course; and
- Not for students who have passed in FINA2320, or have already enrolled in this course; and
- Not for BSc(Actuarial Science) students

Offer in 2019 - 2020: Y 1st sem Offer in 2020 - 2021: Y

Examination:
One 2-hour written examination 60 CLO 1,2,3,4

Grade Descriptors (A+ to F):
A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type: Lecture-based course

Course Teaching & Learning Activities:
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting:
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework (assignments, tutorials and class test(s)) 40 CLO 1,2,3,4
Examination One 2-hour written examination 60 CLO 1,2,3,4

Required/recommended reading and online materials:

Course Website: http://moodle.hku.hk

STAT3610

Course Title: Risk management and insurance (6 credits)

Offering Department: Statistics & Actuarial Science
Course Co-ordinator: Dr R W L Wong, Statistics & Actuarial Science (rwong@hku.hk)

Course Objectives:
This course provides knowledge on basic risk and its management, as well as basic financial planning through insurance products, to students. It allows students to understand the statistical, financial and legal principles underlying the techniques for managing the insurable risks faced by organisations and individuals. This course aims at students who have minimal background in quantitative methods, it involves very minimal quantitative calculations.

Course Contents & Topics:
The course introduces and explains:
- risk in our society,
- insurance and risk,
- introduction to risk management.

Course Website: http://moodle.hku.hk
Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the general risks faced by organisations and individuals and the generic risk management principle

CLO 2 demonstrate knowledge and understanding of the underlying financial and legal principles of the insurance industry

CLO 3 understand how risk can be managed through insurance

CLO 4 compare and contrast different types of commercial and personal insurance products

CLO 5 plan for and arrange their own personal insurance needs

Pre-requisites
Pass in BIO2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2901.

(Note not available to Actuarial Science students)

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y Examination May

Grade Descriptors
(A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

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D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Demonstrate little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework (assignments, tutorials, and a class test) 25 CLO 1,3
Examination One 2-hour written examination 75 CLO 1,2,3,4,5

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk

STAT3611
Computer-aided data analysis (6 credits)

Offering Department
Statistics & Actuarial Science

Course Co-ordinator
Dr E K F Lam, Statistics & Actuarial Science (htmtlk@hku.hk)

Teachers Involved

Course Objectives
A wide range of statistical analyses and methods are presented using data sets from social sciences research and scientific studies. Measuring uncertainty, describing patterns of variability and the inter-relationship between several variables are essential aspects of scientific investigations that require good understanding of statistics. This computer-oriented but non-mathematical course develops the important concepts and methods of statistics. The course makes extensive use of computers through the user friendly statistical software JMP. No knowledge of a programming language is required.

Course Contents & Topics
Data exploration, formulation of testable hypotheses, the evaluation of evidence and forecasting on the basis of past experience.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 summarize and describe the quantitative and qualitative data using some simple statistical measures

CLO 2 describe the patterns of variability and the inter-relationship between several continuous or discrete variables

CLO 3 carry out simple statistical analyses based on some real life data, formulate testable hypotheses, make appropriate statistical inferences and make interpretations on the findings

Pre-requisites
Pass in BIO2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1603 and any University level 2 course); and STAT3616.

Offer in 2019 - 2020
N Offer in 2020 - 2021 : N Examination ---

Grade Descriptors
(A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

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Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Demonstrate little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
# Course Contents & Topics

Data science, data exploration, generalized linear models, variable selection, basis expansion, regularization, cross-validation, tree-based methods, kernel methods, neural networks, dimension reduction, principal component analysis, cluster analysis, stochastic optimization, interpretable machine learning.

# Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: get familiar with the workflow of a data science or machine learning project
- CLO 2: understand and apply a wide range of statistical machine learning methods, and recognize their characteristics, strengths and weaknesses
- CLO 3: identify and use appropriate techniques for a particular data science project
- CLO 4: evaluate the quality of the resulting model in terms of prediction accuracy and model explainability
- CLO 5: apply R/Python programming for solving data-scientific problems

# Pre-requisites

- Pass in STAT2602 or (STAT1603 and any University level 2 course) or STAT3902;
- Pass in STAT3600 or STAT3907, or already enrolled in these courses; and
- Not for students who have passed in STAT4904, or already enrolled in this course; and
- Not for BSc(Actuarial Science) students.

# Grade Descriptors (A+ to F)

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<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td>A</td>
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<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
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<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>F</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

# Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments, practical work, and a term test) 40% of course grade</td>
<td>CLO 1, 2, 3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination 60% of course grade</td>
<td>CLO 1, 2, 3</td>
<td></td>
</tr>
</tbody>
</table>

# Required/recommended reading and online materials

- R. Hooke: How to tell the liars from the Statisticians (Marcel Dekker)
- J. G. Peatman: Introduction to Applied Statistics (Harper)
- M. R. Middleton: Data Analysis Using Microsoft EXCEL 5.0 (Duxbury)
- J. G. Peatman: Introduction to Applied Statistics (Harper)
- R. Hooke: How to tell the liars from the Statisticians (Marcel Dekker)
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- J. G. Peatman: Introduction to Applied Statistics (Harper)
- R. Hooke: How to tell the liars from the Statisticians (Marcel Dekker)
# STAT3614 Business forecasting (6 credits)

**Offering Department**  
Statistics & Actuarial Science

**Course Co-ordinator**  
Dr R W L Wong, Statistics & Actuarial Science (rwong@hku.hk)

**Course Objectives**  
In daily business operations, forecasts are routinely required on different aspects of the economy, the market and individual companies. Numerous statistical techniques have been developed in the past decades to provide forecasts for the business decision-maker. This course considers a wide range of such techniques that have proven useful to practitioners. The course will involve the use of computer software, EXCEIL, in the teaching process.

**Course Contents & Topics**  
Review of basic statistical concepts; autocorrelation analysis; evaluation and combination of forecasts; moving averages and smoothing methods; simple linear regression; multiple regression; growth curves; time series regression; the handling of seasonal cycles; decomposition methods.

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
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<td>2</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
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<tr>
<td>3</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>4</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of limited analytical and critical abilities and logical thinking. Show limited ability to apply effective organizational and presentational skills. Failure to demonstrate sufficient knowledge and skills for attaining most of the course learning outcomes.</td>
</tr>
</tbody>
</table>

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2901

**Offer in 2019 - 2020**  
Y 1st sem Offer in 2020 - 2021: Y

**Course Website**  
http://moodle.hku.hk

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<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
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</thead>
<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Lectures</td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
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</tbody>
</table>

| Assessment Methods and Weighting |  |
| Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
| Assignments | coursework (assignments, a class test and a group project) | 50 | CLO 1,2,3 |
| Examination | One 2-hour written examination | 50 | CLO 1,2,3 |

| Required/recommended reading and online materials |  |
| Lattin J., Carroll J.D. and Green P.E.: Analysing multivariate data (Thomson) |

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# STAT3613 Marketing analytics (6 credits)

**Offering Department**  
Statistics & Actuarial Science

**Course Co-ordinator**  
Dr C W Kwan, Statistics & Actuarial Science (cwkwang@hku.hk)

**Course Objectives**  
This course is designed to provide an overview and practical application of trends, technology and methodology in the marketing survey process including problem formulation, survey design, data collection and analysis, and report writing. Special emphasis will be put on statistical techniques particularly for analysing marketing data including market segmentation, market response models, consumer preference analysis and conjoint analysis. Students will analyse a variety of marketing case studies.

**Course Contents & Topics**  
Marketing decision models, Market response models, Survey research, Statistical methods for segmentation, statistical methods for positioning, Statistical methods for new product design

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

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<tr>
<td>1</td>
<td>Be able to identify and select an appropriate forecasting method.</td>
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<tr>
<td>2</td>
<td>Be able to apply the selected forecasting method to a given dataset.</td>
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<tr>
<td>3</td>
<td>Be able to evaluate the performance of the forecasting method.</td>
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<tr>
<td>4</td>
<td>Be able to present the results of the forecasting analysis in a clear and concise manner.</td>
</tr>
</tbody>
</table>

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
None

**Offer in 2019 - 2020**  
Y 1st sem Offer in 2020 - 2021: Y

**Course Website**  
http://moodle.hku.hk
methods, simple and multiple linear regression

Pre-requisites
Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1603 and any University level 2 course); and Not for students who have passed or already enrolled in any of these courses: STAT2601, STAT2901, STAT3907, STAT4801, ECON2280.

Offer in 2019 - 2020
N

Grade Descriptors
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

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Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities

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<td>CLO 1</td>
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<tr>
<td>Examination</td>
<td>One-hour written examination</td>
<td>60</td>
<td>CLO 1.2,3</td>
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</table>

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk

Additional Course Information
Also available to CompSc students having taken STAT1301. Students should obtain approval from the course coordinator before choosing this course.

STAT3615
Practical mathematics for investment (6 credits)

Offering Department
Statistics & Actuarial Science

Quota
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Course Co-ordinator
Dr A G Benchimol, Statistics & Actuarial Science (benchci@hku.hk)

Teachers Involved
Dr A G Benchimol, Statistics & Actuarial Science

Course Objectives
The main focus of this course is built on the concepts on financial mathematics. Practical applications of these concepts are also considered.

Course Contents & Topics
This course covers: simple and compound interest; annuities certain; discounted cash flow analysis; amortization schedules and sinking funds; yield rates; bonds and related securities; practical applications such as real estate mortgage, short sales and term structure of interest rates.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1: solve practical problems relating to annuities certain, simple and compound interest

CLO 2: carry out discounted cash flow analysis

CLO 3: apply amortization schedules and sinking funds to the practical problems such as real estate mortgage

Pre-requisites
Pass in (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2901; and Not for students who have passed in STAT2902, or have already enrolled in this course.

Offer in 2019 - 2020
Y

Grade Descriptors
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

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Course Type
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<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1.2,3</td>
</tr>
</tbody>
</table>

Examination
May
Survey design includes overall survey design, design of sampling schemes and questionnaires, etc. Sampling methods include sample size determination, sampling and non-sampling errors and biases, methods of estimation of parameters from survey data, imputation for missing data etc. This course will cover design and implementation of sample surveys and analysis of statistical data thus obtained. Survey design includes overall survey design, design of sampling schemes and questionnaires, etc. Sampling methods include sample size determination, post-stratification, ratio and regression estimation methods, non-sampling errors and biases, methods of estimation of parameters from survey data, imputation for missing data etc. Topics may include: survey design and planning; survey quality and ethics; implementation matters like management of survey staff, respondent relationship and logistical issues; and sampling methods like simple random sampling, systematic sampling, stratified sampling, cluster sampling, multi-stage sampling, sample size determination, post-stratification, ratio and regression estimation methods, non-sampling errors and biases, non-responses and missing data. Case studies of major applications of sample survey methods in the public and private sectors, with some examples on the analysis and application of the statistical data thus produced, will be discussed.

On successful completion of this course, students should be able to:

- Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

This course aims to equip students, who have taken STAT2603, with a high level of proficiency in SAS programming for automation of procedures and data processing in solving complex problems more efficiently. The course objectives include:

- CLO 1: Understand the system of SAS and basic programming
- CLO 2: Use the BY statement for parallel processing to aid automation
- CLO 3: Use the output dataset without printing to OUTPUT windows for piping idea in automation
- CLO 4: Use SAS macro to develop customized and automated applications
- CLO 5: Use advanced SAS programming statements and techniques to solve complex problems

On successful completion of this course, students should be able to:

- CLO 1: Design different sample schemes and select the most efficient and suitable one for adoption for a particular situation.
- CLO 2: Use SAS macro to develop customized and automated applications.
- CLO 3: Use the output dataset without printing to OUTPUT windows for piping idea in automation.
- CLO 4: Use SAS macro to develop customized and automated applications.
- CLO 5: Use advanced SAS programming statements and techniques to solve complex problems.

The required/recommended reading materials include:

**Course Name:** Derivatives and risk management (6 credits)  
**Offering Department:** Statistics & Actuarial Science  
**Course Co-ordinator:** Dr R W L Wong, Statistics & Actuarial Science  
**Teachers Involved:** (Dr R W L Wong, Statistics & Actuarial Science)  

**Academic Year:** 2019

**Course Content and Topics:** Review of futures, forwards and options and the no-arbitrage principle; hedging strategies using futures; pricing of forwards and futures; interest rate futures and swaps; trading strategies using options; put-call parity; valuation of European and American options using the binomial-tree model; valuation of European and American options using the Black-Scholes option pricing model; the Greeks: their calculation and interpretation; implied volatility; delta hedging and the role of market-makers; exotic options: Asian options, barrier options, compound options, gap options and exchange options.

**Course Learning Outcomes:** On successful completion of this course, students should be able to:

- CLO 1 use futures, forwards, options and swaps to formulate financial strategies  
- CLO 2 determine the payoff and the value of various derivative products using binomial tree and Black-Scholes formula  
- CLO 3 explain how derivative products can be used as tools to manage financial risk  
- CLO 4 recognize how to decompose complicated derivatives into a portfolio of standard derivatives

**Assessment Methods:**

<table>
<thead>
<tr>
<th>Assessment Details</th>
<th>Weighting in final course grade (%)</th>
<th>Course CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>25</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>75</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials:**

- W. G. Cochran: Sampling Techniques (John Wiley & Sons Ltd., 1997)  

**Course Website:** [http://moodle.hku.hk](http://moodle.hku.hk)
### STAT3620

**Modern nonparametric statistics (6 credits)**

<table>
<thead>
<tr>
<th>Offered Department</th>
<th>Statistics &amp; Actuarial Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr P L H Yu, Statistics &amp; Actuarial Science (<a href="mailto:plhyu@hku.hk">plhyu@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr P L H Yu, Statistics &amp; Actuarial Science)</td>
</tr>
<tr>
<td><strong>Course Objectives</strong></td>
<td>The course aims to acquaint students with the fundamentals, basic properties and use of classical and modern nonparametric statistical methods for data analysis.</td>
</tr>
<tr>
<td><strong>Course Contents &amp; Topics</strong></td>
<td>Topics may include: order-statistics; goodness-of-fit tests; rank tests for single-sample and two-independent samples; tests for designed experiments; permutation tests; tests for trends and association; jackknife and bootstrapping methods; nonparametric regression.</td>
</tr>
<tr>
<td><strong>Course Learning Outcomes</strong></td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td>CLO 1</td>
<td>identify appropriate nonparametric methods for analyzing data</td>
</tr>
<tr>
<td>CLO 2</td>
<td>perform a variety of nonparametric statistical analyses</td>
</tr>
<tr>
<td>CLO 3</td>
<td>gain a working proficiency in the use of statistical software for data management and performing basic nonparametric statistical analyses</td>
</tr>
<tr>
<td>CLO 4</td>
<td>effectively communicate findings and conclusions</td>
</tr>
<tr>
<td><strong>Pre-requisites (and Co-requisites and Impermissible combinations)</strong></td>
<td>Pass in STAT2602 or STAT3902</td>
</tr>
<tr>
<td><strong>Offer in 2019 - 2020</strong></td>
<td>Y</td>
</tr>
<tr>
<td><strong>Grade Descriptors (A+ to F)</strong></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
<tr>
<td><strong>Course Type</strong></td>
<td>Lecture-based course</td>
</tr>
<tr>
<td><strong>Course Teaching &amp; Learning Activities</strong></td>
<td>Activities Details No. of Hours</td>
</tr>
<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
</tr>
<tr>
<td><strong>Assessment Methods and Weighting</strong></td>
<td>Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping</td>
</tr>
<tr>
<td>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
</tr>
<tr>
<td><strong>Course Website</strong></td>
<td><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></td>
</tr>
</tbody>
</table>

### STAT3621

**Statistical data analysis (6 credits)**

<table>
<thead>
<tr>
<th>Offered Department</th>
<th>Statistics &amp; Actuarial Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr D Y Zhang, Statistics &amp; Actuarial Science (<a href="mailto:doraz@hku.hk">doraz@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr D Y Zhang, Statistics &amp; Actuarial Science)</td>
</tr>
<tr>
<td><strong>Course Objectives</strong></td>
<td>Building on prior coursework in statistical methods and modeling, students will get a deeper understanding of the entire process of data analysis. The course aims to develop skills of model selection and hypotheses formulation so that questions of interest can be properly formulated and answered. An important element deals with model review and improvement, when one's first attempt does not adequately fit the data. Students will learn how to explore the data, to build reliable models, and to communicate the results of data analysis to a variety of audiences.</td>
</tr>
</tbody>
</table>
| **Course Contents** | Descriptive statistics, presentation and visualization of data; Simple statistical analyses for the one-sample and two-
**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: make good sense of the problem and identify what to measure for the question of interest.
- CLO 2: summarize and describe the quantitative and qualitative data using some simple appropriate statistical measures.
- CLO 3: identify the association among several continuous or discrete variables.
- CLO 4: carry out appropriate and comprehensive statistical analyses based on real-life data including model selection, perform model diagnostics, formulate testable hypotheses, make appropriate statistical inferences, make interpretations on the findings and report writing.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in STAT3600 or STAT3907 (Students are strongly recommended to take STAT2603 or STAT2604 prior to taking this course.)

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Y</th>
<th>2nd sem</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
<th>May</th>
</tr>
</thead>
</table>

**Grade Descriptors (A+ to F)**

- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar, and unfamiliar situations. Apply highly effective organizational and presentational skills.

- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- F: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Assessment Methods and Weighting**

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<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments and a midterm take-home project)</td>
<td>50</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>50</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

**Course Website**

http://moodle.hku.hk

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**Course Contents & Topics**

Grammar of graphics, visualizing patterns over time, visualizing relationship, visualizing spatial relationships, visualizing texts.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: choose the best chart that fits the data.
- CLO 2: create a compelling visualization using computer software.
- CLO 3: communicate effectively using statistical graphics.
- CLO 4: critically evaluate graphics and suggest improvements.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in STAT2602 or STAT3902

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**Required/recommended reading and online materials**


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**STAT3622 Data visualization (6 credits)**

**Offering Department**

Statistics & Actuarial Science

**Course Co-ordinator**

Dr. A. J. Zhang, Statistics & Actuarial Science

**Course Objectives**

This course will focus on how to work with statistical graphics, graphics that display statistical data, to communicate and analyze data. Students will learn a set of tools such as R to create these graphics and critically evaluate them.

**Course Contents & Topics**

Grammar of graphics, visualizing patterns over time, visualizing relationship, visualizing spatial relationships, visualizing texts.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: choose the best chart that fits the data.
- CLO 2: create a compelling visualization using computer software.
- CLO 3: communicate effectively using statistical graphics.
- CLO 4: critically evaluate graphics and suggest improvements.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in STAT2602 or STAT3902

**Offer in 2019 - 2020**

<table>
<thead>
<tr>
<th>Y</th>
<th>2nd sem</th>
<th>Offer in 2020 - 2021</th>
<th>Examination</th>
<th>No Exam</th>
</tr>
</thead>
</table>

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**Grade Descriptors (A+ to F)**

- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar, and unfamiliar situations. Apply highly effective organizational and presentational skills.

- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

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- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- F: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

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870
Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities

Details

No. of Hours

Lectures

36

Tutorials

12

Reading / Self study

100

Assessment Methods and Weighting

Methods

Details

Weighting in final course grade (%)

Assessment Methods to CLO Mapping

Presentation

oral presentation and in-class discussion

40

CLO 1,2,3,4

Project reports

written report

60

CLO 1,2,3,4

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk

STAT3799

Directed studies in statistics (6 credits)

Academic Year

2019

Offering Department

Statistics & Actuarial Science

Quota

50

Course Co-ordinator

Prof S M S Lee, Statistics & Actuarial Science (smslee@hku.hk)

Teachers Involved

(Various teachers as the assessors of oral presentations and written reports, Statistics & Actuarial Science)

Course Objectives

To enhance students’ knowledge of a particular topic and students’ self-directed learning and critical thinking skills.

Course Contents & Topics

The student undertakes a self-managed study on a topic in statistics under the supervision of a staff member. The topic is preferably one not sufficiently covered in the regular curriculum. The directed study can be a critical review or a synthesis of published work on the subject, or a laboratory or field study that would enhance students' understanding of the subject. The project may not require an element of originality.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 gain first-hand experience in solving a research or applied problem in statistics or related areas

CLO 2 develop skills in important technical tools, including the use of computer software or programs, for typical statistical research and data analyses

CLO 3 write succinct reports on the findings of a research study

CLO 4 make concise oral presentation of the findings of a research study

Pre-requisites

Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Decision Analytics/Risk Management/Statistics Majors; and Not for students who have already enrolled in STAT4790 in this academic year. This capstone course is only for students majoring in Decision Analytics/Risk Management/Statistics; and subject to the consent of course coordinator. This course is mutually exclusive with STAT4710.

The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020

1st sem 2nd sem Offer in 2020 - 2021 ; Y Examination No Exam

Grade Descriptors (A+ to F)

A Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills. (Work of A+ should show considerable additional work beyond that is required in wider areas relevant to the topic.)

B Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions.

Fail

Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type

Project-based course

Course Teaching & Learning Activities

Activities

Details

No. of Hours

Reading / Self study

discussion & meetings to be arranged by the student & the supervisor

120

Assessment Methods and Weighting

Methods

Details

Weighting in final course grade (%)

Assessment Methods to CLO Mapping

Oral presentation

oral presentation & in-class discussion

40

CLO 1,2,4

Research report

written report

60

CLO 1,2,3

Course Website

http://moodle.hku.hk

STAT3901

Life contingencies I (6 credits)

Academic Year

2019

Offering Department

Statistics & Actuarial Science

Quota

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Course Co-ordinator

Prof K C Yuen, Statistics & Actuarial Science (kcyuen@hku.hk)

Teachers Involved

(Prof K C Yuen, Statistics & Actuarial Science)

Course Objectives

The major objectives of this course are to integrate life contingencies into a full probabilistic framework. The time-
## Course Contents & Topics

Key topics include: survival distributions; life table functions; select and ultimate tables; life insurance models; life annuity models; loss-at-issue random variable; benefit premiums.

## Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1** define the continuous survival-time random variable using some assumptions for fractional ages
- **CLO 2** define the expected values, variabilities, and percentiles for survival-time random variables defined on survival-time random variables
- **CLO 3** define present-value-of-benefit random variables defined on survival-time random variables
- **CLO 4** define and calculate the expected values, variabilities, and percentiles for present-value-of-benefit random variables defined on survival-time random variables
- **CLO 5** calculate benefit premiums for life insurances and annuities

## Pre-requisites and Co-requisites

- (Pass in STAT2602 and STAT3615) or
- (Pass in STAT2902 and (Pass in STAT3902 or already enrolled in this course)) or
- (Pass in STAT2602 and STAT2902)

## Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Year</th>
<th>Sem</th>
<th>Course</th>
<th>Examination</th>
<th>Grade Descriptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>1st sem</td>
<td>Offer in 2020 - 2021:</td>
<td>Examination</td>
<td>Dec</td>
</tr>
</tbody>
</table>

## Grade Descriptors (A+ to F)

- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **F** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

## Course Type

Lecture-based course

## Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

## Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>25</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

## Required/recommended reading and online materials


## Course Website

http://moodle.hku.hk
### STAT3903

**Stochastic models (6 credits)**

**Offering Department** Statistics & Actuarial Science  
**Course Co-ordinator** Prof J J F Yao, Statistics & Actuarial Science (jeffyao@hku.hk)  
**Teachers Involved** (Prof J J F Yao, Statistics & Actuarial Science)  
**Course Objectives** This is an introductory course in stochastic processes

<table>
<thead>
<tr>
<th>Course Contents &amp; Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to probability theory, conditional probability and expectation, Markov chains, random walk models, classification of states in a Markov chain, calculation of limiting probabilities and mean time spent in transient states, Poisson process, distribution of inter-arrival time and waiting time, conditional distribution of the arrival time, Brownian Motion, hitting time and maximum variable, geometric Brownian motion, the Black-Scholes option pricing formula, Gaussian bridge, and stationary processes. Birth-and-death process, branching process and renewal process may also be covered (if time permits).</td>
</tr>
</tbody>
</table>

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:

- CLO 1 understand how stochastic models can be applied to the study of real-life phenomena
- CLO 2 understand the essentials of Markov chains, the Poisson process, and Brownian motion
- CLO 3 understand how stochastic models can be applied to the study of real-life phenomena

**Pre-requisites and Co-requisites**  
Pass in STAT2901; and Not for students who have passed in MATH3603, or have already enrolled in this course; and For BSc(Actuarial Science) students only.

**Offer in 2019 - 2020**  
Y 2nd sem  

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
</tbody>
</table>

**Course Type** Lecture-based course

### Course Teaching & Learning Activities

<table>
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<th>No. of Hours</th>
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<td>Tutorials</td>
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### Assessment Methods and Weighting

<table>
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<tr>
<td>Assignments</td>
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<td>25</td>
<td>CLO 1, 2, 3, 4</td>
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<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials


**Course Website** [http://moodle.hku.hk](http://moodle.hku.hk)
### Course Contents & Topics

This course aims at providing an understanding of the fundamental concepts of financial derivatives. Emphases are on basic trading and hedging strategies, and the no-arbitrage principle.

### Pre-requisites (and Co-requisites and Impermissible Combinations)

- Pass in STAT2902; and
- Not for students who have passed in STAT3618, or have already enrolled in this course; and
- Pass in STAT2902; and
- Not for students who have passed in FINA1310, or have already enrolled in this course.

### Grade Descriptors (A to F)

- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

### Assessment Methods and Weighting

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<td>Tutorials</td>
<td></td>
<td>12</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
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<table>
<thead>
<tr>
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<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Assignments</td>
<td>(assignments, tutorials, and a class test)</td>
<td>25</td>
<td>CLO 1, 2, 3, 4, 5, 6, 7</td>
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<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 1, 2, 3, 4, 5, 6, 7</td>
</tr>
</tbody>
</table>

### Course WebSite

http://moodle.hku.hk

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### Department of Statistics & Actuarial Science

### Course Learning Outcomes

- **CLO 1** describe the tasks of a financial manager and the financial decisions made by a corporation
- **CLO 2** recall the use of present and future values in calculating the value of bonds and stocks
- **CLO 3** assess financial performance using various investment criteria and techniques of project analysis
- **CLO 4** analyze the mean-variance portfolio theory, capital asset pricing model and arbitrage pricing theory
- **CLO 5** identify the factors to be considered by a company when deciding on its capital structure and dividend policy, and also the impact of financial leverage and long/short term financing policies on capital structure
- **CLO 6** describe the various forms of market efficiency
- **CLO 7** calculate the value of options using the binomial option pricing model

### Course Website

http://moodle.hku.hk

### STAT3905

Introduction to financial derivatives (6 credits)

### Grade Descriptors (A to F)

- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
A

Demonstrate general but incomplete command of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

D

Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail

Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities |
Lectures | 36 |
Tutorials | 12 |
Reading / Self study | 100 |

Assessment Methods and Weighting

Methods |
Assignments | Coursework (assignments, tutorials, and a class test) | 25 |
Examination | One 3-hour written examination | 75 |

Assessment Methods to CLO Mapping |
CLO 1,2,3 |

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk

STAT3906

Risk theory I (6 credits)

Offering Department |
Statistics & Actuarial Science |

Quota |
--- |

Course Co-ordinator |
Dr K C Cheung, Statistics & Actuarial Science (kccg@hku.hk) |

Course Contents & Topics

Severity models; frequency models; collective risk models; coverage modifications; risk measures.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand the individual risk model and the collective risk model, evaluate the distribution and expectation of the total claim amounts

CLO 2 estimate the premium of a policyholder and the total claim amounts using the information of the claim amounts made in previous years

CLO 3 calculate some commonly used risk measures and explain their use and limitation

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in STAT3903, or already enrolled in this course; or Pass in MATH3603 or STAT3603

Grade Descriptors (A+ to F)

A

Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B

Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C

Demonstrate general but incomplete command of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

D

Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail

Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
Credibility theory and loss distributions

This course covers important actuarial and statistical methods. Credibility is an example of a statistical estimate. The idea of credibility is very useful in premium calculation. Insurance loss varies according to the business nature, what distribution should be used to fit a particular loss is both of theoretical interest and practical importance. This course covers important actuarial and statistical methods.

Course Contents & Topics
Regression and multiple linear regression; predicting; time series models including autoregressive, moving average, autoregressive-moving average and integrated models; forecasting.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: fit a simple or multiple linear regression model to real data
- CLO 2: do ANOVA analysis
- CLO 3: identify and fit a suitable AR, MA or ARMA model to real data
- CLO 4: perform residual analysis
- CLO 5: do forecasting with these fitted models

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT2602 or STAT3902, or already enrolled in this course; and
For BSc(Actuarial Science) students only.

Offer in 2019 - 2020
Offer in 2020 - 2021: Y

Grade Descriptors
A
- Demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B
- Demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C
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- Demonstrates partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail
- Demonstrates little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Assessment Methods and Weighting
Coursework (assignments, tutorials, a computer-based assessment and a class test) - 25
One 3-hour written examination - 75

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk

STAT3908 Credibility theory and loss distributions (6 credits)

Offering Department
Statistics & Actuarial Science

Course Co-ordinator
Dr A G Benchimol, Statistics & Actuarial Science (benchi@hku.hk)

Teachers Involved
(Dr A G Benchimol, Statistics & Actuarial Science)

Course Objectives
Credibility is an example of a statistical estimate. The idea of credibility is very useful in premium calculation. Insurance loss varies according to the business nature, what distribution should be used to fit a particular loss is both of theoretical interest and practical importance. This course covers important actuarial and statistical methods.

Course Contents & Topics
Limited fluctuation approach; Buhlman's approach; Bayesian approach; empirical Bayes parameter estimations; construction and selection of parametric models; properties and estimation of failure time and loss distributions, determination of the acceptability of a fitted model; comparison of fitted models; simulation of both discrete and continuous random variables.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: apply limited fluctuation (classical) credibility including criteria for both full and partial credibility
- CLO 2: perform Bayesian analysis using both discrete and continuous models
- CLO 3: apply Buhlmann and Buhlmann-Straub models and understand the relationship of these to the Bayesian model
- CLO 4: apply conjugate priors in Bayesian analysis and in particular the Poisson-gamma model
- CLO 5: apply empirical Bayesian methods in the nonparametric and semiparametric cases
- CLO 6: construct and select empirical models
- CLO 7: determine the acceptability of a fitted model and/or compare models

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT2602 or STAT3902 or STAT3908

Offer in 2019 - 2020
Offer in 2020 - 2021: Y

Grade Descriptors
A
- Demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentional skills.

C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentional skills.

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Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentional skills are minimally effective or ineffective.

Course Type: Lecture-based course

Course Teaching & Learning Activities

<table>
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<tr>
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<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
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<td>36</td>
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<td>Tutorials</td>
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Assessment Methods and Weighting

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<td>CLO 1,2,3,4,5,6,7</td>
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<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4,5,6,7</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website: http://moodle.hku.hk

STAT3909 Life contingencies II (6 credits)

Offering Department: Statistics & Actuarial Science

Course Co-ordinator: Dr D Lee, Statistics & Actuarial Science (leedav@hku.hk)

Teachers Involved: (Dr D Lee, Statistics & Actuarial Science)

Course Objectives

This course aims at introducing some topics in non-traditional life insurance. Emphasis will be placed on applications of more advanced theories of life contingencies.

Course Contents & Topics

This course is a continuation of the materials covered in STAT3901. We shall discuss the following topics: future loss random variable; policy values; expenses and asset shares; multiple state models and their applications; profit testing.

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 calculate policy values for life insurances and annuities
- CLO 2 incorporate expenses in gross premium and calculate policy values based on the gross premium for life insurances and annuities
- CLO 3 calculate probabilities and actuarial present values under the multiple state model framework
- CLO 4 analyze multiple decrement models and calculate the life insurances and annuities in models with multiple decrements
- CLO 5 analyze multiple life models and calculate the life insurances and annuities in models with multiple lives

CLO 6 explain the concept of profit testing

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in STAT3901, or already enrolled in this course; and For BSc(Actuarial Science) students only.

Offer in 2019 - 2020

Y 2nd sem Offer in 2020 - 2021: Y

Grade Descriptors (A to F)

A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentional skills.

B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentional skills.

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D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Organization and presentional skills are minimally effective or ineffective.

Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentional skills are minimally effective or ineffective.
This course is a basic course on the derivative market. The course covers discrete-time models, volatility estimation, and Black-Scholes formula and its variations. The course also includes some basic risk management ideas and methods.

Course Contents & Topics
- Option market; European and American options; conditional expectation and discrete-time martingale, discrete-time option-pricing theory; binomial model and its Greeks; true probabilities vs. risk-neutral probabilities; estimating volatility; the Black-Scholes formula; implied volatility; option Greeks; market-making and hedging; exotic options.

Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in STAT2602 or STAT3902; and
- Not for students who have passed in FINA2322, or have already enrolled in this course; and
- Not for students who have passed in STAT3618, or have already enrolled in this course.

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F)
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
- Lecture-based course

Assessment Methods and Weighting
- Methods
  - Assignments: Coursework (assignments, tutorials, a computer-based assessment and a class test)
  - Examination: One 3-hour written examination

- Details
  - No. of Hours
    - Assignments: 25
    - Examination: 75

- Weighting in final course grade (%)
  - CLO 1: 25
  - CLO 2: 75

- Assessment Methods to CLO Mapping
  - CLO 1: 1, 2, 3, 4, 5, 6
  - CLO 2: 1, 2, 3, 4, 5, 6

Required/recommended reading and online materials
- Robert L. McDonald: Derivatives Markets (2nd edition), Chapters 10-14
- Lecture notes on conditional expectations and martingale
- http://moodle.hku.hk

Course Objectives
- On successful completion of this course, students should be able to:
  - CLO 1: understand Brownian motion and its properties
  - CLO 2: understand the Ito calculus and Ito formula
  - CLO 3: understand the Black-Scholes model and option pricing theory
  - CLO 4: understand the delta hedging and some basic risk management methods
  - CLO 5: understand some basic interest rate models

Courses

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<tr>
<th>Course</th>
<th>Offering Department</th>
<th>Academic Year</th>
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<tr>
<td>STAT3910</td>
<td>Financial economics I (6 credits)</td>
<td>2019</td>
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<td>Examination Dec</td>
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<tr>
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<tbody>
<tr>
<td>STAT3911</td>
<td>Financial economics II (6 credits)</td>
<td>2019</td>
</tr>
<tr>
<td>Offer in 2019 - 2020</td>
<td>Y 2nd sem Offer in 2020 - 2021 : Y</td>
<td>Examination May</td>
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</table>
CLO 1,2,3,4,5,6
Further topics in contingencies (6 credits)

For BSc(Actuarial Science) students only. Pass in STAT3910, or already enrolled in this course; and Pass in STAT3909; and

Alison Etheridge: A Course in Financial Calculus (2002)
Steven Shreve: Stochastic Calculus for Finance II Continuous-Time Models (2008)

Topics cover further analysis of the multiple state model; unit-linked contracts; cost of guarantees and options; applications of actuarial techniques to a wide range of insurance problems; equity-linked life-contingent insurance products and valuation of these products; simple ruin models for non-life insurance portfolios.

This course covers more advanced stochastic models and actuarial techniques used in the field of life and non-life insurance.

Course Contents & Topics

On successful completion of this course, students should be able to:
CLO 1 obtain transition probabilities in continuous-time multiple state models and evaluate expected state-dependent cash flows
CLO 2 apply the Esscher transform on probability distributions and stochastic processes
CLO 3 describe equity-linked insurance products and value them using risk-neutral pricing
CLO 4 value equity-linked death benefits via the discounted density function
CLO 5 appreciate the role of the expected discounted penalty function in simple risk processes for non-life insurance
CLO 6 evaluate ruin probabilities and related quantities for simple risk processes

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT3909; and Pass in STAT3910, or already enrolled in this course; and For BSc(Actuarial Science) students only.

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. 
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C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. 
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Assessment Methods and Weighting
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<td>One 3-hour written examination</td>
<td>75</td>
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Course Website
http://moodle.hku.hk

STAT3951 Further topics in contingencies (6 credits) Academic Year 2019

Offering Department Statistics & Actuarial Science
Course Co-ordinator Dr D Lee, Statistics & Actuarial Science (leedav@hku.hk)
Teachers Involved (Dr D Lee, Statistics & Actuarial Science)

Course Objectives
This course covers more advanced stochastic models and actuarial techniques used in the field of life and non-life insurance.

Course Contents & Topics
Topics cover further analysis of the multiple state model; unit-linked contracts; cost of guarantees and options; applications of actuarial techniques to a wide range of insurance problems; equity-linked life-contingent insurance products and valuation of these products; simple ruin models for non-life insurance portfolios.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 obtain transition probabilities in continuous-time multiple state models and evaluate expected state-dependent cash flows
CLO 2 apply the Esscher transform on probability distributions and stochastic processes
CLO 3 describe equity-linked insurance products and value them using risk-neutral pricing
CLO 4 value equity-linked death benefits via the discounted density function
CLO 5 appreciate the role of the expected discounted penalty function in simple risk processes for non-life insurance
CLO 6 evaluate ruin probabilities and related quantities for simple risk processes

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT3909; and Pass in STAT3910, or already enrolled in this course; and For BSc(Actuarial Science) students only.

Offer in 2019 - 2020 Y 1st sem Offer in 2020 - 2021: Y

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. 
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. 
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. 
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Assessment Methods and Weighting
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<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
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Required/recommended reading and online materials
### STAT3952

**Investment and asset management (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Statistics &amp; Actuarial Science</th>
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</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Statistics &amp; Actuarial Science (TBC, Statistics &amp; Actuarial Science)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(TBC, Statistics &amp; Actuarial Science)</td>
</tr>
</tbody>
</table>

**Course Objectives**

The main objective of this course is to introduce students to some of the methods and procedures commonly used in the management of an investment portfolio. Emphasis will be placed on methods to tackle problems faced by insurance industry such as investment strategy formulation and interest rate risk management.

This course provides an overview on the problems faced by actuaries when applying fundamental actuarial concepts to investment practice. This course will cover the following topics: Investment Management Process, Asset Allocation, Managing Fixed Income Portfolios and Performance Measurement.

**Course Contents & Topics**

- Online materials
- Required/recommended and Weighting
- Assessment Methods
- Course Type
- Course Teaching & Learning Activities
- Assessment Methods and Weighting
- Required/recommended reading and online materials
- Course Website
- Additional Course Information

#### Online materials

- CTS Contingencies Core Technical Core Reading: Institute of Actuaries, 2010
- Lecture notes on equity linked insurance products and simple dividend-ruin models.

#### Course Website

- http://moodle.hku.hk

#### Course Learnings Outcomes

On successful completion of this course, students should be able to:

- **CLO 1**: Explain how an investment policy and an investment strategy can help manage risk
- **CLO 2**: Identify the obligations of a fiduciary in managing investment portfolios
- **CLO 3**: Describe how to select an investment strategy for an individual and the particular issues influencing investment strategies for institutional investors
- **CLO 4**: Explain principles of risk-based capital management
- **CLO 5**: Describe asset allocation strategies that can be used to construct an asset portfolio
- **CLO 6**: Identify and describe financial and non-financial risks faced by an entity
- **CLO 7**: Define risk metrics to quantify major types of risk exposure, apply ALM principles to the establishment of investment policy and strategy
- **CLO 8**: Select or build a benchmark for a given portfolio or portfolio management style, describe and assess performance measurement methodologies for investment portfolio

#### Pre-requisites (and Co-requisites and Impermissible combinations)

- Offer in 2019 - 2020: N
- Offer in 2020 - 2021: N
- Examination: ---

**Grade Descriptors**

- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presenational skills are minimally effective or ineffective.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to most familiar situations. Apply effective organizational and presentational skills.
- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presenational skills.
- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presenational skills.
- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presenational skills.

#### Course Type

- Lecture-based course

#### Course Teaching & Learning Activities

<table>
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<tbody>
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</tr>
</tbody>
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#### Assessment Methods and Weighting

<table>
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<tr>
<td>Assignments</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5,6,7,8</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5,6,7,8</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

- Crouhy, Galai, & Mark: Risk Management (2001)

#### Course Website

- http://moodle.hku.hk

#### Additional Course Information


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### STAT3953

**Fundamentals of actuarial practice (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Statistics &amp; Actuarial Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr A G Benchimol, Statistics &amp; Actuarial Science (<a href="mailto:benchii@hku.hk">benchii@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr A G Benchimol, Statistics &amp; Actuarial Science (<a href="mailto:benchii@hku.hk">benchii@hku.hk</a>)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course teaches students about the business environment and exposes them to practical real-world situations using the actuarial control cycle as a framework.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>This course provides an overview on selected materials relating to the following topics: Role of the Professional Actuary, External Forces, Risk in Actuarial Problems, Design and Pricing of Actuarial Solutions. Emphasis will be placed on applications to various financial security programmes including individual life insurance, group insurance, social security plans, retirement plans, investment funds and property and casualty insurance.</td>
</tr>
</tbody>
</table>

#### Course Learnings Outcomes

- **CLO 1**: Explain how an investment policy and an investment strategy can help manage risk
- **CLO 2**: Identify the obligations of a fiduciary in managing investment portfolios
- **CLO 3**: Describe how to select an investment strategy for an individual and the particular issues influencing investment strategies for institutional investors
- **CLO 4**: Explain principles of risk-based capital management
- **CLO 5**: Describe asset allocation strategies that can be used to construct an asset portfolio
- **CLO 6**: Identify and describe financial and non-financial risks faced by an entity
- **CLO 7**: Define risk metrics to quantify major types of risk exposure, apply ALM principles to the establishment of investment policy and strategy
- **CLO 8**: Select or build a benchmark for a given portfolio or portfolio management style, describe and assess performance measurement methodologies for investment portfolio

#### Pre-requisites (and Co-requisites and Impermissible combinations)

- Offer in 2019 - 2020: N
- Offer in 2020 - 2021: N
- Examination: ---

**Grade Descriptors**

- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presenational skills are minimally effective or ineffective.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to most familiar situations. Apply effective organizational and presentational skills.
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- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presenational skills.
- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presenational skills.

#### Course Type

- Lecture-based course

#### Course Teaching & Learning Activities

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<tr>
<td>Assignments</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5,6,7,8</td>
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<td>CLO 1,2,3,4,5,6,7,8</td>
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**Required/recommended reading and online materials**

- Crouhy, Galai, & Mark: Risk Management (2001)

#### Course Website

- http://moodle.hku.hk
### Course Learning Outcomes

On successful completion of this course, students should be able to:

<table>
<thead>
<tr>
<th>CLO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provide an introductory description of financial security systems, common actuarial techniques and practical experiences.</td>
</tr>
<tr>
<td>2</td>
<td>Describe actuarial practices, principles, approaches, methods, commonalities, problems and solutions.</td>
</tr>
<tr>
<td>3</td>
<td>Explain actuarial practices across the traditional areas of practice.</td>
</tr>
<tr>
<td>4</td>
<td>Explain actuarial practices as applied directly on behalf of financial security system providers or as a consultant to those providers.</td>
</tr>
<tr>
<td>5</td>
<td>Apply actuarial skills in nontraditional and emerging areas of practice.</td>
</tr>
<tr>
<td>6</td>
<td>Provide context for the specific mathematical and technical skills developed in the basic actuarial courses.</td>
</tr>
<tr>
<td>7</td>
<td>Prepare for the professional role as an Associate of the Society of Actuaries.</td>
</tr>
</tbody>
</table>

### Pre-requisites (and Co-requisites and Impermissible combinations)

For BSc(Actuarial Science) students only.

- Pass in STAT3909; and
- Offer in 2019 - 2020

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

- **Activities**
  - Lectures
  - Project work
  - Reading / Self study

- **Details**
  - 36
  - 12
  - 100

### Assessment Methods and Weighting

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<tbody>
<tr>
<td>Presentation</td>
<td>Oral presentation</td>
<td>25</td>
<td>CLO 4.5,6</td>
</tr>
<tr>
<td>Project reports</td>
<td>Written report</td>
<td>50</td>
<td>CLO 4.5,6,7</td>
</tr>
<tr>
<td>Test</td>
<td>In-class quizzes</td>
<td>25</td>
<td>CLO 1.2,3,4,5,6,7</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

- Klugman, S.: Understanding Actuarial Practice (Society of Actuaries, 2012)

### Course Website

http://moodle.hku.hk
### STAT3955

**Course Name:** Survival analysis (6 credits)  
**Offering Department:** Statistics & Actuarial Science  
**Course Type:** Lecture-based course  
**Course Website:** [http://moodle.hku.hk](http://moodle.hku.hk)

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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<tr>
<td>A: Must</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
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<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
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<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
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</table>

**Course Objectives:** This course is concerned with how models which predict the survival pattern of humans or other entities are established. This exercise is sometimes referred to as survival-model construction.

**Course Contents & Topics:** The nature and properties of parametric and nonparametric survival models will be studied. Topics to be covered include: the introduction of some important basic quantities like the hazard function and survival function; some commonly used parametric survival models; concepts of censoring and/or truncation; parametric estimation of the survival distribution by maximum likelihood estimation method; nonparametric estimation of the survival functions from possibly censored samples by means of the Kaplan-Meier estimator, the Nelson-Aalen estimator; and the kernel density estimator or the Ramlau-Hansen estimator and comparisons of k independent survival functions by means of the generalized log-rank test; parametric regression models; Cox's semiparametric proportional hazards regression model; and multivariate survival analysis.

**Course Learning Outcomes:** On successful completion of this course, students should be able to:

- CLO 1 acquire a clear understanding of the nature of failure time data or survival data, a generalization of the concept of death and life
- CLO 2 perform estimation for some commonly used survival models under different types of censoring mechanisms
- CLO 3 analyze survival data using the Cox's semiparametric proportional hazards model
- CLO 4 extend the Cox's model to a multivariate setup to accommodate multivariate survival data

**Pre-requisites (and Co-requisites and Impermissible combinations)**
- Pass in STAT3902, or already enrolled in this course; or
- Pass in STAT3600 or STAT3901

<table>
<thead>
<tr>
<th>Offer in 2019 - 2020</th>
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<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Y 2nd sem</td>
<td>Offer in 2020 - 2021 : Y</td>
<td>Examination May</td>
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**Assessment Methods and Weighting:**

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<td>Coursework (assignments, tutorials, and a class test) 25</td>
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<td>Examination</td>
<td>One 3-hour written examination 75</td>
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**Course Type:** Lecture-based course

**Course Website:** [http://moodle.hku.hk](http://moodle.hku.hk)

**Course Website:** [http://moodle.hku.hk](http://moodle.hku.hk)

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**Course Type:** Lecture-based course

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**Required/recommended**

## STAT3956 - Pension funds and pension mathematics (6 credits)

**Offering Department:** Statistics & Actuarial Science  
**Course Co-ordinator:** Prof G Ma, Statistics & Actuarial Science (gma328@hku.hk)  
**Teachers Involved:** Prof G Ma, Statistics & Actuarial Science (gma328@hku.hk)

### Course Objectives
This course covers the basics of pension plan design and pension fund management, as well as the fundamentals of pension plan valuations using different actuarial cost methods. The students will be introduced to the application of actuarial valuation techniques to the funding and accounting of pension plans.

### Course Contents & Topics
The following topics will be covered: Fundamentals of private pension plans; pricing and valuation of pension obligations; actuarial cost methods and their effects on cost patterns; selection of actuarial assumptions; principles of asset and liability management.

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- **CLO 1** calculate the pension benefits in accordance with the provisions of a pension plan
- **CLO 2** calculate the normal cost and actuarial liabilities using different actuarial cost methods
- **CLO 3** perform gain and loss analyses for pension valuations
- **CLO 4** select appropriate assumptions and methods for funding or accounting purposes
- **CLO 5** interpret the valuation results presented in actuarial valuation reports
- **CLO 6** understand the principles of asset and liability modeling as related to pension plans

### Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in STAT3909;  
- For BSc(Actuarial Science) students only.

### Offer in 2019 - 2020
- **Y** 1st sem  
- **Offer in 2020 - 2021:** **Y**  
- **Examination:** Dec

### Grade Descriptors (A to F)
- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective organizational and presentational skills.
- **D** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking; but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

### Course Type
Lecture-based course

### Course Teaching & Learning Activities
- **Activities:** Details  
  - Lectures: 36  
  - Tutorials: 12

### Assessment Methods and Weighting
- **Assignments:** (25)  
  - Coursework (assignments, tutorials, and a class test)  
  - Examination (1 hour written examination)  
  - Weighting in final course grade (%)  
  - Assessment Methods to CLO Mapping  
  - CLO 1, 2, 3, 4, 5, 6

### Required/recommended reading and online materials
- Actuarial Standard of Practice No. 27, Selection of Economic Assumptions for Measuring Pension Obligations
- Actuarial Standard of Practice No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
- Actuarial Standard of Practice No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations

### Course Website
http://moodle.hku.hk

## STAT4601 - Time-series analysis (6 credits)

**Offering Department:** Statistics & Actuarial Science  
**Course Co-ordinator:** Dr G Li, Statistics & Actuarial Science (gdli@hku.hk)  
**Teachers Involved:** Dr G Li, Statistics & Actuarial Science (gdli@hku.hk)

### Course Objectives
A time series consists of a set of observations on a random variable taken over time. Time series arise naturally in climatology, economics, environment studies, finance and many other disciplines. The observations in a time series are usually correlated; the course establishes a framework to discuss this. This course distinguishes different type of time series, investigates various representations for the processes and studies the relative merits of different forecasting procedures. Students will analyse real time-series data on the computer.

### Course Contents & Topics
- Stationarity and the autocorrelation functions; linear stationary models; linear non-stationary models; model identification; estimation and diagnostic checking; seasonal models and forecasting methods for time series.

### Course Learning
On successful completion of this course, students should be able to:

### Course Website
http://moodle.hku.hk
### Outcomes

- CLO 1: recognize a stationary vs non-stationary time series
- CLO 2: understand some basic properties of commonly used time series models such as AR (autoregressive), MA (moving average) and ARMA models
- CLO 3: transform non-stationary time series into stationary ones
- CLO 4: identify different time series models based on autocorrelation functions
- CLO 5: fit a suitable AR, MA or ARMA model to real data using SAS (after transforming to stationarity if necessary)
- CLO 6: perform goodness of fit tests for such models
- CLO 7: do forecasting with these fitted time series models

### Pre-requisites (and Co-requisites and Impermissible combinations)

- Pass in STAT3600; and
- Not for students who have passed in STAT3614, or have already enrolled in this course; and
- Not for students who have passed in STAT3907, or have already enrolled in this course.

### Grade Descriptors (A+ to F)

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<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
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### Course Type

Lecture-based course

### Course Teaching & Learning Activities

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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
<td>CLO 1, 2, 3, 4, 5, 6, 7</td>
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</tbody>
</table>

### Required/recommended reading and online materials


### Course Website

http://moodle.hku.hk

### STAT4602

Multivariate data analysis (6 credits) | Academic Year | Quota |
---------------------------------|--------------|-------|
Statistics & Actuarial Science | 2019 | 50 |

### Course Objectives

- In many designed experiments or observational studies, the researchers are dealing with multivariate data, where each observation is a set of measurements taken on the same individual. These measurements are often correlated. The correlation prevents the use of univariate statistics to draw inferences. This course develops the statistical methods for analysing multivariate data through examples in various fields of application and hands-on experience with the statistical software SAS.

### Course Contents & Topics


### Course Learning Outcomes

- On successful completion of this course, students should be able to:
  - CLO 1: analyze multivariate data with main SAS procedures, such as PROC IML, PROC REG, PROC CORR, PROC CANCORR, PROC PRINCOMP, PROC FACTOR, PROC DISCRIM, PROC CANDISC and etc
  - CLO 2: compare the mean structure of multiple measurements for one or more than one population(s) by multivariate MANOVA and profile analysis
  - CLO 3: investigate the linear associations among one/two group(s) of variables by multiple, partial and canonical correlation and multivariate regression
  - CLO 4: explore the latent linear structure of a data set with multiple measurements by principal components analysis and factor analysis
  - CLO 5: classify observations of a population with one or more than one measurements by discriminant analysis

### Pre-requisites (and Co-requisites and Impermissible combinations)

- Pass in STAT3600 or STAT3907

### Grade Descriptors (A+ to F)

<table>
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<tr>
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<tr>
<td></td>
<td>D</td>
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familiar situations. Apply moderately effective organizational and presentational skills.

Fail
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities

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</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
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</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments and tutorials)</td>
<td>25</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Srivastava M. S.: Methods of Multivariate Statistics (John Wiley and Sons, 2002)
SAS Manuals on-line: Use the HELP button.

Course Website
http://moodle.hku.hk

STAT4603 Current topics in risk management (6 credits) Academic Year 2019

Offering Department Statistics & Actuarial Science Quota ---

Course Co-ordinator Ms O T K Choi, Statistics & Actuarial Science (ochoi@hku.hk)

Course Objectives
This course is to broaden the students knowledge of risk management by considering current topics in risk management. These topics will build on the theory and methods covered in the core courses. The topics offered each year depend on staff availability.

Course Contents & Topics
Liquidity risk; Operational risk; Model risk; Enterprise risk management; Cutting edge risk analytics and innovations in risk management.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: gain insights into current advances in risk management
- CLO 2: understand current risk management pitfalls and development
- CLO 3: make effective use of models and techniques for managing various kinds of risk

Pre-requisites
Pass in (STAT3618 or FINA2322)

Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Y</th>
<th>1st sem</th>
<th>Offer in 2020 - 2021</th>
<th>Y</th>
<th>Examination</th>
<th>Dec</th>
</tr>
</thead>
</table>

Grade Descriptors (A+ to F)

| A | Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. |
| B | Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamilar situations. Apply effective organizational and presentational skills. |
| C | Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. |
| D | Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. |
| Fail | Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. |

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Tutorials</td>
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Assessment Methods and Weighting

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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments, tutorials, class test(s) and project(s))</td>
<td>50</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Basel Committee on Banking Supervision:Basel III: A global regulatory framework for more resilient banks and banking systems (BIS, 2010)

Course Website
http://moodle.hku.hk
### STAT4606 Risk management and Basel Accords in banking and finance

**Offering Department**: Statistics & Actuarial Science  
**Course Co-ordinator**: Mr P K Y Pang, Statistics & Actuarial Science  
**Course Contents & Topics**: The course introduces and explains:  
- the importance of risk management,  
- risk nature and types,  
- design and establishment of a risk management framework,  
- the importance of people and corporate culture,  
- the complete risk management cycle,  
- measurement and management of credit, market and operational risks.  
- Basel accords and the capital treatments for credit, market and operational risks,  
- key developments (eg: Know-Your-Customers, Anti-Money laundering, Sarbanes-Oxley) and critical issues,  
- the importance of business continuity,  
- design and implementation of a business continuity plan.  

**Course Learning Outcomes**: On successful completion of this course, students should be able to:  
CLO 1 understand the importance, nature and classification of various risks, and the risk management principle and cycle  
CLO 2 design and establish a risk management framework  
CLO 3 demonstrate knowledge and understanding of the measurements of credit, market and operational risks  
CLO 4 explain and describe Basel accords and its capital treatments for credit, market and operational risks  
CLO 5 appreciate the importance of, design and implement a business continuity plan  

**Pre-requisites (and Co-requisites and Impermissible combinations)**: 
Pass in STAT3618 or STAT3910 or STAT3905 or (FINA2322 and any University level 3 course)  

**Offer in 2019 - 2020**: Y 2nd sem  

**Grade Descriptors (A+ to F)**:  
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.  
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.  
C Demonstrate general but incomplete command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.  
D Demonstrate limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.  
E Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.  

**Course Type**: Lecture-based course  

**Course Teaching & Learning Activities**:  
- Lectures: 36  
- Tutorials: 12  
- Reading / Self study: 100  

**Assessment Methods and Weighting**:  
<table>
<thead>
<tr>
<th>Assessment Methods</th>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>40</td>
<td>CLO 1,2,3,4</td>
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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
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**Required/recommended reading and online materials**:  

**Course Website**: http://moodle.hku.hk  

**Additional Course Information**: This course is previously called STAT2320 as the prerequisite changed to STAT3303.

### STAT4607 Credit risk analysis (6 credits)

**Offering Department**: Statistics & Actuarial Science  
**Course Co-ordinator**: Dr K P Wat, Statistics & Actuarial Science  
**Course Objectives**: For a commercial bank, credit risk has always been the most significant. It is the risk of default on debt, swap, or other counterpart instruments. Credit risk may also result from a change in the value of an asset resulting from a change in the counterpart’s creditworthiness. This course will introduce students to quantitative models for measuring and managing credit risk. It also aims to provide students with an understanding of the credit risk methodology used in the financial industry and the regulatory framework in which the credit risk models operate.  

**Course Contents & Topics**: Probabilities of default, recovery rates and loss given default; Default and credit migration; credit scoring and internal rating models; Credit portfolio models such as CreditMetrics, CreditPortfolioView, KMV and actuarial approach; Credit derivatives.  

**Course Learning Outcomes**: On successful completion of this course, students should be able to:  
CLO 1 understand the Basel requirements for credit risk  
CLO 2 estimate credit scores using the logit model
CLO 3 understand and estimate default probabilities using various approaches such as Moody’s KMV and the mortality method

CLO 4 understand the concept of credit value-at-risk and the CreditMetrics approach

CLO 5 estimate default correlations

CLO 6 assess rating systems

### Pre-requisites (and Co-requisites and Impermissible combinations)

- Pass in STAT3618 or STAT3905 or STAT3910 or (FINA2322 and any University level 3 course)

### Offer in 2019 - 2020

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<tr>
<td>Fail</td>
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</tbody>
</table>

### Course Objectives

On successful completion of this course, students should be able to:

- CLO 1 understand VaR and expected shortfall as risk measures
- CLO 2 compute VaR and expected shortfall
- CLO 3 model volatility using GARCH-type models
- CLO 4 understand extreme-value theory
- CLO 5 understand backtesting and stress testing

### Course Contents & Topics

- Risk Measures: Value-at-Risk (VaR) models (parametric, Monte Carlo simulation and Historical simulation); Risk factor mapping; Advanced VaR models (GARCH-type models, extreme-value theory and normal-mixture); Principal Component Analysis and VaR; Backtesting and stress testing.

### Course Learning Outcomes

- Learn and understand the basics of market risk analysis
- Learn and understand the basics of backtesting and stress testing
- Learn and understand the basics of risk factors
- Learn and understand the basics of risk management
- Learn and understand the basics of risk analysis

### Course Website

http://moodle.hku.hk
Big data analytics (6 credits)  

**Course Type**  Lecture-based course

**Course Teaching & Learning Activities**  
- **Activities**  
  - Lectures  
  - Tutorials  
  - Reading / Self study

**Assessment Methods and Weighting**  
- **Methods**  
  - Assignments  
  - Examination

**Course Co-ordinator**  Dr P L H Yu, Statistics & Actuarial Science

**Course Website**  http://moodle.hku.hk

**Course Objectives**  
In the past decade, huge volume of data with highly complicated structure has appeared in every aspect, such as social web logs, e-mails, video, speech recordings, photographs, tweets and others. The efficient extraction of valuable information from these data sources becomes a challenging task. This course focuses on the practical knowledge and skills of some advanced analytics and statistical modeling for solving big data problems.

**Course Contents & Topics**  
Recommender systems, Link analysis, Social network analysis, Text analytics, Sentiment analysis, Topic modeling, Deep Learning, and Reinforcement learning

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:
- CLO 1 understand and apply a wide range of data analytic techniques, and recognize their characteristics, strengths and weaknesses
- CLO 2 obtain hands-on experience of computer software for data analytics
- CLO 3 identify and use appropriate data analytic techniques for data extraction, taking into account both the structure of the data and the goals of the user of the discovered knowledge
- CLO 4 evaluate the quality of discovered knowledge, taking into account the requirements of the data analytic task being performed and the goals of the user

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in STAT3612 or STAT4904

**Offer in 2019 - 2020**  
- **Offer in 2020 - 2021**  
  - Academic Year: 2019
  - Examination: No Exam

**Grade Descriptors (A+ to F)**  
- **A**  
  - Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**  
  - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**  
  - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**  
  - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**  
  - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Required/recommended reading and online materials**  

**Reporting Department**  Statistics & Actuarial Science

**Course Website**  http://moodle.hku.hk

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**STAT4609**  Big data analytics (6 credits)

**Offering Department**  Statistics & Actuarial Science  
**Quota**  50

**Teachers Involved**  
Dr P L H Yu, Statistics & Actuarial Science (plhyu@hku.hk)

**Course Objectives**  
In the past decade, huge volume of data with highly complicated structure has appeared in every aspect, such as social web logs, e-mails, video, speech recordings, photographs, tweets and others. The efficient extraction of valuable information from these data sources becomes a challenging task. This course focuses on the practical knowledge and skills of some advanced analytics and statistical modeling for solving big data problems.

**Course Contents & Topics**  
Recommender systems, Link analysis, Social network analysis, Text analytics, Sentiment analysis, Topic modeling, Deep Learning, and Reinforcement learning

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:
- CLO 1 understand and apply a wide range of data analytic techniques, and recognize their characteristics, strengths and weaknesses
- CLO 2 obtain hands-on experience of computer software for data analytics
- CLO 3 identify and use appropriate data analytic techniques for data extraction, taking into account both the structure of the data and the goals of the user of the discovered knowledge
- CLO 4 evaluate the quality of discovered knowledge, taking into account the requirements of the data analytic task being performed and the goals of the user

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in STAT3612 or STAT4904

**Offer in 2019 - 2020**  
- **Offer in 2020 - 2021**  
  - Academic Year: 2019
  - Examination: No Exam

**Grade Descriptors (A+ to F)**  
- **A**  
  - Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**  
  - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**  
  - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**  
  - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**  
  - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Required/recommended reading and online materials**  

**Course Website**  http://moodle.hku.hk

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**STAT4610**  Bayesian learning (6 credits)  

**Offering Department**  Statistics & Actuarial Science  
**Quota**  50

**Course Objectives**  
In the past decade, huge volume of data with highly complicated structure has appeared in every aspect, such as social web logs, e-mails, video, speech recordings, photographs, tweets and others. The efficient extraction of valuable information from these data sources becomes a challenging task. This course focuses on the practical knowledge and skills of some advanced analytics and statistical modeling for solving big data problems.

**Course Contents & Topics**  
Recommender systems, Link analysis, Social network analysis, Text analytics, Sentiment analysis, Topic modeling, Deep Learning, and Reinforcement learning

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:
- CLO 1 understand and apply a wide range of data analytic techniques, and recognize their characteristics, strengths and weaknesses
- CLO 2 obtain hands-on experience of computer software for data analytics
- CLO 3 identify and use appropriate data analytic techniques for data extraction, taking into account both the structure of the data and the goals of the user of the discovered knowledge
- CLO 4 evaluate the quality of discovered knowledge, taking into account the requirements of the data analytic task being performed and the goals of the user

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in STAT3612 or STAT4904

**Offer in 2019 - 2020**  
- **Offer in 2020 - 2021**  
  - Academic Year: 2019
  - Examination: No Exam

**Grade Descriptors (A+ to F)**  
- **A**  
  - Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**  
  - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**  
  - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**  
  - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
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**Required/recommended reading and online materials**  

**Course Website**  http://moodle.hku.hk
Course Co-ordinator: Statistics & Actuarial Science (ug_enquiry@saas.hku.hk)

Course Objectives: This course aims to introduce Bayesian methodologies and computational techniques of Markov Chain Monte Carlo, and application in the deep learning.

Course Contents & Topics: On successful completion of this course, students should be able to:

Course Learning Outcomes: This course aims to introduce Bayesian methodologies and computational techniques of Markov Chain Monte Carlo, and application in the deep learning.

Pre-requisites: No Exam

Offer in 2019 - 2020: N

Grade Descriptors (A+ to F):

<table>
<thead>
<tr>
<th>Grade</th>
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<tbody>
<tr>
<td>A</td>
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<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
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<td>Demonstrate little or no command of knowledge and skills required for attaining for the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
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</tr>
</tbody>
</table>

Course Type: Lecture-based course

Assessment Methods and Weighting:

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<th>Methods</th>
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<td></td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>

STAT4710: Capstone experience for statistics undergraduates (6 credits)

Offering Department: Statistics & Actuarial Science

Course Co-ordinator: Prof G Yin, Statistics & Actuarial Science (ug_enquiry@saas.hku.hk)

Course Objectives: This project-based course aims to provide students with capstone experience to formulate and investigate real life problems in the area of statistics, risk management, finance, climate, social science, medicine and scientific research by integrating and applying the statistical theories and quantitative techniques learnt in their junior university years.

Course Contents & Topics: No formal teaching. Students are expected to devote 120-140 hours working on this project. Students will work in groups of four or five under the supervision of a teacher. Students are required to give a presentation on their work two to three weeks before the end of the semester, and submit their final report at the end of the semester.

It aims to help the students to establish a good and solid foundation of life-long learning skills, and to enable students to equip with hands-on experience in solving real life problems starting from identification of the key variable(s) of interest, literature search, model formulation, data analysis or simulation, technical report writing and presentation of the results. Students will need to find an interesting topic of their own, conduct literature search regarding the most recent research related to the problem, make suggestions to improve the current situations or even solve the problem identified in their project.

Course Learning Outcomes: On successful completion of this course, students should be able to:

CLO 1 formulate a problem using statistical or risk management ideas for a particular issue we are facing with and determine ways in which statistics/risk management can be used to solve the problems or to make predictions

CLO 2 integrate theory and practice, and to understand limitations of their current knowledge

CLO 3 work in a team and to collaborate with people with different background

CLO 4 express ideas effectively in both written and oral forms

CLO 5 develop further logical, critical thinking, creativity, technical report writing, communication and consultation skills

CLO 6 advocate to others the appreciation of statistics/risk management as to its relevance to our daily life

Pre-requisites (and Co-requisites and Impermissible combinations): Students are expected to have satisfactorily completed at least 24 credits of advanced level disciplinary core/elective courses in the Decision Analytics/Risk Management/Statistics Majors. Students who are interested in taking the course should submit their applications to the Department.

This capstone course is only for students majoring in Decision Analytics/Risk Management/Statistics, and is mutually exclusive with STAT3799, STAT4766 and STAT4799.

The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020: Y

Grade Descriptors (A+ to F):

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
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<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to some unfamiliar situations. Apply minimally effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no command of knowledge and skills required for attaining for the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
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</table>

Department of Statistics & Actuarial Science
This project-based course aims to provide students with capstone experience to formulate and investigate practical problems in actuarial science by integrating and applying actuarial theories and techniques learnt in their university years. It aims to help the students to establish a good and solid foundation of self-learning skills, and to enable students to equip with hands-on experience in solving practical problems including definition of the problem, designing the solution, and presentation of the results.

Topics acceptable for projects in this course can be related to any of the traditional actuarial areas of practice such as life insurance, pension, finance, investment, enterprise risk management and general insurance. Students are required to give a presentation on their work two to three weeks before the end of the semester, and submit their final report at the end of the semester. Students will work in groups of four or five under the supervision of a teacher and/or an industry supervisor. Students are required to give a presentation on their work two to three weeks before the end of the semester, and submit their final report at the end of the semester.

No formal teaching will be given for this course. Students are expected to devote 120-140 hours working on this project. Students will work in groups of four or five under the supervision of a teacher and/or an industry supervisor. Students are required to give a presentation on their work two to three weeks before the end of the semester, and submit their final report at the end of the semester.

Students will need to decide on the topic for a practical project, conduct market research regarding industry activities related to the topic, and make suggestion on a solution of the problem identified in their project.

On successful completion of this course, students should be able to:

- CLO 1 define a practical problem, discuss the issues faced by different stakeholders, and design workable solutions for the problems.
- CLO 2 integrate theoretical results and practical approaches, and to specify limitations of current developments.
- CLO 3 work in a team and to collaborate with members with different background.
- CLO 4 deliver actuarial results effectively in a written report and in oral presentations.
- CLO 5 develop further logical, critical thinking, creativity, technical report writing, communication and consultation skills.
- CLO 6 explain to a non-actuarial audience the approaches of actuarial science as applied to problems in a financial security system.

Pass in at least 24 credits of advanced level disciplinary core/elective courses in BSc(Actuarial Science) programme including (Pass in STAT3901, or already enrolled in this course; or Pass in STAT3909, or already enrolled in this course); and

This capstone course is only for BSc(Actuarial Science) students, and is mutually exclusive with STAT4767 and STAT4798.

The earliest that a student is allowed to take this capstone course is their year 3 study.
Department of Statistics & Actuarial Science

Statistics internship (6 credits)  
Actuarial science internship (6 credits)  

Dr A G Benchimol, Statistics & Actuarial Science  

It is expected that students are to work at least 160 hours.  

Various teachers as the assessors of oral presentations and written reports, Statistics & Actuarial Science  

No Exam  

2019  

Offering Department  
Statistics & Actuarial Science  
Quota  
---  

Teachers Involved  

Dr C W Kwan, Statistics & Actuarial Science  

Teachers Involve  

Course Objectives  
This course is offered to students majoring in Decision Analytics/Risk Management/Statistics who take on a minimum of 160 hours of internship work related to his/her major disciplines. It provides students with first-hand experience in the applications of academic knowledge in a real-life work environment.  

Course Contents & Topics  
Upon completion of the internship, each student is required to submit a written report and to give a presentation on his/her internship experience. The report should emphasize important working/educational experiences encountered by the student during his/her internship. In many situations, this would mean a report of the project(s) that the student has been involved in during his/her internship.  

Course Learning Outcomes  
On successful completion of this course, students should be able to:  
CLO 1 gain first-hand work experience in an industry related to decision analytics, risk management or statistics  
CLO 2 apply knowledge in decision analytics, risk management or statistics to solve practical problems in the work place  
CLO 3 understand contexts for specific quantitative skills developed in basic decision analytics, risk management or statistics courses  
CLO 4 communicate specialist knowledge in decision analytics, risk management or statistics to non-experts in a work environment  

Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Decision Analytics/Risk Management/Statistics Majors.  
This capstone course is only for students majoring in Decision Analytics/Risk Management/Statistics; and is mutually exclusive with STAT4710.  
The earliest that a student is allowed to take this capstone course is their year 3 study.  

Offer in 2019 - 2020  
Y  
1st sem  
2nd sem  
Summer  
Offer in 2020 - 2021: Y  

Examination  
No Exam  

Grade Descriptors  
Pass  
Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of “Distinction”.  

Fail  
Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.  

Course Type  
Internship  

Course Teaching & Learning Activities  
Activities  
Details  
No. of Hours  
Internship work  
it is expected that students are to work at least 160 hours (or equivalent to 4 weeks full-time)  
160  

Assessment Methods and Weighting  
Methods  
Details  
Weighing in final course grade (%)  
Assessment Methods to CLO Mapping  
Oral presentation  
oral presentation and in-class discussion  
40  
CLO 1,2,3,4  
Written report  
written report  
60  
CLO 1,2,3,4  

Course Website  
http://moodle.hku.hk  

Additional Course Information  
Upon completion of the internship, each student is required to submit a written report and to give an oral presentation on their internship experience. Supervisors will assess the students based on their performance during the internship period (in the case of internships outside the university, the internal supervisor will assess the student based on the feedback by the external supervisor).  

Satisfactory completion of this course can be counted towards the Capstone requirement. Details of internship will be recorded on the student's transcript. This course will be assessed on "Pass/Fail" basis. Students who are interested to enrol in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.  

STAT4767  
Actuarial science internship (6 credits)  

Academic Year  
2019  

Offering Department  
Statistics & Actuarial Science  
Quota  
---  

Teachers Involved  

Dr A G Benchimol, Statistics & Actuarial Science  

Teachers Involve  

Course Objectives  
This course is offered to actuarial science students who take on a 6-month full time or similar internships. The objective is for a student to complete this course as a project based on his/her internship.  

Course Contents & Topics  
This course will include a written report which should emphasize important working/educational experiences encountered by the student during his/her internship. In many situations, this would mean a report of the project(s) that the student has been involved in during his/her internship.  

Course Learning Outcomes  
On successful completion of this course, students should be able to:  
CLO 1 gain practical experiences during internship  
CLO 2 describe basic actuarial practices learned during the internship  
CLO 3 explain how actuarial theories learned in University can be applied in practice  
CLO 4 provide context for specific technical skills developed in basic actuarial courses  

Pre-requisites (and Co-requisites and Impermissible)  
Pass in at least 24 credits of advanced level disciplinary core/elective courses in BSc(Actuarial Science) programme including STAT3901; and this capstone course is only for BSc(Actuarial Science) students; and is mutually exclusive with STAT4711.
The earliest that a student is allowed to take this capstone course is their year 3 study.

Grade Descriptors

<table>
<thead>
<tr>
<th>Grade Descriptors (Pass /Pass with distinction /Fail)</th>
<th>Examination</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td></td>
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</table>
| Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of “Distinction”.
|             |             |         |
| Fail                                                 |             |         |
| Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc. |

Course Type

Internship

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internship work</td>
<td>it is expected that students are to work at least 6 months or 120 working days</td>
<td>960</td>
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Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral presentation</td>
<td>oral presentation and in-class discussion</td>
<td>40</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Written report</td>
<td>written report</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Course Website

http://moodle.hku.hk

Additional Course Information

Despite no weighting for this assessment component, the completion of the employer’s evaluation form by the employer/direct supervisor is required for passing the course. Satisfactory completion of this course can be counted towards the Capstone requirement. Details of internship will be recorded on the student’s transcript. This course will be assessed on “Pass/Fail” basis. Students who are interested to enrol in this course should contact the Department to obtain the approval. Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

STAT4798

Statistics and actuarial science project (6 credits)

Offering Department

Statistics & Actuarial Science

Course Co-ordinator

Prof S M S Lee, Statistics & Actuarial Science (smlee@hku.hk)

Teachers Involved

(Various teachers as the assessors of oral presentations and written reports, Statistics & Actuarial Science)

Course Objectives

Each year a few projects suitable for Actuarial Science students will be offered to provide students with practical experience in approaching a real problem, in report writing and in oral presentation.

Course Contents & Topics

These projects, under the supervision of individual staff members, involve the applications of statistics and/or probability in a wide range of problems of practical and/or academic interests.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 formulate meaningful research problems
CLO 2 learn and apply advanced techniques in probability and/or statistics to solve real life problems
CLO 3 summarize and present research findings in a professional manner

Pre-requisites (and Co-requisites and impermissible combinations)

Pass in at least 24 credits of advanced level disciplinary core/elective courses in BSc(Actuarial Science) programme including STAT3902 and STAT3907; and Pass or already enrolled in at least one of the following courses: STAT3911, STAT4602, STAT4904; and

This capstone course is only for BSc(Actuarial Science) students; and subject to the consent of course coordinator. This course is mutually exclusive with STAT4711.

The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020

Y 1st sem 2nd sem Offer in 2020 - 2021: Y

Grade Descriptors

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills. (Work of A+ should show considerable additional work beyond that is required in wider areas relevant to the topic.)
|             |             |         |
| B                         |             |         |
| Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.
|             |             |         |
| C                         |             |         |
| Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
|             |             |         |
| D                         |             |         |
| Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.
|             |             |         |
| Fail                      |             |         |
| Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type

Project-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>120</td>
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</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral presentation</td>
<td>oral presentation &amp; in-class discussion</td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Research report</td>
<td>written report</td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Course Website

http://moodle.hku.hk

Additional Course Information

Approval is subject to past academic performance.

STAT4799

Statistics project (12 credits)

Academic Year

2019
Course Co-ordinator: Prof S M S Lee, Statistics & Actuarial Science (smlee@hku.hk)

Course Objectives: Each year a few projects suitable for students majoring in Decision Analytics/ Risk Management/ Statistics will be offered to provide students with practical experience in approaching a real problem, in report writing and in oral presentation.

Course Contents & Topics: These projects, under the supervision of individual staff members, involve the applications of statistics and/or probability in a wide range of problems of practical and/or academic interests.

Course Learning Outcomes:
- CLO 1: Gain first-hand experience in solving a research or applied problem in statistics or related areas.
- CLO 2: Develop skills in important technical tools, including the use of computer software or programs, for typical statistical research and data analyses.
- CLO 3: Write succinct reports on the findings of a research study.
- CLO 4: Make concise oral presentation of the findings of a research study.

Pre-requisites and Co-requisites: Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Decision Analytics/Risk Management/Statistics Majors including STAT3600; and Pass or already enrolled in at least one of the following courses: STAT3612, STAT3911, STAT4601, STAT4602; and Not for students who have already enrolled in STAT3799 in this academic year.

Course Objectives: This capstone course is only for students majoring in Decision Analytics/Risk Management/Statistics; and subject to the consent of course coordinator.

This course is mutually exclusive with STAT4710.

The earliest that a student is allowed to take this capstone course is their year 3 study.

Course Contents & Topics: Each year a few projects suitable for students majoring in Decision Analytics/ Risk Management/Statistics will be offered to provide students with practical experience in approaching a real problem, in report writing and in oral presentation.

These projects, under the supervision of individual staff members, involve the applications of statistics and/or probability in a wide range of problems of practical and/or academic interests.

Course Learning Outcomes:
- CLO 1: Gain first-hand experience in solving a research or applied problem in statistics or related areas.
- CLO 2: Develop skills in important technical tools, including the use of computer software or programs, for typical statistical research and data analyses.
- CLO 3: Write succinct reports on the findings of a research study.
- CLO 4: Make concise oral presentation of the findings of a research study.

Pre-requisites and Co-requisites: Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Decision Analytics/Risk Management/Statistics Majors including STAT3600; and Pass or already enrolled in at least one of the following courses: STAT3612, STAT3911, STAT4601, STAT4602; and Not for students who have already enrolled in STAT3799 in this academic year.

Course Objectives: This capstone course is only for students majoring in Decision Analytics/Risk Management/Statistics; and subject to the consent of course coordinator.

This course is mutually exclusive with STAT4710.

The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2019 - 2020: Y Year long Offer in 2020 - 2021: Y

Grade Descriptors (A+ to F):
- A: Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Insightful use and critical analysis of information drawn from a full range of high quality sources and to quote/reference aptly. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills. [Work of A+ should show considerable additional work beyond that is required in wider areas relevant to the topic.]
- B: Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Mixture of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type: Project-based course

Course Teaching & Learning Activities:
- Activities: the student is expected to meet & discuss with a supervisor regularly in the course of the project
- No. of Hours: 240

Assessment Methods and Weighting:
- Methods: written report
- Weighting in final course grade (%): 60
- Assessment Methods to CLO Mapping: CLO 1,2,3

Course Website: http://moodle.hku.hk

Additional Course Information: Approval is subject to past academic performance.

STAT4901 Risk theory II (6 credits)

Offering Department: Statistics & Actuarial Science

Quota: 50

Course Learning Outcomes:
- On successful completion of this course, students should be able to:
  - CLO 1: Understand utility theory including some commonly used utility functions, Jevons inequality, risk aversion and utility maximization
  - CLO 2: Define discrete and continuous ruin models
  - CLO 3: Calculate the adjustment coefficient, Lundberg’s inequality and Tijms approximation in ruin theory
  - CLO 4: Understand the effect of reinsurance and change of parameters on ruin probability
  - CLO 5: Understand non-homogeneous birth process and its applications as contagion models for claim frequencies
  - CLO 6: Understand mixed Poisson process and its applications including the inflation model and the IBNR model
  - CLO 7: Derive the relationship between stop-loss moments and equilibrium distributions

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in STAT3906

Offer in 2019 - 2020: N, Offer in 2020 - 2021: N

Examination: ---
Grade Descriptors (A+ to F)

A  Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities, logical and coherent thinking. Apply limited or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities, logical and coherent thinking. Apply limited or barely effective organizational and presenational skills.

C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities, logical and coherent thinking. Apply moderately effective organizational and presentational skills.

D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Tutorials</td>
</tr>
<tr>
<td>Reading / Self study</td>
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<table>
<thead>
<tr>
<th>No. of Hours</th>
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<tbody>
<tr>
<td>36</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>100</td>
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Assessment Methods and Weighting

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<tr>
<th>Methods</th>
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<tbody>
<tr>
<td>Assignments</td>
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<tr>
<td>Examination</td>
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<table>
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<tr>
<th>Weighting in final course grade (%)</th>
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<tbody>
<tr>
<td>Assignments</td>
</tr>
<tr>
<td>Examination</td>
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</table>

<table>
<thead>
<tr>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website
http://moodle.hku.hk

STAT4902

Selected topics in actuarial science (6 credits)

Offering Department
Statistics & Actuarial Science

Quota
---

Course Co-ordinator
TBC, Statistics & Actuarial Science

Teachers Involved

Course Objectives
This course is an advanced course in actuarial science which discusses selected topics which potential graduate students will find useful. It focuses on tools that are in the frontier of actuarial science with examples on applications.

Course Contents & Topics
The contents will be chosen from the following topics:

- Coherent risk measures; Premium calculation principles; Copulas; Extreme value theory; Stochastic dominance;
- Ordering of risks; Renewal equations with insurance applications; Reliability properties; Generalized linear models;
- Comonotonicity; Measures of dependency; Phase-type distributions; Applications to enterprise risk analysis; Other topics as determined by the instructor.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 understand the mathematical tools useful for further research and applications
- CLO 2 apply the tools to solve potentially unseen problems

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT3906

Offer in 2019 - 2020
N Offer in 2020 - 2021 : N

Examination
---

Grade Descriptors (A+ to F)

A  Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities, logical and coherent thinking. Apply limited or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities, logical and coherent thinking. Apply limited or barely effective organizational and presenational skills.

C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities, logical and coherent thinking. Apply moderately effective organizational and presentational skills.

D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
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Assessment Methods and Weighting

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<th>Weighting in final course grade (%)</th>
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<table>
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<tr>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1, 2</td>
</tr>
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</table>

Required/recommended reading and online materials


894
### Course Objectives

The purpose of this course is to develop knowledge of the basic techniques for ratemaking and estimating claim liabilities for general insurance. Application of the actuarial techniques to resolve general insurance problems will be emphasized. The course also provides general knowledge on the general insurance markets in Hong Kong and China. Students will acquire the fundamental concept on general insurance actuarial science together with the supporting calculations.

### Course Contents & Topics

1. General Insurance Markets in Hong Kong, Taiwan and PRC
   - Introduction of general insurance markets
   - Regulations on general insurance
2. Basic techniques for ratemaking
   - How to read and use manual rate pages
   - Ratemaking related to exposures
   - Ratemaking related to premiums
   - Ratemaking related to loss and loss adjustment expenses
   - Calculate the underwriting expense provisions
   - Pure premium methods
   - Loss ratio methods
   - Rating differential and relativities
   - Considerations when selecting the final rates
3. Estimating claim liabilities
   - Data requirement
   - Build and analyze claim development triangles
   - Reserving techniques
   - Considerations when estimating the claim liabilities
   - Estimate recoveries and unpaid claim adjustment expenses
   - Appraise and validation of the estimated results
4. Applications using predictive modeling in General Insurance
   - e.g. predictive modeling, Enterprise Risk Management, etc.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1** understand the feature and underlying risk of general insurance products
- **CLO 2** calculate the premium rate for basic general insurance products
- **CLO 3** estimate the claims liabilities for general insurance products

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in STAT3906

### Offer in 2019 - 2020

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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<tr>
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<tr>
<td></td>
<td>Reading / Self study</td>
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### Assessment Methods and Weighting

<table>
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<tr>
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<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>25</td>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 2.3</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials


### Course Website

http://moodle.hku.hk

Referencess:
- Actuarial Standard Board of the American Academy of Actuaries, Actuarial Standard of Practice No. 13, Trending Procedures in Property/Casualty Insurance Ratemaking
Department of Statistics & Actuarial Science

American Academy of Actuaries Committee on Risk Classification, Risk Classification Statement of Principles, June 1980.
Casualty Actuarial Society Committee on Ratemaking Principles, Statement of Principles Regarding Property and Casualty Insurance Ratemaking, Casualty Actuarial Society, May 1988
Feldblum, S., Personal Automobile Premiums: An Asset Share Pricing Approach for Property-Casualty Insurance, PCAS LXXXIII, 1996, pp. 190-256 (excluding Sections 7-9)
Insurance Services Office, Inc., Personal Automobile Manual (Effective 6-98), General Rules 1-6 only.

STAT4904
Statistical learning for risk modelling (6 credits)

Offering Department: Statistics & Actuarial Science
Course Co-ordinator: Dr C Wang, Statistics & Actuarial Science (stacw@hku.hk)

Course Objectives
To make sense of the vast and complex data sets that have emerged in insurance and finance, it is essential to have a firm understanding of the basic statistical modelling and prediction techniques. This course introduces some useful predictive analytics techniques, such as principal component analysis, naive Bayes classification, decision tree models, and cluster analysis. The R programming language will be used for actual implementation.

Course Contents & Topics
- Basics of statistical learning, cross-validation, linear model selection and regularization (subset selection, shrinkage methods, dimensional reduction methods), generalised linear model, tree-based methods (decision trees, bagging, boosting, random forests), principal component analysis, naive Bayes classification, cluster analysis (K-means clustering, hierarchical clustering)
- Use of useful predictive analytics techniques, such as principal component analysis, naive Bayes classification, decision tree models, and cluster analysis. The R programming language will be used for actual implementation.
- Parametric and nonparametric likelihood methods: high-order approximations; profile likelihood and its variants; theorems; delta method; Edgeworth expansions; saddlepoint approximations.
- Computationally-intensive methods: cross-validation; bootstrap; permutation methods.
- Robust methods: measures of robustness; M-estimator; L-estimator; R-estimator; estimating functions.
- Nonparametric statistical inference: sample quantiles; sign tests; rank tests; Kolmogorov-Smirnov test; signed likelihood ratio statistics; empirical likelihood.
- Basics of statistical learning, cross-validation, linear model selection and regularization (subset selection, shrinkage methods, dimensional reduction methods), generalised linear model, tree-based methods (decision trees, bagging, boosting, random forests), principal component analysis, naive Bayes classification, cluster analysis (K-means clustering, hierarchical clustering)

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand and apply a wide range of predictive analytics techniques for risk modelling
- CLO 2 apply the techniques by using the R programming language and interpret the outputs
- CLO 3 recognize and compare the characteristics, strengths and weaknesses of different methods

Pre-requisites and Co-requisites
- Pass in STAT3907 or STAT3600; and
- Not for students who have passed in STAT3612, or already enrolled in this course; and
- For BSc(Acctuarial Science) students only.

Offer in 2019 - 2020
Y 2nd sem Offer in 2020 - 2021 : Y

Grade Descriptors (A+ to F)
A
- Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
B
- Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
C
- Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
D
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities | Details | No. of Hours
--- | --- | ---
Lectures | 36
Tutorials | 12
Reading / Self study | 100

Assessment Methods and Weighting
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Assignments | Coursework (assignments and computer-based project(s)) | 50 | CLO 1,2,3
Examination | One 2-hour written examination | 50 | CLO 1,2,3

Required/recommended reading and online materials
An Introduction to Statistical Learning, with Applications in R, James, Witten, Hastie, Tibshirani, 2013, New York: Springer

Course Website
http://moodle.hku.hk

STAT7609
Research methods in statistics (6 credits)

Offering Department: Statistics & Actuarial Science
Course Co-ordinator: Prof J F Yao, Statistics & Actuarial Science (jeffyao@hku.hk)

Course Objectives
This course introduces some statistical concepts and methods which potential graduate students will find useful in preparing for work on a research degree in statistics. Focus is on applications of state-of-the-art statistical techniques and their underlying theory.

Course Contents & Topics
Contents may be selected from:
1. Basic asymptotic methods: modes of convergence; stochastic orders; laws of large numbers; central limit theorems; delta method; Edgeworth expansions; saddlepoint approximations.
2. Parametric and nonparametric likelihood methods: high-order approximations; profile likelihood and its variants; signed likelihood ratio statistics; empirical likelihood.
3. Nonparametric statistical inference: sample quantiles; sign and rank tests; Kolmogorov-Smirnov test; nonparametric regression; density estimation; kernel methods.
4. Computationally-intensive methods: cross-validation; bootstrap; permutation methods.
5. Robust methods: measures of robustness; M-estimator; L-estimator; R-estimator; estimating functions.
7. Other topics as determined by the instructor.

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 comprehend the language and technicalities found in statistical research literature
### Pre-requisites (and Co-requisites and Impermissible combinations)

- CLO 2: understand the use of standard mathematical tools for conducting statistical research
- CLO 3: apply a variety of research tools to solve standard statistical problems
- CLO 4: acquire exposure to some developments in contemporary statistical research

Pass in STAT3600 or STAT3907

### Grade Descriptors (A to F)

- **A**
  - Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

- **B**
  - Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

- **C**
  - Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

- **D**
  - Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- **Fail**
  - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

<table>
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<tr>
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<td>CLO 1, 2, 3, 4</td>
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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

### Offer in 2019 - 2020

- Y: 1st sem
- Offer in 2020 - 2021: Y
- Examination: Dec

### Course Contents & Topics

Contents include: sigma-algebra, measurable space, measure and probability, measure space and probability space, measurable functions, random variables, integration theory, characteristic functions, convergence of random variables, Hilbert spaces, conditional expectation, martingales.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1** understand the fundamental measure theory and probability theory
- **CLO 2** learn the general concept of integration, understand the monotone convergence theorem, Fatou's lemma and dominated convergence theorem
- **CLO 3** understand the concept of conditional expectation
- **CLO 4** have some elementary knowledge of martingale

### Pre-requisites (and Co-requisites and Impermissible combinations)

- Pass in STAT3603 or STAT3903

### Offer in 2019 - 2020

- Y: 1st sem
- Offer in 2020 - 2021: Y
- Examination: Dec

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

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### Course Website

http://moodle.hku.hk
Required/recommended reading and online materials
Course Website
http://moodle.hku.hk

STAT7611
Computational statistics (6 credits)
Offering Department Statistics & Actuarial Science
Quota ---

Course Objectives
On successful completion of this course, students should be able to:

CLO 1 understand the importance of the technique for generating random variables in Bayesian statistics, Monte Carlo integration and bootstrapping methods.

CLO 2 realize the advantages and disadvantages of the Newton-Raphson algorithm and the Fisher scoring algorithm and apply them to fit generalized linear models.

CLO 3 understand the essence and basic principle of the EM-type algorithms and MM-type algorithms, realize their range of application, and apply them to solve practical problems.

CLO 4 apply EM-type algorithms to find the posterior mode and apply Markov chain Monte Carlo methods to generate posterior samples.

CLO 5 apply Bootstrap methods to obtain estimated standard errors of estimators and confidence intervals of parameters for both parametric and non-parametric cases.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT3600 or STAT3907

Offer in 2019 - 2020
Y 1st sem Offer in 2020 - 2021: Y

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework (assignments, practical work, and a term test) 25 CLO 1,2,3,4,5
Examination One 2-hour written examination 75 CLO 1,2,3,4,5

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk

STAT7614
Advanced statistical modelling (6 credits)
Offering Department Statistics & Actuarial Science
Quota ---

Course Objectives
This course introduces modern methods for constructing and evaluating statistical models and their implementation using popular computing software, such as R or Python. It will cover both the underlying principles of each modelling approach and the model estimation procedures.

Course Contents & Topics
Topics from: (i) Generalized linear models; (ii) Mixed models; (iii) Kernel and local polynomial regression; selection of smoothing parameters; (iv) Generalized additive models; (v) Hidden Markov model and Bayesian network.

Course Learning
On successful completion of this course, students should be able to:

CLO 1,2,3,4,5

to CLO Mapping
# Course Description

**Course Title:** Methods in Financial Risk Management and Credit Risk

**Department:** Department of Statistics & Actuarial Science

**Course Code:** STAT7615

**Offering Department:** Statistics & Actuarial Science

**Course Co-ordinator:** Dr Z Zhang, Statistics & Actuarial Science (zhangz08@hku.hk)

**Course Objectives:**
This course covers statistical methods and models of importance to risk management and finance and links finance theory to market practice via statistical modeling and decision making. Emphases will be put on empirical analyses to address the discrepancy between finance theory and market data.

**Course Contents & Topics:** Content includes: Elementary Stochastic Calculus; Basic Monte Carlo and Quasi-Monte Carlo Methods; Variance Reduction Techniques; Simulating the value of options and the value-at-risk for risk management; Review of univariate volatility models; multivariate volatility models; Value-at-risk and expected shortfall; estimation, back-testing and stress testing; Extreme value theory for risk management.

**Course Learning Outcomes:**
- On successful completion of this course, students should be able to:
  - CLO 1 apply Monte Carlo methods to determine the value of options and other derivative securities
  - CLO 2 predict volatility of a set of securities using appropriate models
  - CLO 3 estimate the value-at-risk under extreme value theory

**Pre-requisites (and Co-requisites and Impermissible combinations):** Pass in STAT4608

**Grade Descriptors (A+ to F):**
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Assessment Methods and Weighting:**
- Assignments: Coursework (assignments and class test(s)) 50 in course grade (%)
- Examination: One 2-hour written examination 50 in course grade (%)

**Required/recommended reading and online materials:**
R. H. Myers et al., 2010: Generalized Linear Models (2nd ed.), Wiley
W. Hardle et al., 2004: Nonparametric and Semi-parametric Models, Springer
M. Scutari & J. Denis, 2015: Bayesian Networks: with Examples in R, CRC Press

**Course Website:** http://moodle.hku.hk

**Credit Notes:** Advanced quantitative risk management and finance (6 credits)

**Offering Academic Year:** 2019

**Quota:** ---
<table>
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<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1, 2, 3</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
- Danielsson Jon: Financial Risk Forecasting (Willy 2011)

### Course Website
http://moodle.hku.hk
SECTION X  

DEGREE REGULATIONS

REGULATIONS FOR THE DEGREE OF
BACHELOR OF SCIENCE
(BSc)

These regulations apply to students admitted under the 4-year ‘2012 curriculum’ to the BSc degree curriculum to the first year in the academic year 2017-18 and thereafter, students admitted directly to the second year in the academic year 2018-19 and thereafter, and students admitted directly to the third year in the academic year 2019-20.

(See also General Regulations and Regulations for First Degree Curricula)

Definitions

Sc1 For the purpose of these regulations and the syllabuses for the BSc degree, unless the context otherwise requires:

“Science course” means any course offered by the Faculty of Science, and the School of Biomedical Sciences.

“Advanced Science course” means any level 3, 4 or above course offered by the Faculty of Science and the School of Biomedical Sciences.

“Course” means a course of study, with a credit value expressed as a number of credit-units as specified in the syllabuses for a degree curriculum.

“Syllabus” means courses taught by departments, centres, and schools, offered under a degree curriculum.

“Credits” or “credit-units” means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses.

Admission to the BSc degree

Sc2 To be eligible for admission to the BSc degree, candidates shall:

(a) comply with the General Regulations;
(b) comply with the Regulations for First Degree Curricula; and
(c) satisfy all the requirements of the curriculum in accordance with these regulations and the syllabuses.

Period of study

Sc3 The curriculum for the BSc degree shall normally require eight semesters of full-time study, extending over not fewer than four academic years, and shall include any assessment to be held during and/or at the end of each semester. Candidates shall not in any case be permitted to extend their studies beyond the maximum period of registration of six academic years.

1 This regulation should be read in conjunction with UG1 of the Regulations for First Degree Curricula.
Selection of courses

**Sc4** Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each semester. Any change to the selection of courses shall be made only during the add/drop period of the semester in which the course begins, and such changes shall not be reflected in the transcript of the candidate. Requests for changes after the designated add/drop period of the semester shall not be considered.

Curriculum requirements and progression in curriculum

**Sc5**

(a) Candidates shall satisfy the requirements prescribed in UG5 of the Regulations of First Degree Curricula.

(b) Candidates shall take not fewer than 240 credits, in the manner specified in these regulations and the syllabuses.

(c) Candidates shall take at least 96 credits of Science courses including all required courses of the major programme of the BSc degree curriculum.

(d) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements may be fewer than 24 credits.

(e) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load of 288 credits for the normative period of study specified in the curriculum regulations, save as provided for under Sc5(f).

(f) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load of 432 credits for the maximum period of registration specified in the curriculum regulations.

(g) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The number of transferred credits will be recorded on the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total credits normally required under the degree curricula of the candidates during their candidature at the University.

(h) Candidates shall be recommended for discontinuation of their studies if they have:

(i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or

(ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or

(iii) exceeded the maximum period of registration specified in Sc3, unless otherwise permitted by the Board of the Faculty.
Advanced standing

Sc6 Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum in accordance with UG2 of the Regulations for First Degree Curricula. Credits granted for advanced standing will be recorded on the transcript of the candidate but shall not be included in the calculation of the GPA.

Assessment

Sc7

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(d) Candidates are required to make up for failed courses in the following manner: repeating the failed course by undergoing instruction and satisfying the assessment, or for elective courses, taking another course in lieu and satisfying the assessment requirements.

(e) There shall be no appeal against the results of examinations and all other forms of assessment.

Award of BSc Degree

Sc8 To be eligible for the award of the BSc degree, candidates shall have:

(a) satisfied the requirements in UG5 of the Regulations for First Degree Curricula;

(b) passed not fewer than 240 credits, comprising 96 credits of the required courses as prescribed in the major programme of the BSc degree curriculum.
Honours classification

(a) Honours classifications shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the Degree of BSc in accordance with the following Graduation GPA scores, with all courses taken (including failed courses, but not including courses approved by the Senate graded as ‘Pass’, ‘Fail’ or ‘Distinction’) carrying weightings which are proportionate to their credit values:

<table>
<thead>
<tr>
<th>Class of honours</th>
<th>GGPA range</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class Honours</td>
<td>3.60 – 4.30</td>
</tr>
<tr>
<td>Second Class Honours</td>
<td>(2.40 – 3.59)</td>
</tr>
<tr>
<td>Division One</td>
<td>3.00 – 3.59</td>
</tr>
<tr>
<td>Division Two</td>
<td>2.40 – 2.99</td>
</tr>
<tr>
<td>Third Class Honours</td>
<td>1.70 – 2.39</td>
</tr>
<tr>
<td>Pass</td>
<td>1.00 – 1.69</td>
</tr>
</tbody>
</table>

(b) Honours classification may not be determined solely on the basis of a candidate’s Graduation GPA and the Board of Examiners for the Degree of BSc may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Graduation GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.

---

2 For students in the 2017-18 intake and thereafter who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core course with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.
These regulations apply to students admitted under the 4-year ‘2012 curriculum’ to the BSc degree curriculum to the first year in the academic year 2015-16 and 2016-17, students admitted directly to the second year in the academic year 2017-18, and students admitted directly to the third year in the academic years 2017-18 and 2018-19.

(See also General Regulations and Regulations for First Degree Curricula)

**Definitions**

**Sc1** For the purpose of these regulations and the syllabuses for the BSc degree, unless the context otherwise requires:

“Science course” means any course offered by the Faculty of Science, and the School of Biomedical Sciences.

“Advanced Science course” means any level 3, 4 or above course offered by the Faculty of Science and the School of Biomedical Sciences.

“Course” means a course of study, with a credit value expressed as a number of credit-units as specified in the syllabuses for a degree curriculum.

“Syllabus” means courses taught by departments, centres, and schools, offered under a degree curriculum.

“Credits” or “credit-units” means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses.

**Admission to the BSc degree**

**Sc2** To be eligible for admission to the BSc degree, candidates shall:

(a) comply with the General Regulations;

(b) comply with the Regulations for First Degree Curricula; and

(c) satisfy all the requirements of the curriculum in accordance with these regulations and the syllabuses.

**Period of study**

**Sc3** The curriculum for the BSc degree shall normally require eight semesters of full-time study, extending over not fewer than four academic years, and shall include any assessment to be held during and/or at the end of each semester. Candidates shall not in any case be permitted to extend their studies beyond the maximum period of registration of six academic years.

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1 This regulation should be read in conjunction with UG1 of the Regulations for First Degree Curricula.
Selection of courses

**Sc4** Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each semester. Any change to the selection of courses shall be made only during the add/drop period of the semester in which the course begins, and such changes shall not be reflected in the transcript of the candidate. Requests for changes after the designated add/drop period of the semester shall not be considered.

Curriculum requirements and progression in curriculum

**Sc5**

(a) Candidates shall satisfy the requirements prescribed in UG5 of the Regulations of First Degree Curricula.

(b) Candidates shall take not fewer than 240 credits, in the manner specified in these regulations and the syllabuses.

(c) Candidates shall take at least 96 credits of Science courses including all required courses of the major programme of the BSc degree curriculum.

(d) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements may be fewer than 24 credits.

(e) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load of 288 credits for the normative period of study specified in the curriculum regulations, save as provided for under Sc5(f).

(f) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load of 432 credits for the maximum period of registration specified in the curriculum regulations.

(g) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The number of transferred credits will be recorded on the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total credits normally required under the degree curricula of the candidates during their candidature at the University.

(h) Candidates shall be recommended for discontinuation of their studies if they have:

   (i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or

   (ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or

   (iii) exceeded the maximum period of registration specified in Sc3, unless otherwise permitted by the Board of the Faculty.
Advanced standing

Sc6 Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum in accordance with UG2 of the Regulations for First Degree Curricula. Credits granted for advanced standing will be recorded on the transcript of the candidate but shall not be included in the calculation of the GPA.

Assessment

Sc7

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(d) Candidates are required to make up for failed courses in the following manner: repeating the failed course by undergoing instruction and satisfying the assessment, or for elective courses, taking another course in lieu and satisfying the assessment requirements.

(e) There shall be no appeal against the results of examinations and all other forms of assessment.

Award of BSc Degree

Sc8 To be eligible for the award of the BSc degree, candidates shall have:

(a) satisfied the requirements in UG5 of the Regulations for First Degree Curricula;

(b) passed not fewer than 240 credits, comprising 96 credits of the required courses as prescribed in the major programme of the BSc degree curriculum.
Honours classification

(a) Honours classifications shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the Degree of BSc in accordance with the following Graduation GPA scores, with all courses taken (including failed courses, but not including courses approved by the Senate graded as ‘Pass’, ‘Fail’ or ‘Distinction’) carrying weightings which are proportionate to their credit values:

<table>
<thead>
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<th>Class of honours</th>
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</thead>
<tbody>
<tr>
<td>First Class Honours</td>
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</tr>
<tr>
<td>Pass</td>
<td>1.00 – 1.69</td>
</tr>
</tbody>
</table>

(b) Honours classification may not be determined solely on the basis of a candidate’s Graduation GPA and the Board of Examiners for the Degree of BSc may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Graduation GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.

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2 For students in the 2017-18 intake and thereafter who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core course with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.
REGULATIONS FOR THE DEGREE OF
BACHELOR OF SCIENCE
(BSc)

These regulations apply to students admitted under the 4-year ‘2012 curriculum’ to the BSc degree curriculum to the first year in the academic years 2014-15, and students admitted directly to the third year in the academic years 2016-17.

(See also General Regulations and Regulations for First Degree Curricula)

Definitions

Sc1 For the purpose of these regulations and the syllabuses for the BSc degree, unless the context otherwise requires:

“Science course” means any course offered by the Faculty of Science, and the School of Biomedical Sciences.

“Advanced Science course” means any level 3, 4 or above course offered by the Faculty of Science and the School of Biomedical Sciences.

“Course” means a course of study, with a credit value expressed as a number of credit-units as specified in the syllabuses for a degree curriculum.

“Syllabus” means courses taught by departments, centres, and schools, offered under a degree curriculum.

“Credits” or “credit-units” means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses.

Admission to the BSc degree

Sc2 To be eligible for admission to the BSc degree, candidates shall:

(a) comply with the General Regulations;

(b) comply with the Regulations for First Degree Curricula; and

(c) satisfy all the requirements of the curriculum in accordance with these regulations and the syllabuses.

Period of study

Sc3 The curriculum for the BSc degree shall normally require eight semesters of full-time study, extending over not fewer than four academic years, and shall include any assessment to be held during and/or at the end of each semester. Candidates shall not in any case be permitted to extend their studies beyond the maximum period of registration of six academic years.

Selection of courses

1 This regulation should be read in conjunction with UG1 of the Regulations for First Degree Curricula.
Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each semester. Any change to the selection of courses shall be made only during the add/drop period of the semester in which the course begins, and such changes shall not be reflected in the transcript of the candidate. Requests for changes after the designated add/drop period of the semester shall not be considered.

Curriculum requirements and progression in curriculum

(a) Candidates shall satisfy the requirements prescribed in UG5 of the Regulations of First Degree Curricula.

(b) Candidates shall take not fewer than 240 credits, in the manner specified in these regulations and the syllabuses.

(c) Candidates shall take at least 96 credits of Science courses including all required courses of the major programme of the BSc degree curriculum.

(d) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements may be fewer than 24 credits.

(e) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load of 288 credits for the normative period of study specified in the curriculum regulations, save as provided for under Sc5(f).

(f) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load of 432 credits for the maximum period of registration specified in the curriculum regulations.

(g) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The number of transferred credits will be recorded on the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total credits normally required under the degree curricula of the candidates during their candidature at the University.

(h) Candidates shall be recommended for discontinuation of their studies if they have:

(i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or

(ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or

(iii) exceeded the maximum period of registration specified in Sc3, unless otherwise permitted by the Board of the Faculty.
Advanced standing

**Sc6** Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum in accordance with UG2 of the Regulations for First Degree Curricula. Credits granted for advanced standing will be recorded on the transcript of the candidate but shall not be included in the calculation of the GPA.

Assessment

**Sc7**

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(d) Candidates are required to make up for failed courses in the following manner: repeating the failed course by undergoing instruction and satisfying the assessment, or for elective courses, taking another course in lieu and satisfying the assessment requirements.

(e) There shall be no appeal against the results of examinations and all other forms of assessment.

Award of BSc Degree

**Sc8** To be eligible for the award of the BSc degree, candidates shall have:

(a) satisfied the requirements in UG5 of the Regulations for First Degree Curricula;

(b) passed not fewer than 240 credits, comprising 96 credits of the required courses as prescribed in the major programme of the BSc degree curriculum.
Honours classification

(a) Honours classifications shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the Degree of BSc in accordance with the following Cumulative GPA scores, with all courses taken (including failed courses, but not including courses approved by the Senate graded as ‘Pass’, ‘Fail’ or ‘Distinction’) carrying equal weighting:

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(b) Honours classification may not be determined solely on the basis of a candidate’s Cumulative GPA and the Board of Examiners for the Degree of BSc may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Cumulative GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.
REGULATIONS FOR THE DEGREE OF
BACHELOR OF SCIENCE
(BSc)

These regulations apply to students admitted under the 4-year ‘2012 curriculum’ to the BSc degree curriculum to the first year in the academic years 2012-13 and 2013-14, and students admitted directly to the third year in the academic years 2014-15 and 2015-16.

(See also General Regulations and Regulations for First Degree Curricula)

Definitions

Sc1 For the purpose of these regulations and the syllabuses for the BSc degree, unless the context otherwise requires:

“Science course” means any course offered by the Faculty of Science, and the School of Biomedical Sciences.

“Advanced Science course” means any level 3, 4 or above course offered by the Faculty of Science and the School of Biomedical Sciences.

“Course” means a course of study, with a credit value expressed as a number of credit-units as specified in the syllabuses for a degree curriculum.

“Syllabus” means courses taught by departments, centres, and schools, offered under a degree curriculum.

“Credits” or “credit-units” means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses.

Admission to the BSc degree

Sc2 To be eligible for admission to the BSc degree, candidates shall:

(a) comply with the General Regulations;

(b) comply with the Regulations for First Degree Curricula; and

(c) satisfy all the requirements of the curriculum in accordance with these regulations and the syllabuses.

Period of study

Sc3 The curriculum for the BSc degree shall normally require eight semesters of full-time study, extending over not fewer than four academic years, and shall include any assessment to be held during and/or at the end of each semester. Candidates shall not in any case be permitted to extend their studies beyond the maximum period of registration of six academic years.

1 This regulation should be read in conjunction with UG1 of the Regulations for First Degree Curricula.
Selection of courses

Sc4 Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each semester. Any change to the selection of courses shall be made only during the add/drop period of the semester in which the course begins, and such changes shall not be reflected in the transcript of the candidate. Requests for changes after the designated add/drop period of the semester shall not be considered.

Curriculum requirements and progression in curriculum

Sc5

(a) Candidates shall satisfy the requirements prescribed in UG5 of the Regulations of First Degree Curricula.

(b) Candidates shall take not fewer than 240 credits, in the manner specified in these regulations and the syllabuses.

(c) Candidates shall take at least 96 credits of Science courses including all required courses of the major programme of the BSc degree curriculum.

(d) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements may be fewer than 24 credits.

(e) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load of 288 credits for the normative period of study specified in the curriculum regulations, save as provided for under Sc5(f).

(f) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load of 432 credits for the maximum period of registration specified in the curriculum regulations.

(g) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The number of transferred credits will be recorded on the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total credits normally required under the degree curricula of the candidates during their candidature at the University.

(h) Candidates shall be recommended for discontinuation of their studies if they have:

(i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or

(ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or

(iii) exceeded the maximum period of registration specified in Sc3, unless otherwise permitted by the Board of the Faculty.
Advanced standing

Sc6 Advanced standing may be granted to candidates in recognition of studies completed successfully in an approved institution of higher education elsewhere in accordance with UG2 of the Regulations for First Degree Curricula. Credits granted for advanced standing will be recorded on the transcript of the candidate but shall not be included in the calculation of the GPA.

Assessment

Sc7

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(d) Candidates are required to make up for failed courses in the following manner: repeating the failed course by undergoing instruction and satisfying the assessment, or for elective courses, taking another course in lieu and satisfying the assessment requirements.

(e) There shall be no appeal against the results of examinations and all other forms of assessment.

Award of BSc Degree

Sc8 To be eligible for the award of the BSc degree, candidates shall have:

(a) satisfied the requirements in UG5 of the Regulations for First Degree Curricula;

(b) passed not fewer than 240 credits, comprising 96 credits of the required courses as prescribed in the major programme of the BSc degree curriculum.
Honours classification

Sc9

(a) Honours classifications shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the Degree of BSc in accordance with the following Cumulative GPA scores, with all courses taken (including failed courses, but not including courses approved by the Senate graded as ‘Pass’, ‘Fail’ or ‘Distinction’) carrying equal weighting:

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(b) Honours classification may not be determined solely on the basis of a candidate’s Cumulative GPA and the Board of Examiners for the Degree of BSc may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Cumulative GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.
REGULATIONS FOR FIRST DEGREE CURRICULA

Regulations for First Degree Curricula (for students admitted under the 4-year ‘2012 curriculum’ to the first year in the academic year 2019-20 and thereafter)

(See also General Regulations)

UG 1 Definitions:

For the purpose of regulations and syllabuses for all first degree curricula unless otherwise defined —

An ‘academic year’ comprises two semesters, the first semester to commence in September and end in December, and the second semester to commence in January and end in May/June, on dates as prescribed by the Senate. It includes, normally at the end of each semester, a period during which candidates are assessed. For some curricula, a ‘summer semester’ may be organized in addition to the normal two semesters. Clinical curricula have extended semesters.

A ‘summer semester’ normally comprises seven to eight weeks of intensive timetabled teaching and assessment to commence four weeks after the end of the second semester assessment period, and to conclude about one week before the start of the next academic year.

The ‘maximum period of registration’ is equivalent to a period which is 150% of the curriculum’s normative period of study as specified in the degree regulations, provided that where this results in a residual fraction of an academic year, the fractional period shall be extended to one full academic year.

‘Degree curriculum’ means the entire study requirements for the award of an undergraduate degree.

‘Major programme’ means the study requirements, including a capstone experience, for a single major area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 72 credits nor more than 96 credits, as prescribed in the syllabuses for a degree curriculum.

‘Minor programme’ means the study requirements for a single minor area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 36 credits nor more than 48 credits, as prescribed in the syllabuses for a degree curriculum.

‘Professional core’ refers to the study requirements, including a capstone experience, prescribed in the regulations and syllabuses for disciplinary studies in degree curricula which are not structured as major/minor programmes for reasons relating to professional qualification and/or accreditation.

‘Course’ means a course of study, with a credit value expressed as a number of credit-units as specified in the syllabuses for a degree curriculum.

‘Disciplinary elective course’ or ‘Disciplinary Elective’ means any course offered in the same major or minor programme or the professional core which can be taken by candidates to fulfill the curriculum requirements as specified in the syllabuses of the degree curriculum.

‘Elective course’ or ‘Elective’ means any course offered within the same or another curriculum, other than compulsory courses in the candidate’s degree curriculum, that can be

1 These regulations are applicable to candidates admitted from 2019-20 onwards. Reference in these regulations to the powers of the Boards of Faculties shall be applicable to Senate Boards of Studies which administer first degree curricula.
taken by the candidate in order to complete the credit requirements of the degree curriculum. ‘Capstone experience’ refers to one or more courses within the major programme or professional core which are approved by the Board of the Faculty for the purpose of integrating knowledge and skills acquired, and which are prescribed in the syllabuses of the degree curriculum. ‘Syllabus’ means courses taught by departments, centres, and schools, offered under a degree curriculum. ‘Prerequisite’ means a course or a group of courses which candidates must have completed successfully or a requirement which candidates must have fulfilled before being permitted to take the course in question. ‘Corequisite’ means a course which candidates must take in conjunction with the course in question. ‘Credits’ or ‘credit-units’ means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses. ‘Grade Points’ are standardized measurements of candidates’ academic achievement in courses taken to satisfy the requirements of the degree curriculum and are expressed as a scale prescribed in these regulations. ‘Grade Point Average’ is a numerical measure of a candidate’s academic achievement over a specified period of time. Each course attempted (including each failed course) is assigned a numerical value, with all courses carrying equal weighting. This numerical value is the product of grade points earned for the course and the credit value of that course. The ‘Grade Point Average’ is the sum of these numerical values divided by the total number of credits attempted:

$$\text{GPA} = \frac{\sum_{i} \text{Course Grade Point} \times \text{Course Credit Value}}{\sum_{i} \text{Course Credit Value}}$$

(Where ‘i’ stands for all passed and failed courses taken by the student over a specified period)

‘Semester Grade Point Average’ or ‘Semester GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given semester. ‘Year Grade Point Average’ or ‘Year GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given academic year. ‘Cumulative Grade Point Average’ or ‘Cumulative GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) at the time of calculation. ‘Graduation Grade Point Average’ or ‘Graduation GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) at the point of graduation. For students in the 2017-18 intake and thereafter who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core courses with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.

‘Assessment’ refers to judgment about the quality and extent to which a student has achieved the stated learning objectives or learning outcomes. It includes all types of assessment activities which allow for such a judgment to be made. For the purpose of interpreting the relevant provisions of the Ordinance and the Statutes and where appropriate,
reference to ‘examination’ or 'examinations' in the Ordinance and the Statutes shall include and cover all forms of ‘assessment’ and its related processes.

A ‘transcript’ refers to a transcript of the record of study of a candidate, issued by the Registry of the University.

UG 2 Advanced standing:

Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum. Candidates who are awarded Advanced Standing will not be granted any further credit transfer for those studies for which Advanced Standing has been granted. The amount of credits to be granted for advanced standing shall be determined by the Board of the Faculty, in accordance with the following principles:

(a) at least half the number of credits of the degree curriculum normally required for award of the degree shall be accumulated through study at this University or from transfer of credits for courses completed at other institutions in accordance with Regulation UG 4(d); and

(b) in accordance with Statute III.5 and notwithstanding the granting of advanced and/or transfer credits, a minimum of two semesters of study at this University shall be required before a candidate is considered for the award of a first degree, other than a degree in medicine or surgery, and a minimum of four semesters of study at this University shall be required before a candidate is considered for a first degree in medicine or surgery.

Credits granted for advanced standing shall not normally be included in the calculation of the GPA unless permitted by the Board of the Faculty but will be recorded on the transcript of the candidate.

UG 3 Period of study:

The period of study of the curriculum shall be specified in the regulations governing the degree. To be eligible for award of the degree, a candidate shall fulfill all curriculum requirements within the maximum period of registration, unless otherwise permitted or required by the Board of the Faculty.

UG 4 Progression in curriculum:

(a) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements is fewer than 24 credits.

(b) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load for the normative period of study specified in the curriculum regulations, save as provided for under UG4(c).

(c) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load for the maximum period of registration specified in the curriculum regulations.

(d) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The
number of transferred credits may be recorded in the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total credits normally required under the degree curricula of the candidates during their candidature at the University.

(e) Unless otherwise permitted by the Board of the Faculty, candidates shall be recommended for discontinuation of their studies if they have:

(i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or

(ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or

(iii) exceeded the maximum period of registration specified in the regulations of the degree.

UG 5 Requirements for graduation:

To be eligible for admission to the degree, candidates shall fulfill the following requirements in addition to the requirements prescribed in the regulations and syllabuses governing the degree curriculum within the maximum period of registration:

(a) successful completion of 12 credits in English language enhancement, including 6 credits in Core University English\(^2\) and 6 credits in an English in the Discipline course\(^3\);

(b) successful completion of 6 credits in Chinese language enhancement\(^4\);

(c) unless otherwise prescribed in the curriculum regulations and syllabuses, successful completion of 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry\(^5\) with not more than 24 credits of course being selected within one academic year except where candidates are required to make up for failed credits; and

(d) successful completion of a capstone experience as specified in the syllabuses of the degree curriculum.

UG 6 Exemption:

Candidates may be exempted, with or without special conditions attached, from any of the requirements in UG 5 by the Senate in exceptional circumstances. Candidates who are so

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\(^2\) Candidates who have achieved Level 5\(^*\)\(^*\) in English Language in the Hong Kong Diploma of Secondary Education Examination, or equivalent, may at the discretion of the Faculty be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

\(^3\) (a) To satisfy the English in the Discipline (ED) requirement, candidates who have passed the ED course for a Major but subsequently change that Major are required to pass the ED course for the new Major, or either of the double Majors finally declared upon graduation irrespective of whether the second Major is offered within or outside of the candidates’ home Faculty.

(b) Candidates declaring double Majors can, if they fail in the ED course for one of the Majors, either (i) re-take and successfully complete that failed ED course, or (ii) successfully complete the ED course for the other Major, irrespective of whether the Major is offered within or outside of the candidates’ home Faculty.

(c) Candidates who undertake studies in double Majors or double degrees are not required to take a second ED course but may be advised by the Faculty to do so.

\(^4\) Candidates who have not studied Chinese language during their secondary education may be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

\(^5\) Candidates registered for dual degree studies are required to successfully complete 24 credits of courses in the Common Core Curriculum, selecting one course from each Area of Inquiry, within the curriculum of the first degree, as appropriate.
exempted must replace the number of exempted credits with courses of the same credit value.

**UG 7  Assessment:**

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates suspended under Statute XXXI shall not be allowed to take, present themselves for, and participate in any assessments during the period of suspension, unless otherwise permitted by the Senate.

(d) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(e) Candidates are required to make up for failed courses in the following manner as prescribed in the curriculum regulations:

(i) undergoing re-assessment/re-examination in the failed course to be held no later than the end of the following semester (not including the summer semester); or

(ii) re-submitting failed coursework, without having to repeat the same course of instruction; or

(iii) repeating the failed course by undergoing instruction and satisfying the assessments; or

(iv) for elective courses, taking another course *in lieu* and satisfying the assessment requirements.

(f) There shall be no appeal against the results of examinations and all other forms of assessment.

**UG 8  Grading system:**

(a) The grades, their standards and the grade points for assessment shall be as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Standard</th>
<th>Grade Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>Excellent</td>
<td>4.3</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td>4.0</td>
</tr>
<tr>
<td>A-</td>
<td></td>
<td>3.7</td>
</tr>
<tr>
<td>B+</td>
<td>Good</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>3.0</td>
</tr>
<tr>
<td>B-</td>
<td></td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>Satisfactory</td>
<td>2.3</td>
</tr>
<tr>
<td>C</td>
<td>Pass</td>
<td>2.0</td>
</tr>
<tr>
<td>C-</td>
<td></td>
<td>1.7</td>
</tr>
<tr>
<td>D+</td>
<td>Fail</td>
<td>1.3</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

6  UG 8 is not applicable to the respective Professional Core of the BDS and MBBS curricula.
(b) Special permission may be given by Senate for courses in individual curricula to be graded as ‘Pass’, ‘Fail’ or ‘Distinction’. Such courses will not be included in the calculation of the GPA.

**UG 9 Honours classifications:**

(a) Honours classifications shall be awarded in five divisions\(^7\): First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the degree in accordance with the following Graduate GPA scores, with all courses taken (including failed courses) carrying equal weighting which are proportionate to their credit values\(^8\).

<table>
<thead>
<tr>
<th>Class of honours</th>
<th>GGPA range</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class Honours</td>
<td>3.60 – 4.30</td>
</tr>
<tr>
<td>Second Class Honours</td>
<td>(2.40 – 3.59)</td>
</tr>
<tr>
<td>Division One</td>
<td>3.00 – 3.59</td>
</tr>
<tr>
<td>Division Two</td>
<td>2.40 – 2.99</td>
</tr>
<tr>
<td>Third Class Honours</td>
<td>1.70 – 2.39</td>
</tr>
<tr>
<td>Pass</td>
<td>1.00 – 1.69</td>
</tr>
</tbody>
</table>

(b) Honours classification may not be determined solely on the basis of a candidate’s Graduation GPA and the Board of Examiners for the degree may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Graduation GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.

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\(^7\) UG 9 is not applicable to the BChinMed, BDS and MBBS curricula.

\(^8\) For students in the 2017-18 intake and thereafter who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core course with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.
REGULATIONS FOR FIRST DEGREE CURRICULA

Regulations for First Degree Curricula (for students admitted under the 4-year ‘2012 curriculum’ to the first year in the academic year 2018-19, and students admitted directly to the second year in the academic year 2019-20)

(See also General Regulations)

UG 1 Definitions:

For the purpose of regulations and syllabuses for all first degree curricula unless otherwise defined —

An ‘academic year’ comprises two semesters, the first semester to commence in September and end in December, and the second semester to commence in January and end in May/June, on dates as prescribed by the Senate. It includes, normally at the end of each semester, a period during which candidates are assessed. For some curricula, a ‘summer semester’ may be organized in addition to the normal two semesters. Clinical curricula have extended semesters.

A ‘summer semester’ normally comprises seven to eight weeks of intensive timetabled teaching and assessment to commence four weeks after the end of the second semester assessment period, and to conclude about one week before the start of the next academic year.

The ‘maximum period of registration’ is equivalent to a period which is 150% of the curriculum’s normative period of study as specified in the degree regulations, provided that where this results in a residual fraction of an academic year, the fractional period shall be extended to one full academic year.

‘Degree curriculum’ means the entire study requirements for the award of an undergraduate degree.

‘Major programme’ means the study requirements, including a capstone experience, for a single major area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 72 credits nor more than 96 credits, as prescribed in the syllabuses for a degree curriculum.

‘Minor programme’ means the study requirements for a single minor area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 36 credits nor more than 48 credits, as prescribed in the syllabuses for a degree curriculum.

‘Professional core’ refers to the study requirements, including a capstone experience, prescribed in the regulations and syllabuses for disciplinary studies in degree curricula which are not structured as major/minor programmes for reasons relating to professional qualification and/or accreditation.

‘Course’ means a course of study, with a credit value expressed as a number of credit-units as specified in the syllabuses for a degree curriculum.

‘Disciplinary elective course’ or ‘Disciplinary Elective’ means any course offered in the same major or minor programme or the professional core which can be taken by candidates to fulfill the curriculum requirements as specified in the syllabuses of the degree curriculum.

‘Elective course’ or ‘Elective’ means any course offered within the same or another curriculum, other than compulsory courses in the candidate’s degree curriculum, that can be

1 These regulations are applicable to candidates admitted from 2018-19 onwards. Reference in these regulations to the powers of the Boards of Faculties shall be applicable to Senate Boards of Studies which administer first degree curricula.
taken by the candidate in order to complete the credit requirements of the degree curriculum.

‘Capstone experience’ refers to one or more courses within the major programme or professional core which are approved by the Board of the Faculty for the purpose of integrating knowledge and skills acquired, and which are prescribed in the syllabuses of the degree curriculum.

‘Syllabus’ means courses taught by departments, centres, and schools, offered under a degree curriculum.

‘Prerequisite’ means a course or a group of courses which candidates must have completed successfully or a requirement which candidates must have fulfilled before being permitted to take the course in question.

‘Corequisite’ means a course which candidates must take in conjunction with the course in question.

‘Credits’ or ‘credit-units’ means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses.

‘Grade Points’ are standardized measurements of candidates’ academic achievement in courses taken to satisfy the requirements of the degree curriculum and are expressed as a scale prescribed in these regulations.

‘Grade Point Average’ is a numerical measure of a candidate’s academic achievement over a specified period of time. Each course attempted (including each failed course) is assigned a numerical value, with all courses carrying equal weighting. This numerical value is the product of grade points earned for the course and the credit value of that course. The ‘Grade Point Average’ is the sum of these numerical values divided by the total number of credits attempted:

\[
GPA = \frac{\sum_i \text{Course Grade Point} \times \text{Course Credit Value}}{\sum_i \text{Course Credit Value}}
\]

(where ‘i’ stands for all passed and failed courses taken by the student over a specified period)

‘Semester Grade Point Average’ or ‘Semester GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given semester.

‘Year Grade Point Average’ or ‘Year GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given academic year.

‘Cumulative Grade Point Average’ or ‘Cumulative GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) at the time of calculation.

‘Graduation Grade Point Average’ or ‘Graduation GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) at the point of graduation. For students in the 2017-18 intake and thereafter who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core courses with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.

‘Assessment’ refers to judgment about the quality and extent to which a student has achieved the stated learning objectives or learning outcomes. It includes all types of assessment activities which allow for such a judgment to be made. For the purpose of interpreting the relevant provisions of the Ordinance and the Statutes and where appropriate,
reference to ‘examination’ or 'examinations' in the Ordinance and the Statutes shall include and cover all forms of ‘assessment’ and its related processes.

A ‘transcript’ refers to a transcript of the record of study of a candidate, issued by the Registry of the University.

UG 2 Advanced standing:

Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum. Candidates who are awarded Advanced Standing will not be granted any further credit transfer for those studies for which Advanced Standing has been granted. The amount of credits to be granted for advanced standing shall be determined by the Board of the Faculty, in accordance with the following principles:

(a) at least half the number of credits of the degree curriculum normally required for award of the degree shall be accumulated through study at this University or from transfer of credits for courses completed at other institutions in accordance with Regulation UG 4(d); and

(b) in accordance with Statute III.5 and notwithstanding the granting of advanced and/or transfer credits, a minimum of two semesters of study at this University shall be required before a candidate is considered for the award of a first degree, other than a degree in medicine or surgery, and a minimum of four semesters of study at this University shall be required before a candidate is considered for a first degree in medicine or surgery.

Credits granted for advanced standing shall not normally be included in the calculation of the GPA unless permitted by the Board of the Faculty but will be recorded on the transcript of the candidate.

UG 3 Period of study:

The period of study of the curriculum shall be specified in the regulations governing the degree. To be eligible for award of the degree, a candidate shall fulfill all curriculum requirements within the maximum period of registration, unless otherwise permitted or required by the Board of the Faculty.

UG 4 Progression in curriculum:

(a) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements is fewer than 24 credits.

(b) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load for the normative period of study specified in the curriculum regulations, save as provided for under UG4(c).

(c) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load for the maximum period of registration specified in the curriculum regulations.

(d) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The
number of transferred credits may be recorded in the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total credits normally required under the degree curricula of the candidates during their candidature at the University.

(e) Unless otherwise permitted by the Board of the Faculty, candidates shall be recommended for discontinuation of their studies if they have:

(i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or
(ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or
(iii) exceeded the maximum period of registration specified in the regulations of the degree.

UG 5 Requirements for graduation:

To be eligible for admission to the degree, candidates shall fulfill the following requirements in addition to the requirements prescribed in the regulations and syllabuses governing the degree curriculum within the maximum period of registration:

(a) successful completion of 12 credits in English language enhancement, including 6 credits in Core University English\(^2\) and 6 credits in an English in the Discipline course\(^3\);
(b) successful completion of 6 credits in Chinese language enhancement\(^4\);
(c) successful completion of 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry\(^5\) with not more than 24 credits of course being selected within one academic year except where candidates are required to make up for failed credits; and
(d) successful completion of a capstone experience as specified in the syllabuses of the degree curriculum.

UG 6 Exemption:

Candidates may be exempted, with or without special conditions attached, from any of the requirements in UG 5 by the Senate in exceptional circumstances. Candidates who are so exempted must replace the number of exempted credits with courses of the same credit value.

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2 Candidates who have achieved Level 5** in English Language in the Hong Kong Diploma of Secondary Education Examination, or equivalent, may at the discretion of the Faculty be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

3 (a) To satisfy the English in the Discipline (ED) requirement, candidates who have passed the ED course for a Major but subsequently change that Major are required to pass the ED course for the new Major, or either of the double Majors finally declared upon graduation irrespective of whether the second Major is offered within or outside of the candidates’ home Faculty.

(b) Candidates declaring double Majors can, if they fail in the ED course for one of the Majors, either (i) re-take and successfully complete that failed ED course, or (ii) successfully complete the ED course for the other Major, irrespective of whether the Major is offered within or outside of the candidates’ home Faculty.

(c) Candidates who undertake studies in double Majors or double degrees are not required to take a second ED course but may be advised by the Faculty to do so.

4 Candidates who have not studied Chinese language during their secondary education may be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

5 Candidates registered for dual degree studies are required to successfully complete 24 credits of courses in the Common Core Curriculum, selecting one course from each Area of Inquiry, within the curriculum of the first degree, as appropriate.
UG 7 Assessment:

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates suspended under Statute XXXI shall not be allowed to take, present themselves for, and participate in any assessments during the period of suspension, unless otherwise permitted by the Senate.

(d) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(e) Candidates are required to make up for failed courses in the following manner as prescribed in the curriculum regulations:
   (i) undergoing re-assessment/re-examination in the failed course to be held no later than the end of the following semester (not including the summer semester); or
   (ii) re-submitting failed coursework, without having to repeat the same course of instruction; or
   (iii) repeating the failed course by undergoing instruction and satisfying the assessments; or
   (iv) for elective courses, taking another course in lieu and satisfying the assessment requirements.

(f) There shall be no appeal against the results of examinations and all other forms of assessment.

UG 8 Grading system:

(a) The grades, their standards and the grade points for assessment shall be as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Standard</th>
<th>Grade Point</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>A</td>
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<td></td>
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</tr>
<tr>
<td>C+</td>
<td>Satisfactory</td>
<td>2.3</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>2.0</td>
</tr>
<tr>
<td>C-</td>
<td></td>
<td>1.7</td>
</tr>
<tr>
<td>D+</td>
<td>Pass</td>
<td>1.3</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>F</td>
<td>Fail</td>
<td>0</td>
</tr>
</tbody>
</table>

(b) Special permission may be given by Senate for courses in individual curricula to be

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UG 8 is not applicable to the respective Professional Core of the BDS and MBBS curricula.
graded as ‘Pass’, ‘Fail’ or ‘Distinction’. Such courses will not be included in the calculation of the GPA.

**UG 9  Honours classifications:**

(a) Honours classifications shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the degree in accordance with the following Graduate GPA scores, with all courses taken (including failed courses) carrying equal weighting which are proportionate to their credit values:

<table>
<thead>
<tr>
<th>Class of honours</th>
<th>GGPA range</th>
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<tbody>
<tr>
<td>First Class Honours</td>
<td>3.60 – 4.30</td>
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<td>Second Class Honours</td>
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<td>Division Two</td>
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</tr>
<tr>
<td>Third Class Honours</td>
<td>1.70 – 2.39</td>
</tr>
<tr>
<td>Pass</td>
<td>1.00 – 1.69</td>
</tr>
</tbody>
</table>

(b) Honours classification may not be determined solely on the basis of a candidate’s Graduation GPA and the Board of Examiners for the degree may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Graduation GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.

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7 UG 9 is not applicable to the BChinMed, BDS and MBBS curricula.
8 For students in the 2017-18 intake and thereafter who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core course with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.
REGULATIONS FOR FIRST DEGREE CURRICULA

Regulations for First Degree Curricula (for students admitted under the 4-year ‘2012 curriculum’ to the first year in the academic year 2017-18, students admitted directed to the second year in the academic year 2018-19 and students admitted directly to the third year in the academic year 2019-20)

(See also General Regulations)

UG 1 Definitions:

For the purpose of regulations and syllabuses for all first degree curricula unless otherwise defined —

An ‘academic year’ comprises two semesters, the first semester to commence in September and end in December, and the second semester to commence in January and end in May/June, on dates as prescribed by the Senate. It includes, normally at the end of each semester, a period during which candidates are assessed. For some curricula, a ‘summer semester’ may be organized in addition to the normal two semesters. Clinical curricula have extended semesters.

A ‘summer semester’ normally comprises seven to eight weeks of intensive timetabled teaching and assessment to commence four weeks after the end of the second semester assessment period, and to conclude about one week before the start of the next academic year.

The ‘maximum period of registration’ is equivalent to a period which is 150% of the curriculum’s normative period of study as specified in the degree regulations, provided that where this results in a residual fraction of an academic year, the fractional period shall be extended to one full academic year.

‘Degree curriculum’ means the entire study requirements for the award of an undergraduate degree.

‘Major programme’ means the study requirements, including a capstone experience, for a single major area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 72 credits nor more than 96 credits, as prescribed in the syllabuses for a degree curriculum.

‘Minor programme’ means the study requirements for a single minor area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 36 credits nor more than 48 credits, as prescribed in the syllabuses for a degree curriculum.

‘Professional core’ refers to the study requirements, including a capstone experience, prescribed in the regulations and syllabuses for disciplinary studies in degree curricula which are not structured as major/minor programmes for reasons relating to professional qualification and/or accreditation.

‘Course’ means a course of study, with a credit value expressed as a number of credit-units as specified in the syllabuses for a degree curriculum.

‘Disciplinary elective course’ or ‘Disciplinary Elective’ means any course offered in the same major or minor programme or the professional core which can be taken by candidates to fulfill the curriculum requirements as specified in the syllabuses of the degree curriculum.

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1 These regulations are applicable to candidates admitted from 2017-18 onwards. Reference in these regulations to the powers of the Boards of Faculties shall be applicable to Senate Boards of Studies which administer first degree curricula.
‘Elective course’ or ‘Elective’ means any course offered within the same or another curriculum, other than compulsory courses in the candidate’s degree curriculum, that can be taken by the candidate in order to complete the credit requirements of the degree curriculum.

‘Capstone experience’ refers to one or more courses within the major programme or professional core which are approved by the Board of the Faculty for the purpose of integrating knowledge and skills acquired, and which are prescribed in the syllabuses of the degree curriculum.

‘Syllabus’ means courses taught by departments, centres, and schools, offered under a degree curriculum.

‘Prerequisite’ means a course or a group of courses which candidates must have completed successfully or a requirement which candidates must have fulfilled before being permitted to take the course in question.

‘Corequisite’ means a course which candidates must take in conjunction with the course in question.

‘Credits’ or ‘credit-units’ means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses.

‘Grade Points’ are standardized measurements of candidates’ academic achievement in courses taken to satisfy the requirements of the degree curriculum and are expressed as a scale prescribed in these regulations.

‘Grade Point Average’ is a numerical measure of a candidate’s academic achievement over a specified period of time. Each course attempted (including each failed course) is assigned a numerical value, with all courses carrying equal weighting. This numerical value is the product of grade points earned for the course and the credit value of that course. The ‘Grade Point Average’ is the sum of these numerical values divided by the total number of credits attempted:

\[
GPA = \frac{\sum_i \text{Course Grade Point} \times \text{Course Credit Value}}{\sum_i \text{Course Credit Value}}
\]

(where ‘i’ stands for all passed and failed courses taken by the student over a specified period)

‘Semester Grade Point Average’ or ‘Semester GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given semester.

‘Year Grade Point Average’ or ‘Year GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given academic year.

‘Cumulative Grade Point Average’ or ‘Cumulative GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) at the time of calculation.

‘Graduation Grade Point Average’ or ‘Graduation GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) at the point of graduation. For students in the 2017-18 intake and thereafter who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core courses with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.

‘Assessment’ refers to judgment about the quality and extent to which a student has achieved the stated learning objectives or learning outcomes. It includes all types of
assessment activities which allow for such a judgment to be made. For the purpose of interpreting the relevant provisions of the Ordinance and the Statutes and where appropriate, reference to ‘examination’ or ‘examinations’ in the Ordinance and the Statutes shall include and cover all forms of ‘assessment’ and its related processes.

A ‘transcript’ refers to a transcript of the record of study of a candidate, issued by the Registry of the University.

UG 2 Advanced standing:

Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum. Candidates who are awarded Advanced Standing will not be granted any further credit transfer for those studies for which Advanced Standing has been granted. The amount of credits to be granted for advanced standing shall be determined by the Board of the Faculty, in accordance with the following principles:

(a) at least half the number of credits of the degree curriculum normally required for award of the degree shall be accumulated through study at this University or from transfer of credits for courses completed at other institutions in accordance with Regulation UG 4(d); and

(b) in accordance with Statute III.5 and notwithstanding the granting of advanced and/or transfer credits, a minimum of two semesters of study at this University shall be required before a candidate is considered for the award of a first degree, other than a degree in medicine or surgery, and a minimum of four semesters of study at this University shall be required before a candidate is considered for a first degree in medicine or surgery.

Credits granted for advanced standing shall not normally be included in the calculation of the GPA unless permitted by the Board of the Faculty but will be recorded on the transcript of the candidate.

UG 3 Period of study:

The period of study of the curriculum shall be specified in the regulations governing the degree. To be eligible for award of the degree, a candidate shall fulfill all curriculum requirements within the maximum period of registration, unless otherwise permitted or required by the Board of the Faculty.

UG 4 Progression in curriculum:

(a) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements is fewer than 24 credits.

(b) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load for the normative period of study specified in the curriculum regulations, save as provided for under UG4(c).

(c) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load for the maximum period of registration specified in the curriculum regulations.
(d) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The number of transferred credits may be recorded in the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total credits normally required under the degree curricula of the candidates during their candidature at the University.

(e) Unless otherwise permitted by the Board of the Faculty, candidates shall be recommended for discontinuation of their studies if they have:

(i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or

(ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or

(iii) exceeded the maximum period of registration specified in the regulations of the degree.

UG 5 Requirements for graduation:

To be eligible for admission to the degree, candidates shall fulfill the following requirements in addition to the requirements prescribed in the regulations and syllabuses governing the degree curriculum within the maximum period of registration:

(a) successful completion of 12 credits in English language enhancement, including 6 credits in Core University English\(^2\) and 6 credits in an English in the Discipline course\(^3\);

(b) successful completion of 6 credits in Chinese language enhancement\(^4\);

(c) successful completion of 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry\(^5\) with not more than 24 credits of course being selected within one academic year except where candidates are required to make up for failed credits; and

(d) successful completion of a capstone experience as specified in the syllabuses of the degree curriculum.

UG 6 Exemption:

Candidates may be exempted, with or without special conditions attached, from any of the

---

\(^2\) Candidates who have achieved Level 5** in English Language in the Hong Kong Diploma of Secondary Education Examination, or equivalent, may at the discretion of the Faculty be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

\(^3\) (a) To satisfy the English in the Discipline (ED) requirement, candidates who have passed the ED course for a Major but subsequently change that Major are required to pass the ED course for the new Major, or either of the double Majors finally declared upon graduation irrespective of whether the second Major is offered within or outside of the candidates’ home Faculty.

(b) Candidates declaring double Majors can, if they fail in the ED course for one of the Majors, either (i) re-take and successfully complete that failed ED course, or (ii) successfully complete the ED course for the other Major, irrespective of whether the Major is offered within or outside of the candidates’ home Faculty.

(c) Candidates who undertake studies in double Majors or double degrees are not required to take a second ED course but may be advised by the Faculty to do so.

\(^4\) Candidates who have not studied Chinese language during their secondary education may be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

\(^5\) Candidates registered for dual degree studies are required to successfully complete 24 credits of courses in the Common Core Curriculum, selecting one course from each Area of Inquiry, within the curriculum of the first degree, as appropriate.
requirements in UG 5 by the Senate in exceptional circumstances. Candidates who are so exempted must replace the number of exempted credits with courses of the same credit value.

**UG 7 Assessment:**

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates suspended under Statute XXXI shall not be allowed to take, present themselves for, and participate in any assessments during the period of suspension, unless otherwise permitted by the Senate.

(d) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(e) Candidates are required to make up for failed courses in the following manner as prescribed in the curriculum regulations:

(i) undergoing re-assessment/re-examination in the failed course to be held no later than the end of the following semester (not including the summer semester); or

(ii) re-submitting failed coursework, without having to repeat the same course of instruction; or

(iii) repeating the failed course by undergoing instruction and satisfying the assessments; or

(iv) for elective courses, taking another course in lieu and satisfying the assessment requirements.

(f) There shall be no appeal against the results of examinations and all other forms of assessment.

**UG 8 Grading system:**

(a) The grades, their standards and the grade points for assessment shall be as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Standard</th>
<th>Grade Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>Excellent</td>
<td>4.3</td>
</tr>
<tr>
<td>A</td>
<td></td>
<td>4.0</td>
</tr>
<tr>
<td>A-</td>
<td></td>
<td>3.7</td>
</tr>
<tr>
<td>B+</td>
<td>Good</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>3.0</td>
</tr>
<tr>
<td>B-</td>
<td></td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>Satisfactory</td>
<td>2.3</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>2.0</td>
</tr>
<tr>
<td>C-</td>
<td></td>
<td>1.7</td>
</tr>
<tr>
<td>D+</td>
<td>Pass</td>
<td>1.3</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>F</td>
<td>Fail</td>
<td>0</td>
</tr>
</tbody>
</table>

UG 8 is not applicable to the respective Professional Core of the BDS and MBBS curricula.
(b) Special permission may be given by Senate for courses in individual curricula to be graded as ‘Pass’, ‘Fail’ or ‘Distinction’. Such courses will not be included in the calculation of the GPA.

UG 9  Honours classifications:

(a) Honours classifications shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the degree in accordance with the following Graduate GPA scores, with all courses taken (including failed courses) carrying equal weighting which are proportionate to their credit values:

<table>
<thead>
<tr>
<th>Class of honours</th>
<th>GGPA range</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class Honours</td>
<td>3.60 – 4.30</td>
</tr>
<tr>
<td>Second Class Honours</td>
<td>(2.40 – 3.59)</td>
</tr>
<tr>
<td>Division One</td>
<td>3.00 – 3.59</td>
</tr>
<tr>
<td>Division Two</td>
<td>2.40 – 2.99</td>
</tr>
<tr>
<td>Third Class Honours</td>
<td>1.70 – 2.39</td>
</tr>
<tr>
<td>Pass</td>
<td>1.00 – 1.69</td>
</tr>
</tbody>
</table>

(b) Honours classification may not be determined solely on the basis of a candidate’s Graduation GPA and the Board of Examiners for the degree may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Graduation GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.

7 UG 9 is not applicable to the BChinMed, BDS and MBBS curricula.

8 For students in the 2017-18 intake and thereafter who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core course with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.
REGULATIONS FOR FIRST DEGREE CURRICULA

Regulations for First Degree Curricula (for students admitted under the 4-year ‘2012 curriculum’ to the first year in the academic years in 2014-15, 2015-16 and 2016-17, students admitted directed to the second year in the academic year 2017-18, and students admitted directed to the third year in the academic years 2016-17, 2017-18 and 2018-19)

(See also General Regulations)

UG 1 Definitions:

For the purpose of regulations and syllabuses for all first degree curricula unless otherwise defined —

An ‘academic year’ comprises two semesters, the first semester to commence in September and end in December, and the second semester to commence in January and end in May/June, on dates as prescribed by the Senate. It includes, normally at the end of each semester, a period during which candidates are assessed. For some curricula, a ‘summer semester’ may be organized in addition to the normal two semesters. Clinical curricula have extended semesters.

A ‘summer semester’ normally comprises seven to eight weeks of intensive timetabled teaching and assessment to commence four weeks after the end of the second semester assessment period, and to conclude about one week before the start of the next academic year.

The ‘maximum period of registration’ is equivalent to a period which is 150% of the curriculum’s normative period of study as specified in the degree regulations, provided that where this results in a residual fraction of an academic year, the fractional period shall be extended to one full academic year.

‘Degree curriculum’ means the entire study requirements for the award of an undergraduate degree.

‘Major programme’ means the study requirements, including a capstone experience, for a single major area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 72 credits nor more than 96 credits, as prescribed in the syllabuses for a degree curriculum.

‘Minor programme’ means the study requirements for a single minor area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 36 credits nor more than 48 credits, as prescribed in the syllabuses for a degree curriculum.

‘Professional core’ refers to the study requirements, including a capstone experience, prescribed in the regulations and syllabuses for disciplinary studies in degree curricula which are not structured as major/minor programmes for reasons relating to professional qualification and/or accreditation.

1 These regulations are applicable to candidates admitted from 2016-17 onwards to the first year of first degree curricula under the 4-year ‘2012 curriculum’, the 2-year curriculum in respect of the BSc(IM), the 5-year curriculum in respect of the BA&BED(LangEd), BEd&BSc, BEd&BSoSc, BSc(Sp&HearSc), and BNurs, and the 6-year curriculum in respect of the BCHinMed, BDS and MBBS. Reference in these regulations to the powers of the Boards of Faculties shall be applicable to Senate Boards of Studies which administer first degree curricula.

(The Regulations for First Degree Curricula applicable to cohorts admitted in 2012-13 and 2013-14 under the 4-year ‘2012 curriculum’ can be found in the Calendar for 2013-14, and in the Calendar for 2014-15 for the cohorts admitted in 2014-15 and 2015-16.)
‘Course’ means a course of study, with a credit value expressed as a number of credit-units as specified in the syllabuses for a degree curriculum.

‘Disciplinary elective course’ or ‘Disciplinary Elective’ means any course offered in the same major or minor programme or the professional core which can be taken by candidates to fulfill the curriculum requirements as specified in the syllabuses of the degree curriculum.

‘Elective course’ or ‘Elective’ means any course offered within the same or another curriculum, other than compulsory courses in the candidate’s degree curriculum, that can be taken by the candidate in order to complete the credit requirements of the degree curriculum.

‘Capstone experience’ refers to one or more courses within the major programme or professional core which are approved by the Board of the Faculty for the purpose of integrating knowledge and skills acquired, and which are prescribed in the syllabuses of the degree curriculum.

‘Syllabus’ means courses taught by departments, centres, and schools, offered under a degree curriculum.

‘Prerequisite’ means a course or a group of courses which candidates must have completed successfully or a requirement which candidates must have fulfilled before being permitted to take the course in question.

‘Corequisite’ means a course which candidates must take in conjunction with the course in question.

‘Credits’ or ‘credit-units’ means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses.

‘Grade Points’ are standardized measurements of candidates’ academic achievement in courses taken to satisfy the requirements of the degree curriculum and are expressed as a scale prescribed in these regulations.

‘Grade Point Average’ is a numerical measure of a candidate’s academic achievement over a specified period of time. Each course attempted (including each failed course) is assigned a numerical value, with all courses carrying equal weighting. This numerical value is the product of grade points earned for the course and the credit value of that course. The ‘Grade Point Average’ is the sum of these numerical values divided by the total number of credits attempted:

\[
GPA = \frac{\sum_i \text{Course Grade Point} \times \text{Course Credit Value}}{\sum_i \text{Course Credit Value}}
\]

(where ‘\(i\)’ stands for all passed and failed courses taken by the student over a specified period)

‘Semester Grade Point Average’ or ‘Semester GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given semester.

‘Year Grade Point Average’ or ‘Year GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given academic year.

‘Cumulative Grade Point Average’ or ‘Cumulative GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) at the time of calculation.

‘Assessment’ refers to judgment about the quality and extent to which a student has achieved the stated learning objectives or learning outcomes. It includes all types of assessment activities which allow for such a judgment to be made. For the purpose of interpreting the relevant provisions of the Ordinance and the Statutes and where appropriate,
reference to ‘examination’ or 'examinations' in the Ordinance and the Statutes shall include and cover all forms of ‘assessment’ and its related processes.

A ‘transcript’ refers to a transcript of the record of study of a candidate, issued by the Registry of the University.

**UG 2  Advanced standing:**

Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum. Candidates who are awarded Advanced Standing will not be granted any further credit transfer for those studies for which Advanced Standing has been granted. The amount of credits to be granted for advanced standing shall be determined by the Board of the Faculty, in accordance with the following principles:

(a) at least half the number of credits of the degree curriculum normally required for award of the degree shall be accumulated through study at this University or from transfer of credits for courses completed at other institutions in accordance with Regulation UG 4(d); and

(b) in accordance with Statute III.5 and notwithstanding the granting of advanced and/or transfer credits, a minimum of two semesters of study at this University shall be required before a candidate is considered for the award of a first degree, other than a degree in medicine or surgery, and a minimum of four semesters of study at this University shall be required before a candidate is considered for a first degree in medicine or surgery.

Credits granted for advanced standing shall not normally be included in the calculation of the GPA unless permitted by the Board of the Faculty but will be recorded on the transcript of the candidate.

**UG 3  Period of study:**

The period of study of the curriculum shall be specified in the regulations governing the degree. To be eligible for award of the degree, a candidate shall fulfill all curriculum requirements within the maximum period of registration, unless otherwise permitted or required by the Board of the Faculty.

**UG 4  Progression in curriculum:**

(a) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements is fewer than 24 credits.

(b) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load for the normative period of study specified in the curriculum regulations, save as provided for under UG4(c).

(c) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load for the maximum period of registration specified in the curriculum regulations.

(d) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The
number of transferred credits may be recorded in the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total credits normally required under the degree curricula of the candidates during their candidature at the University.

(e) Unless otherwise permitted by the Board of the Faculty, candidates shall be recommended for discontinuation of their studies if they have:
   (i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or
   (ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or
   (iii) exceeded the maximum period of registration specified in the regulations of the degree.

UG 5  Requirements for graduation:

To be eligible for admission to the degree, candidates shall fulfill the following requirements in addition to the requirements prescribed in the regulations and syllabuses governing the degree curriculum within the maximum period of registration:
   (a) successful completion of 12 credits in English language enhancement, including 6 credits in Core University English and 6 credits in an English in the Discipline course;
   (b) successful completion of 6 credits in Chinese language enhancement;
   (c) successful completion of 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of course being selected within one academic year except where candidates are required to make up for failed credits; and
   (d) successful completion of a capstone experience as specified in the syllabuses of the degree curriculum.

UG 6  Exemption:

Candidates may be exempted, with or without special conditions attached, from any of the

2 Candidates who have achieved Level 5** in English Language in the Hong Kong Diploma of Secondary Education Examination, or equivalent, may at the discretion of the Faculty be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

3 (a) To satisfy the English in the Discipline (ED) requirement, candidates who have passed the ED course for a Major but subsequently change that Major are required to pass the ED course for the new Major, or either of the double Majors finally declared upon graduation irrespective of whether the second Major is offered within or outside of the candidates’ home Faculty.

(b) Candidates declaring double Majors can, if they fail in the ED course for one of the Majors, either (i) re-take and successfully complete that failed ED course, or (ii) successfully complete the ED course for the other Major, irrespective of whether the Major is offered within or outside of the candidates’ home Faculty.

(c) Candidates who undertake studies in double Majors or double degrees are not required to take a second ED course but may be advised by the Faculty to do so.

4 Candidates who have not studied Chinese language during their secondary education may be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

5 Candidates registered for double degree studies are required to successfully complete 24 credits of courses in the Common Core Curriculum, selecting one course from each Area of Inquiry, within the curriculum of the first degree, as appropriate.
requirements in UG 5 by the Senate in exceptional circumstances. Candidates who are so exempted must replace the number of exempted credits with courses of the same credit value.

**UG 7 Assessment:**

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates suspended under Statute XXXI shall not be allowed to take, present themselves for, and participate in any assessments during the period of suspension, unless otherwise permitted by the Senate.

(d) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(e) Candidates are required to make up for failed courses in the following manner as prescribed in the curriculum regulations:

(i) undergoing re-assessment/re-examination in the failed course to be held no later than the end of the following semester (not including the summer semester); or

(ii) re-submitting failed coursework, without having to repeat the same course of instruction; or

(iii) repeating the failed course by undergoing instruction and satisfying the assessments; or

(iv) for elective courses, taking another course in lieu and satisfying the assessment requirements.

(f) There shall be no appeal against the results of examinations and all other forms of assessment.

**UG 8 Grading system:**

(a) The grades, their standards and the grade points for assessment shall be as follows:

<table>
<thead>
<tr>
<th>Grade</th>
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</tr>
<tr>
<td>A-</td>
<td></td>
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</tr>
<tr>
<td>B+</td>
<td>Good</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>3.0</td>
</tr>
<tr>
<td>B-</td>
<td></td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>Satisfactory</td>
<td>2.3</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>2.0</td>
</tr>
<tr>
<td>C-</td>
<td></td>
<td>1.7</td>
</tr>
<tr>
<td>D+</td>
<td>Pass</td>
<td>1.3</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>F</td>
<td>Fail</td>
<td>0</td>
</tr>
</tbody>
</table>

6 UG 8 is not applicable to the respective Professional Core of the BDS and MBBS curricula.
(b) Special permission may be given by Senate for courses in individual curricula to be graded as ‘Pass’, ‘Fail’ or ‘Distinction’. Such courses will not be included in the calculation of the GPA.

UG 9 Honours classifications:

(a) Honours classifications shall be awarded in five divisions\(^7\): First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the degree in accordance with the following Cumulative GPA scores, with all courses taken (including failed courses) carrying equal weighting:

<table>
<thead>
<tr>
<th>Class of honours</th>
<th>CGPA range</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class Honours</td>
<td>3.60 – 4.30</td>
</tr>
<tr>
<td>Second Class Honours</td>
<td>(2.40 – 3.59)</td>
</tr>
<tr>
<td>Division One</td>
<td>3.00 – 3.59</td>
</tr>
<tr>
<td>Division Two</td>
<td>2.40 – 2.99</td>
</tr>
<tr>
<td>Third Class Honours</td>
<td>1.70 – 2.39</td>
</tr>
<tr>
<td>Pass</td>
<td>1.00 – 1.69</td>
</tr>
</tbody>
</table>

(b) Honours classification may not be determined solely on the basis of a candidate’s Cumulative GPA and the Board of Examiners for the degree may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Cumulative GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.

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\(^7\) UG 9 is not applicable to the BChinMed, BDS and MBBS curricula.
REGULATIONS FOR FIRST DEGREE CURRICULA

Regulations for First Degree Curricula (for students admitted under the 4-year '2012 curriculum' to the first year in the academic years 2012-13 and 2013-14, and students admitted directly to the third year in 2014-15 and 2015-16)

(See also General Regulations)

UG 1 Definitions:

For the purpose of regulations and syllabuses for all first degree curricula unless otherwise defined —

An ‘academic year’ comprises two semesters, the first semester to commence in September and end in December, and the second semester to commence in January and end in May/June, on dates as prescribed by the Senate. It includes, normally at the end of each semester, a period during which candidates are assessed. For some curricula, a ‘summer semester’ may be organized in addition to the normal two semesters. Clinical curricula have extended semesters.

A ‘summer semester’ normally comprises seven to eight weeks of intensive timetabled teaching and assessment to commence four weeks after the end of the second semester assessment period, and to conclude about one week before the start of the next academic year.

The ‘maximum period of registration’ is equivalent to a period which is 150% of the curriculum’s normative period of study as specified in the degree regulations, provided that where this results in a residual fraction of an academic year, the fractional period shall be extended to one full academic year.

‘Degree curriculum’ means the entire study requirements for the award of an undergraduate degree.

‘Major programme’ means the study requirements, including a capstone experience, for a single major area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 72 credits nor more than 96 credits, as prescribed in the syllabuses for a degree curriculum.

‘Minor programme’ means the study requirements for a single minor area of disciplinary, interdisciplinary or multidisciplinary study, accumulating not fewer than 36 credits nor more than 48 credits, as prescribed in the syllabuses for a degree curriculum.

‘Professional core’ refers to the study requirements, including a capstone experience, prescribed in the regulations and syllabuses for disciplinary studies in degree curricula which are not structured as major/minor programmes for reasons relating to professional qualification and/or accreditation.

These regulations are applicable to candidates admitted from 2016-17 onwards to the first year of first degree curricula under the 4-year ‘2012 curriculum’, the 2-year curriculum in respect of the BSc(IM), the 5-year curriculum in respect of the BA&BEd(LangEd), BEd&BSc, BEd&BScSocSc, BSc(Sp&HearSc), and BNurs, and the 6-year curriculum in respect of the BChinMed, BDS and MBBS. Reference in these regulations to the powers of the Boards of Faculties shall be applicable to Senate Boards of Studies which administer first degree curricula.

(The Regulations for First Degree Curricula applicable to cohorts admitted in 2012-13 and 2013-14 under the 4-year ‘2012 curriculum’ can be found in the Calendar for 2013-14, and in the Calendar for 2014-15 for the cohorts admitted in 2014-15 and 2015-16.)
‘Course’ means a course of study, with a credit value expressed as a number of credit-units as specified in the syllabuses for a degree curriculum.

‘Disciplinary elective course’ or ‘Disciplinary Elective’ means any course offered in the same major or minor programme or the professional core which can be taken by candidates to fulfill the curriculum requirements as specified in the syllabuses of the degree curriculum.

‘Elective course’ or ‘Elective’ means any course offered within the same or another curriculum, other than compulsory courses in the candidate’s degree curriculum, that can be taken by the candidate in order to complete the credit requirements of the degree curriculum.

‘Capstone experience’ refers to one or more courses within the major programme or professional core which are approved by the Board of the Faculty for the purpose of integrating knowledge and skills acquired, and which are prescribed in the syllabuses of the degree curriculum.

‘Syllabus’ means courses taught by departments, centres, and schools, offered under a degree curriculum.

‘Prerequisite’ means a course or a group of courses which candidates must have completed successfully or a requirement which candidates must have fulfilled before being permitted to take the course in question.

‘Corequisite’ means a course which candidates must take in conjunction with the course in question.

‘Credits’ or ‘credit-units’ means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses.

‘Grade Points’ are standardized measurements of candidates’ academic achievement in courses taken to satisfy the requirements of the degree curriculum and are expressed as a scale prescribed in these regulations.

‘Grade Point Average’ is a numerical measure of a candidate’s academic achievement over a specified period of time. Each course attempted (including each failed course) is assigned a numerical value, with all courses carrying equal weighting. This numerical value is the product of grade points earned for the course and the credit value of that course. The ‘Grade Point Average’ is the sum of these numerical values divided by the total number of credits attempted:

\[
GPA = \frac{\sum_i \text{Course Grade Point} \times \text{Course Credit Value}}{\sum_i \text{Course Credit Value}}
\]

(where ‘i’ stands for all passed and failed courses taken by the student over a specified period)

‘Semester Grade Point Average’ or ‘Semester GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given semester.

‘Year Grade Point Average’ or ‘Year GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given academic year.

‘Cumulative Grade Point Average’ or ‘Cumulative GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) at the time of calculation.

‘Assessment’ refers to judgment about the quality and extent to which a student has achieved the stated learning objectives or learning outcomes. It includes all types of assessment activities which allow for such a judgment to be made. For the purpose of interpreting the relevant provisions of the Ordinance and the Statutes and where appropriate,
reference to ‘examination’ or 'examinations' in the Ordinance and the Statutes shall include and cover all forms of ‘assessment’ and its related processes.

A ‘transcript’ refers to a transcript of the record of study of a candidate, issued by the Registry of the University.

UG 2 Advanced standing:

Advanced standing may be granted to candidates in recognition of studies completed successfully in an approved institution of higher education elsewhere. Candidates who are awarded Advanced Standing will not be granted any further credit transfer for those studies for which Advanced Standing has been granted. The amount of credits to be granted for advanced standing shall be determined by the Board of the Faculty, in accordance with the following principles:

(a) at least half the number of credits of the degree curriculum normally required for award of the degree shall be accumulated through study at this University or from transfer of credits for courses completed at other institutions in accordance with Regulation UG 4(d); and

(b) in accordance with Statute III.5 and notwithstanding the granting of advanced and/or transfer credits, a minimum of two semesters of study at this University shall be required before a candidate is considered for the award of a first degree, other than a degree in medicine or surgery, and a minimum of four semesters of study at this University shall be required before a candidate is considered for a first degree in medicine or surgery.

Credits granted for advanced standing shall not normally be included in the calculation of the GPA unless permitted by the Board of the Faculty but will be recorded on the transcript of the candidate.

UG 3 Period of study:

The period of study of the curriculum shall be specified in the regulations governing the degree. To be eligible for award of the degree, a candidate shall fulfill all curriculum requirements within the maximum period of registration, unless otherwise permitted or required by the Board of the Faculty.

UG 4 Progression in curriculum:

(a) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements is fewer than 24 credits.

(b) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load for the normative period of study specified in the curriculum regulations, save as provided for under UG4(c).

(c) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load for the maximum period of registration specified in the curriculum regulations.
(d) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The number of transferred credits may be recorded in the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total credits normally required under the degree curricula of the candidates during their candidature at the University.

(e) Unless otherwise permitted by the Board of the Faculty, candidates shall be recommended for discontinuation of their studies if they have:

(i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or
(ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or
(iii) exceeded the maximum period of registration specified in the regulations of the degree.

UG 5 Requirements for graduation:

To be eligible for admission to the degree, candidates shall fulfill the following requirements in addition to the requirements prescribed in the regulations and syllabuses governing the degree curriculum within the maximum period of registration:

(a) successful completion of 12 credits in English language enhancement, including 6 credits in Core University English2 and 6 credits in an English in the Discipline course3;
(b) successful completion of 6 credits in Chinese language enhancement4;
(c) successful completion of 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry5 with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits; and
(d) successful completion of a capstone experience as specified in the syllabuses of the degree curriculum.

2 Candidates who have achieved Level 5** in English Language in the Hong Kong Diploma of Secondary Education Examination, or equivalent, may at the discretion of the Faculty be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

3 (a) To satisfy the English in the Discipline (ED) requirement, candidates who have passed the ED course for a Major but subsequently change that Major are required to pass the ED course for the new Major, or either of the double Majors finally declared upon graduation irrespective of whether the second Major is offered within or outside of the candidates’ home Faculty.

(b) Candidates declaring double Majors can, if they fail in the ED course for one of the Majors, either (i) re-take and successfully complete that failed ED course, or (ii) successfully complete the ED course for the other Major, irrespective of whether the Major is offered within or outside of the candidates’ home Faculty.

(c) Candidates who undertake studies in double Majors or double degrees are not required to take a second ED course but may be advised by the Faculty to do so.

4 Candidates who have not studied Chinese language during their secondary education may be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

5 Candidates registered for double degree studies are required to successfully complete 24 credits of courses in the Common Core Curriculum, selecting one course from each Area of Inquiry, within the curriculum of the first degree, as appropriate.
UG 6 Exemption:

Candidates may be exempted, with or without special conditions attached, from any of the requirements in UG 5 by the Senate in exceptional circumstances. Candidates who are so exempted must replace the number of exempted credits with courses of the same credit value.

UG 7 Assessment:

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(d) Candidates are required to make up for failed courses in the following manner as prescribed in the curriculum regulations:
   (i) undergoing re-assessment/re-examination in the failed course to be held no later than the end of the following semester (not including the summer semester); or
   (ii) re-submitting failed coursework, without having to repeat the same course of instruction; or
   (iii) repeating the failed course by undergoing instruction and satisfying the assessments; or
   (iv) for elective courses, taking another course in lieu and satisfying the assessment requirements.

(e) There shall be no appeal against the results of examinations and all other forms of assessment.

UG 8 Grading system:

(a) The grades, their standards and the grade points for assessment shall be as follows:

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<tr>
<th>Grade</th>
<th>Standard</th>
<th>Grade Point</th>
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<tr>
<td>A+</td>
<td>Excellent</td>
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<td>A</td>
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<td>A-</td>
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<td>Fail</td>
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</table>

6 UG 8 is not applicable to the respective Professional Core of the BDS and MBBS curricula.
(b) Special permission may be given by Senate for courses in individual curricula to be graded as ‘Pass’, ‘Fail’ or ‘Distinction’. Such courses will not be included in the calculation of the GPA.

UG 9  Honours classifications:

(a) Honours classifications shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the degree in accordance with the following Cumulative GPA scores, with all courses taken (including failed courses) carrying equal weighting:

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<tr>
<th>Class of honours</th>
<th>CGPA range</th>
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<tr>
<td>First Class Honours</td>
<td>3.60 – 4.30</td>
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<td>Second Class Honours</td>
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<td>Division One</td>
<td>3.00 – 3.59</td>
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<td>Division Two</td>
<td>2.40 – 2.99</td>
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<td>Third Class Honours</td>
<td>1.70 – 2.39</td>
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<td>Pass</td>
<td>1.00 – 1.69</td>
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</tbody>
</table>

(b) Honours classification may not be determined solely on the basis of a candidate’s Cumulative GPA and the Board of Examiners for the degree may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Cumulative GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.

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7 UG 9 is not applicable to the BChinMed, BDS and MBBS curricula.
### SECTION XI  Teaching Weeks

**Teaching Weeks 2019-20 for Undergraduate and Taught Postgraduate Students**

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### Notes:

- **First Semester:** 11 Mondays and Tuesdays, 12 Wednesdays, Thursdays and Fridays, 11 Saturdays
- **Second Semester:** 11 Mondays, 13 Tuesdays and Wednesdays, 12 Thursdays, 10.5 Fridays, 11 Saturdays

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#### Second Semester: 11 Mondays, 13 Tuesdays and Wednesdays, 12 Thursdays, 10.5 Fridays, 11 Saturdays

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### POSSIBLE SUMMER SEMESTER

- **JUN 29 - AUG 22, 2020**

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### Notes:

- **First Day of Teaching:** Sep 2, 2019
- **Reading/Field Trip Week:** Oct 14 - 19, 2019
- **Last Day of Teaching:** Nov 30, 2019
- **Revision Period:** Dec 2 - 6, 2019
- **Assessment Period:** Dec 7 - 23, 2019
- **Last Day of Teaching:** May 2, 2020
- **Revision Period:** May 4 - 9, 2020
- **Assessment Period:** May 15 - 30, 2020
- **Break Dates:**
  - Jan 25 - 31, 2020
  - Mar 9 - 14, 2020
  - May 25 - 31, 2020

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**General Holiday**

**Reading/Field Trip Week**

**University Holiday (Full Day)**

**Revision Period**

**University Holiday (afternoon only)**

**Class Suspension Period for the Lunar New Year**

**Assessment Period**

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**Teaching Weeks 2019-20 for Undergraduate and Taught Postgraduate Students**

- First Semester: 11 Mondays and Tuesdays, 12 Wednesdays, Thursdays and Fridays, 11 Saturdays
- Second Semester: 11 Mondays, 13 Tuesdays and Wednesdays, 12 Thursdays, 10.5 Fridays, 11 Saturdays

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**General Holiday**

**Reading/Field Trip Week**

**University Holiday (Full Day)**

**Revision Period**

**University Holiday (afternoon only)**

**Class Suspension Period for the Lunar New Year**

**Assessment Period**

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**Notes:**

- First Semester: 11 Mondays and Tuesdays, 12 Wednesdays, Thursdays and Fridays, 11 Saturdays
- Second Semester: 11 Mondays, 13 Tuesdays and Wednesdays, 12 Thursdays, 10.5 Fridays, 11 Saturdays
Useful contacts and websites
# Useful contacts and websites

### Faculty of Science
- **Office Location**: Ground Floor, Chong Yuet Ming Physics Building
- **Tel**: 3917 2683
- **Fax**: 2858 4620
- **Email**: science@hku.hk
- **Website**: [https://www.scifac.hku.hk/](https://www.scifac.hku.hk/)

*(Please visit [https://www.scifac.hku.hk/](https://www.scifac.hku.hk/) for the latest updates of BSc courses, timetables, notices and forms)*

### Departments/Schools

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<tr>
<th>Department/School</th>
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<tr>
<td>Biological Sciences</td>
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<td>Biomedical Sciences</td>
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### Academic Advising Office
- **Tel**: 3917 0128
- **Website**: [http://aao.hku.hk](http://aao.hku.hk)

### Academic Services Office
- **Office Location**: G04, Run Run Shaw Building
- **Tel**: 2859 2433
- **Fax**: 2540 1405
- **Email**: asoffice@hku.hk
- **Website**: [http://www.ase.hku.hk](http://www.ase.hku.hk)

### Common Core courses
- **Website**: [https://commoncore.hku.hk/](https://commoncore.hku.hk/)

### HKU Worldwide Undergraduate Exchange Programme
- **Website**: [https://aal.hku.hk/studyabroad/](https://aal.hku.hk/studyabroad/)

### Centre of Development and Resources for Students (CEDARS)
- **Tel**: 3917 2305
- **Website**: [https://www.cedars.hku.hk/](https://www.cedars.hku.hk/)

### University Health Service
- **Tel**: 3917 2501 (General enquiries) 2549 4686 (Medical appointments only)
- **Website**: [http://www.uhs.hku.hk](http://www.uhs.hku.hk)

### Plagiarism
- **Website**: [https://tl.hku.hk/plagiarism/](https://tl.hku.hk/plagiarism/)