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
## CONTENTS

<table>
<thead>
<tr>
<th>SECTION I</th>
<th>BSc Degree Curriculum and Graduation Requirements</th>
<th>1 - 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECTION II</td>
<td>Capstone Requirement for Science Students</td>
<td>6</td>
</tr>
<tr>
<td>SECTION III</td>
<td>Credit Unit Statement of BSc Degree Curriculum</td>
<td>7 - 8</td>
</tr>
<tr>
<td>SECTION IV</td>
<td>List of BSc Courses and English and Chinese language courses on offer in 2022-2023 and 2023-2024</td>
<td>9 - 75</td>
</tr>
<tr>
<td>SECTION V</td>
<td>Equivalency of HKDSE and other qualifications</td>
<td>76</td>
</tr>
</tbody>
</table>

### SECTION VI  Science Majors 2022-2023 77 - 349

- List of Science Majors
- Major in Astronomy
- Major in Biochemistry
- Major in Biological Sciences
- Major in Biological Sciences (Intensive)
- Major in Chemistry
- Major in Chemistry (Intensive)
- Major in Decision Analytics
- Major in Earth System Science
- Major in Ecology & Biodiversity
- Major in Ecology & Biodiversity (Intensive)
- Major in Environmental Science
- Major in Food & Nutritional Science
- Major in Geology
- Major in Geology (Intensive)
- Major in Mathematics
- Major in Mathematics (Intensive)
- Major in Mathematics / Physics
- Major in Molecular Biology & Biotechnology
- Major in Molecular Biology & Biotechnology (Intensive)
- Major in Physics
- Major in Physics (Intensive)
- Major in Risk Management
- Major in Statistics

### SECTION VII  Science Minors 2022-2023 350 - 487

- List of Science Minors
- Minor in Actuarial Studies
- Minor in Astronomy
- Minor in Biochemistry
- Minor in Chemistry
- Minor in Computational & Financial Mathematics
- Minor in Earth Sciences
- Minor in Ecology & Biodiversity
- Minor in Environmental Science
Minor in Food & Nutritional Science

Minor in Marine Biology

Minor in Mathematics

Minor in Molecular Biology & Biotechnology

Minor in Operations Research & Mathematical Programming

Minor in Physics

Minor in Plant Science

Minor in Risk Management

Minor in Science Entrepreneurship

Minor in Statistics

SECTION VIII Students taking double Majors, Major-Minor or double Minors with overlapping course requirements

Double Counting of Courses in Double Majors, Major-Minor or Double Minors

SECTION IX Course Descriptions

Biomedical Sciences

Biological Sciences

English

Chemistry

Chinese

Earth Sciences

Mathematics

Physics

Science Faculty

Statistics & Actuarial Science

SECTION X Degree Regulations

Regulations for the Degree of Bachelor of Science

Regulations for First Degree Curricula

SECTION XI Teaching Weeks
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 2017-18 and thereafter are required to complete at least one Science major out of the 14 regular or 7 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

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) UGS:
- 2 English courses and 1 Chinese course for university language requirements (18 credits)
- 6 common core courses in 4 Areas of Inquiry (36 credits)
- any other non-credit bearing courses as required (0 credit)

(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)

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 regular Science major</td>
<td>Students taking one regular Science major and one minor</td>
<td>Students taking double majors (one regular Science major and a 2nd major (a regular Science major or a non-Science major))</td>
<td>Students taking an intensive Science major</td>
<td>Students taking an intensive Science major and a minor</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: 36 credits *
- 6 courses in 4 Areas of Inquiry (at least 1 and not more than 2 courses from each AoI)

Language Courses: 18 credits
- English: 12 credits [6 credits in Core University English (CAES1000, taken in Year 1) and 6 credits in English in the Discipline (CAES9820, taken in Year 2)]
- Chinese: 6 credits (CSCI9001, taken in Year 3)

Electives: 90 credits
- To make up the 240 total credits

Minor*: 36 - 48 credits
- Electives: 42 - 54 credits
- To make up the 240 total credits

2nd Major **:
- 72 - 96 credits
- Electives: 36 - 42 credits
- To make up the 240 total credits

Minor*: 36 - 48 credits
- Electives: 0 - 6 credits
- To make up the 240 total credits

Notes:
+ Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111:
- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
- Mathematics qualification in Gao Kao will be considered on a case-by-case basis

It is optional for them to take the course SCNC1111. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112:

- Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

It is optional for them to take the course SCNC1112. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

# 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 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)
- 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, Yediniy gosudarstvennyi 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 (AoIs): (1) Scientific and Technological and Big Data; (2) Arts and 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 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;

(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 (i.e. CAES1000) and 6 credits in an English in the Discipline course (i.e. CAES9820 Academic English for Science Students);

(b) 6 credits in Chinese language enhancement (i.e. CSC9001 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 with not more than 24 credits of...
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, and students admitted directly to the third year in 2020-21 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

(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 (i.e. CAES1000) and 6 credits in an English in the Discipline course (i.e. CAES9820 Academic English for Science Students OR CAES9821 Professional and Technical Communication for Mathematical Sciences);

(b) 6 credits in Chinese language enhancement (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 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;

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

(e) any other non-credit bearing courses as required.

(b) Honours Classification

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>
</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 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.

# Students with fewer than half total credits letter-graded will be awarded a pass degree with no honours classification.

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 Language 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 (Yediniy gosudarstvenniy 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.

Please note that:
- JUPAS students with HKDSE English Language Level 3 or Level 4 are NOT allowed to use any of the above equivalent standards to get exempted from CAES1000.
- Non-JUPAS students* are NOT allowed to use HKDSE results to get exempted from CAES1000.
- Test results (i.e., the above list* and HKDSE) should be in the same year in which students are admitted to the University. Test results obtained after the admission to the University will NOT be considered.

* Non-JUPAS students are allowed to use IELTS/TOEFL which is achieved within 2 years before admission to fulfil the English language requirement for admission.

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.

To satisfy the Chinese language enhancement requirement, students should take the 6-credit course CSC9001 (Practical Chinese for science students), 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.

4 For the special Common Core Proviso in the Determination of the Graduation GPA, students may refer to the Common Core website (https://commoncore.hku.hk/special-proviso/) for details.
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>2a. 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>2b. Biological Sciences (Intensive)</td>
<td>1. BIOL4994 Biological sciences project (12)</td>
</tr>
<tr>
<td>3a. Chemistry</td>
<td>1. CHEM3999 Directed studies in chemistry (6)</td>
</tr>
<tr>
<td></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>3b. Chemistry (Intensive)</td>
<td>1. CHEM3999 Directed studies in chemistry (6)</td>
</tr>
<tr>
<td></td>
<td>2. CHEM4966 Chemistry internship (6)</td>
</tr>
<tr>
<td></td>
<td>3. 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. BIOL3991 Directed studies in ecology &amp; biodiversity (6)</td>
</tr>
<tr>
<td>8b. Ecology &amp; Biodiversity (Intensive)</td>
<td>2. BIOL4991 Ecology &amp; biodiversity project (12)</td>
</tr>
<tr>
<td>9. Environmental Science</td>
<td>1. ENVS3990 Directed studies in environmental science (6)</td>
</tr>
<tr>
<td></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></td>
</tr>
<tr>
<td>12. Mathematics</td>
<td>1. MATH3999 Directed studies in mathematics (6)</td>
</tr>
<tr>
<td>Mathematics (Intensive)</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>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>
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<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
(100%) normally include the following outputs (totaling no more than 8,000 words): field assignments and reports (normally no more than 10 field assignments). Details of the assessment tasks can be found in the description of individual courses.

(f) Internship (6 credits)
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. 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 17 Science Minors are as follows:

<table>
<thead>
<tr>
<th>Majors/Minors</th>
<th>Type of Courses</th>
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<tbody>
<tr>
<td></td>
<td>Lecture-based</td>
</tr>
<tr>
<td>Actuarial Studies (Minor)</td>
<td>✓</td>
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<tr>
<td>Astronomy (Minor)</td>
<td>✓</td>
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<tr>
<td>Biochemistry (Major &amp; Minor)</td>
<td>✓</td>
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<tr>
<td>Biological Sciences (Intensive Major &amp; Major)</td>
<td>✓</td>
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<tr>
<td>Chemistry (Intensive Major, Major &amp; Minor)</td>
<td>✓</td>
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<tr>
<td>Computational &amp; Financial Mathematics (Minor)</td>
<td>✓</td>
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<tr>
<td>Decision Analytics (Major)</td>
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<td>Earth Sciences (Minor)</td>
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<td>Earth System Science (Major)</td>
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<tr>
<td>Ecology &amp; Biodiversity (Intensive Major, Major &amp; Minor)</td>
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<tr>
<td>Environmental Science (Major &amp; Minor)</td>
<td>✓</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>Risk Management (Major &amp; Minor)</td>
<td>✓</td>
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<tr>
<td>Science Entrepreneurship (Minor)</td>
<td>✓</td>
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<tr>
<td>Statistics (Major &amp; Minor)</td>
<td>✓</td>
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</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 2022-2023 and 2023-2024
### List of BSc Courses on offer in 2022/2023 and 2023/2024

#### School of Biomedical Sciences

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
<th>Pre-requisite</th>
<th>Available in Semester offered in 2022 - 2023</th>
<th>Exam held in 2022 - 2023</th>
<th>Quota</th>
<th>Communication --intensive</th>
<th>Course Coordinator</th>
<th>Major / Minor (The Major/Minor that this course appears as.)</th>
</tr>
</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: Not for students who have passed in BIOC1600 or have already enrolled in this course.</td>
<td>Y Y 1 Dec</td>
<td>---</td>
<td>Y</td>
<td>Prof J Tanner, Biomedical Sciences</td>
<td>Major in Biochemistry (2022,2021,2020,2019, 2018,2017,2016,2015); Minor in Biochemistry (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
<td></td>
</tr>
<tr>
<td>BIOC3999</td>
<td>Directed studies in biochemistry</td>
<td>6</td>
<td>Pass in at least 34 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Biochemistry. Major including BIOC2600 or BIOL2220 and BIOL3401. This capstone course is for Biochemistry Major students only. The earliest that a student is allowed to</td>
<td>Y Y 1, 2, S No exam</td>
<td>36</td>
<td>N</td>
<td>Dr B H B Yuen, Biomedical Sciences</td>
<td>Major in Biochemistry (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
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</table>

^ Availability of courses in 2023-2024 is subject to change.
<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Year(s)</th>
<th>Major(s)</th>
</tr>
</thead>
<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 BIIOC3604. 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, 5 No exam 20 N</td>
<td>Dr B H B Yuen, Biomedical Sciences&lt;br&gt;Major in Biochemistry [2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015]</td>
</tr>
<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: BIIOC3401, BIOC3601, BIOC3604, BIOC4611 and BIOC4613. BIIOC4610 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 No exam 25 N</td>
<td>Dr B H B Yuen, Prof J D Huang, Biomedical Sciences&lt;br&gt;Major in Biochemistry [2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015]</td>
</tr>
</tbody>
</table>
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) or Bachelor of Medicine and Bachelor of Surgery (MBBS) course. Students having taken level 2 BBMS/BIOC/MBBS course should take the replacement course for BIOL1110 in any regular major offered by the School of Biological Sciences.

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Year(s)</th>
<th>Prerequisites</th>
<th>Course Outcomes</th>
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</thead>
<tbody>
<tr>
<td>Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Prerequisites</td>
<td>Offered</td>
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List of BSc Courses
List of BSc Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Pre-requisites</th>
<th>Lecturer</th>
<th>Credit Code</th>
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<tbody>
<tr>
<td>BIOL2409</td>
<td>Biotechnology industry and entrepreneurship</td>
<td>6</td>
<td>Pass in 1110 NOT for students who have passed in BIOL3409.</td>
<td>Dr W B L Lim, Biological Sciences</td>
<td>Major in Molecular Biology &amp; Biotechnology (Intensive) (2022,2021)</td>
</tr>
</tbody>
</table>

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Example:

**BIOL2408 Green earth-plants and mankind**
6 units
Pass in BIOL1110 and BIOL2103
- Units: 6
- Pre-requisites: Pass in BIOL1110 and BIOL2103
- Lecturer: Prof. M L Chye, Biological Sciences
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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
<th>Prerequisite</th>
<th>Exam</th>
<th>Examination Type</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Major</th>
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<tr>
<td>BIOL3110</td>
<td>Environmental toxicology</td>
<td>6</td>
<td>BIOL2103 or CHEM3141 or ENVS3042</td>
<td>N</td>
<td>N</td>
<td>60</td>
<td>N</td>
<td>TBC, Biological Sciences</td>
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<tr>
<td>BIOL3201</td>
<td>Food chemistry</td>
<td>6</td>
<td>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>N</td>
<td>N</td>
<td>60</td>
<td>N</td>
<td>Dr J C Y Lee, Biological Sciences</td>
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<tr>
<td>BIOL3202</td>
<td>Nutritional biochemistry</td>
<td>6</td>
<td>BIOL2220 or MEDE2301</td>
<td>Y</td>
<td>Y</td>
<td>100</td>
<td>Y</td>
<td>Dr C B Chan, Biological Sciences</td>
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<tr>
<td>BIOL3203</td>
<td>Food microbiology</td>
<td>6</td>
<td>BIOL2220 or MEDE2301</td>
<td>Y</td>
<td>Y</td>
<td>140</td>
<td>Y</td>
<td>Dr H S El-Nazami, Biological Sciences</td>
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<tr>
<td>BIOL3204</td>
<td>Nutrition and the life cycle</td>
<td>6</td>
<td>BIOL2220 or BIOL2600 or BIOL302</td>
<td>Y</td>
<td>Y</td>
<td>50</td>
<td>Y</td>
<td>Dr J C Y Lee, Biological Sciences</td>
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<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>6</td>
<td>BIOL2103 or BIOL2220 or MEDE2301</td>
<td>Y</td>
<td>Y</td>
<td>135</td>
<td>Dec</td>
<td>Dr W Y Lui, Biological Sciences</td>
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<td>BIOL3208</td>
<td>Food safety and quality management</td>
<td>6</td>
<td>Pass in BIOL3201 or BIOL3203</td>
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<td>BIOL3218</td>
<td>Food hygiene and quality control</td>
<td>6</td>
<td>Pass in BIOL2101 or BIOL3203</td>
<td>Not for students who have passed in</td>
<td>Y</td>
<td>Y</td>
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<td>Course Code</td>
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<td>BIOL3301</td>
<td>Marine biology</td>
<td>6</td>
<td>Pass in BIOL2306 or ENV32002</td>
<td>Y Y 1</td>
<td>Dec</td>
<td>60</td>
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<td>BIOL3302</td>
<td>Systematics and phylogenetics</td>
<td>6</td>
<td>Pass in BIOL1306; and Any level 2 BIOL course</td>
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<td>Dec</td>
<td>60</td>
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<td>BIOL3303</td>
<td>Conservation biology</td>
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<td>Pass in BIOL2306</td>
<td>Y Y 2</td>
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<td>Prof T C Bonebrake, Biological Sciences</td>
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<td>BIOL3305</td>
<td>Tropical and temperate marine ecology field course</td>
<td>6</td>
<td>Pass in &quot;C&quot; or above in BIOL2306 or BIOL3301 or BIOL3303 or ENV52001</td>
<td>Y Y S</td>
<td>No exam</td>
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<td>N</td>
<td>Dr B Russell, Biological Sciences</td>
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<td>Level</td>
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<td>BIOL3313</td>
<td>Freshwater ecology</td>
<td>Pass in BIOL2102 and BIOL2306</td>
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<td>BIOL3314</td>
<td>Plant structure and evolution</td>
<td>Pass in BIOL1309; and Any level 2 BIOL course</td>
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<td>Experimental intertidal ecology</td>
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<td>Dr B Guenard, Biological Sciences</td>
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<tr>
<td>BIOL3320</td>
<td>The biology of marine mammals</td>
<td>Pass in BIOL2306</td>
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<td>, Biological Sciences</td>
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<tr>
<td>BIOL3322</td>
<td>Marine invertebrate zoology</td>
<td>Pass in BIOL2306</td>
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<td>Course Code</td>
<td>Course Title</td>
<td>Pass in</td>
<td>Fail in</td>
<td>Exam</td>
<td>Credits</td>
<td>Professor/Instructor</td>
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<td>Credits</td>
<td>Pre-requisites</td>
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<td>BIOL3405</td>
<td>Molecular microbiology</td>
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<td>Pass in BIOL2103</td>
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<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology</td>
<td>6</td>
<td>6</td>
<td>Pass in BIOL2102 or BIOL2200 or BIOL2600 or MEDE2301</td>
<td>Prof A O L Wong, Biological Sciences</td>
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<tr>
<td>BIOL3407</td>
<td>Genetics</td>
<td>6</td>
<td>6</td>
<td>Pass in BIOL1110 or BIOL1600 or BIOL2102</td>
<td>Dr G Y W Chan, Biological Sciences</td>
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<tr>
<td>BIOL3408</td>
<td>Business aspects of biotechnology</td>
<td>6</td>
<td>6</td>
<td>Pass in any level 3 BIOL or BIOL 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>Dr W B L Lim, Biological Sciences</td>
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<tr>
<td>BIOL3410</td>
<td>Insect ecology: the little things that run the world</td>
<td>6</td>
<td>6</td>
<td>Pass in BIOL1308 and BIOL2308</td>
<td>Dr B Guenard, Biological Sciences</td>
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite</th>
<th>Exam Type</th>
<th>Instructor(s)</th>
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<tr>
<td>BIOL3501</td>
<td>Evolution</td>
<td>6</td>
<td>Pass in BIOL2306</td>
<td>N</td>
<td>Dr M Sun, Biological Sciences</td>
<td>Major in Biological Sciences (2018,2017,2016)</td>
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<tr>
<td>BIOL3502</td>
<td>Conservation genetics</td>
<td>6</td>
<td>Pass in BIOL2306 or BIOL3303 or BIOL3408</td>
<td>N</td>
<td>Dr M Sun, Biological Sciences</td>
<td>Minor in Ecology &amp; Biodiversity (2016,2015)</td>
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<tr>
<td>BIOL3505</td>
<td>Oyster aquaculture and restoration</td>
<td>6</td>
<td>Pass in BIOL2103 or BIOL2306 or BIOL3301 or BIOL3303</td>
<td>N</td>
<td>Dr T Vengatesen, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2016,2015)</td>
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<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
<td>6</td>
<td>Pass in BIOL2103 or BIOL2220 or BIOL3301 or BIOL3304</td>
<td>Y</td>
<td>Prof A Yan, Biological Sciences</td>
<td>Major in Molecular Biology &amp; Biotechnology (2017,2016,2015)</td>
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<tr>
<td>BIOL3608</td>
<td>Food Commodities</td>
<td>Not for students who have passed in BIOL3210; Not for students who have passed in BIOL4207; Not for students who have passed in BIOL4208.</td>
<td>6</td>
<td>Y</td>
<td>2</td>
<td>Dr. L. Zhang, Biological Sciences</td>
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<tr>
<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>6</td>
<td>N</td>
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<td>Dr. L. Karczmarski, Biological Sciences</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 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>6</td>
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<td>1, 2</td>
<td>Dr. J. C. Y. Lee, Biological Sciences</td>
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<tr>
<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>
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<td>Dr. Y. L. Zhai, Biological Sciences</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>
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<td>Dr. J. Wu, Biological Sciences</td>
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<td>BIOL4207</td>
<td>Meats and dairy sciences</td>
<td>Pass in BIOL3201</td>
<td>N N --- ---</td>
<td>50 N</td>
<td>Prof N P Shah, Biological Sciences Major in Food &amp; Nutritional Science (2016,2015)</td>
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<tr>
<td>BIOL4208</td>
<td>Meats, dairy and grain sciences</td>
<td>Pass in BIOL3201 or (BIOL2101 and any level 3 BIOL course); and Not for students who have passed in BIOL3210; and Not for students who have passed in BIOL4207</td>
<td>N N --- ---</td>
<td>15 N</td>
<td>Prof N P Shah, Biological Sciences Major in Food &amp; Nutritional Science (2018,2017,2016,2015); Minor in Food &amp; Nutritional Science (2016,2015)</td>
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<tr>
<td>BIOL4210</td>
<td>Food product development</td>
<td>Pass in BIOL3203 or BIOL4205</td>
<td>N N --- ---</td>
<td>40 N</td>
<td>Dr M F Wang, Biological Sciences Major in Food &amp; Nutritional Science (2015); Minor in Food &amp; Nutritional Science (2016,2015)</td>
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<td>BIOL4303</td>
<td>Animal behaviour</td>
<td>6</td>
<td>Pass in BIOL2306; and Pass in one of the following courses: BIOL3301, BIOL3313, BIOL3315, BIOL3320 or BIOL3419 Not for students who have passed in BIOL3101</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 ENV3301 or ENV3304 or ENV33020</td>
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*List of BSc Courses*
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<th>Co-requisites</th>
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<td>BIOL4415</td>
<td>Healthcare biotechnology</td>
<td>6</td>
<td>Pass in BIOL3401 or BIOL3408</td>
<td>Y Y 2 May 70 N</td>
<td>Dr G.Y.W. Chan, Biological Sciences</td>
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<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology</td>
<td>6</td>
<td>Pass in BIOLC3601 or BIOL3604 or BIOL3701 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408</td>
<td>Y N 2 May 40 N</td>
<td>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 BIOLC3601 or BIOL3604 or BIOL3701 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408</td>
<td>Y Y 2 May 40 N</td>
<td>Dr J.W. Zhang, Biological Sciences</td>
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<tr>
<td>BIOL4451</td>
<td>Cetacean behaviour, ecology and conservation: field research experience</td>
<td>6</td>
<td>Pass in at least one of the following courses: BIOL3101, BIOL3301, BIOL3313 or BIOL3320</td>
<td>N N --- --- 12 N</td>
<td>Biological Sciences</td>
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<tr>
<td>BIOL4501</td>
<td>Molecular phylogenetics and evolution</td>
<td>6</td>
<td>Pass in BIOL3401 or BIOL3408</td>
<td>N N --- --- 25 N</td>
<td>TBC, Biological Sciences</td>
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<tr>
<td>BIOL4506</td>
<td>Oyster aquaculture: business and technology</td>
<td>6</td>
<td>Pass in BIOL3109 or BIOL3203 or BIOL3301 or BIOL3303 or ENV3304 or</td>
<td>N Y --- --- 20 N</td>
<td>Dr T Vergenssen, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity</td>
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<tr>
<td>Course Code</td>
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<tr>
<td>BIOL4911</td>
<td>Conservation science in practice</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Ecology and Biodiversity Major or Ecology &amp; Biodiversity (Intensive) Major only. The earliest that a student is allowed to take this course is their Year 3.</td>
<td>6</td>
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<td>Y</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 (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>
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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 (BIOL3XXX or BIOL4XXX) 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>
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<tr>
<td>BIOL4921</td>
<td>Animal behaviour and behavioural ecology: field course</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>
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<tr>
<td>BIOL4922</td>
<td>Food product development and evaluation</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) included BIOL3203 and / or BIOL4220 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>6</td>
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**List of BSc Courses**

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<th>Course Code</th>
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<th>Prerequisites</th>
<th>Credits</th>
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<th>Exam</th>
<th>T</th>
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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 or Ecology &amp; Biodiversity (Intensive) Major only. The earliest that a student is allowed to take this course is their Year 3.</td>
<td>6</td>
<td>Y</td>
<td>1, 2, S</td>
<td>No exam</td>
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<td>N</td>
<td>Dr. T. Vengatesan, Biological Sciences</td>
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Y Y 1, 2, S No exam --- N Dr. T. Vengatesan, Biological Sciences

This course is for Ecology & Biodiversity Major / Ecology & Biodiversity (Intensive) Major only.

The earliest that a student is allowed to take this course is their Year 3 study.

N N --- --- 9 N TBC, Biological Sciences

This capstone course is for Ecology & Biodiversity Major / Ecology & Biodiversity (Intensive) Major students only.

The earliest that a student is allowed to take this course is their year 3 study.

N N --- --- 15 N Dr. J. C. Y. Lee, Biological Sciences

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.

N N --- --- 8 N Dr. J. C. Y. Lee, Biological Sciences

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.

N N --- --- 15 N Dr. J. C. Y. Lee, Biological Sciences

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.

N N --- --- 20 N TBC, Biological Sciences

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.

N N --- --- 15 N Dr. J. C. Y. Lee, Biological Sciences

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.

N N --- --- 20 N TBC, Biological Sciences

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.

N N --- --- 15 N Dr. J. C. Y. Lee, Biological Sciences

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.

N N --- --- 20 N TBC, Biological Sciences

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.
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<th>Course Code</th>
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<tr>
<td>BIOL4962</td>
<td>Food &amp; nutritional science internship</td>
<td>6</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>Y Y 1, 2, S No exam --- N Dr J C Y Lee, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
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<tr>
<td>BIOL4963</td>
<td>Molecular biology &amp; biotechnology internship</td>
<td>6</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 / Molecular Biological &amp; Biotechnology (intensive) 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 No exam --- N Dr J C Y Lee, Biological Sciences</td>
<td>Major in Molecular Biology &amp; Biotechnology (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
<td></td>
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<tr>
<td>BIOL4964</td>
<td>Biological sciences internship</td>
<td>6</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 / Biological Sciences (intensive) 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 No exam --- N Dr Y W Chan, Biological Sciences</td>
<td>Major in Biological Sciences (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
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<tr>
<td>BIOL4991</td>
<td>Ecology &amp; biodiversity project</td>
<td>12</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Ecology &amp; Biodiversity Major / Ecology &amp; Biodiversity Major (Intensive); and This capstone course is for Ecology &amp; Biodiversity Major / Ecology &amp; Biodiversity Major (Intensive) students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 0 No exam --- N Dr S W Y Sin, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2022,2021,2020,2019); Major in Ecology &amp; Biodiversity (Intensive) (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
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<tr>
<td>BIOL4992</td>
<td>Food &amp; nutritional science project</td>
<td>12</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; and Cumulative GPA of 3.0 or above. 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>Y Y 0 No exam --- N Dr C B Chan, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
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<tr>
<td>BIOL4993</td>
<td>Molecular biology &amp; biotechnology project</td>
<td>12</td>
<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 Y 0 No exam --- N Dr Chaogu Zheng, Biological Sciences</td>
<td>Major in Molecular Biology &amp; Biotechnology (Intensive) (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
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<tr>
<td>BIOL4994</td>
<td>Biological sciences project</td>
<td>12</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; and Cumulative GPA of 3.0 or above. This capstone course is for Biological Sciences Major students only.</td>
<td>Y Y 0 No exam --- N Dr C Schunter, Biological Sciences</td>
<td>Major in Biological Sciences (Intensive) (2022,2021,2020,2019, 2018,2017)</td>
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The earliest that a student is allowed to take this capstone course is their year 3 study.

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### List of BSc Courses

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<th>Course Code</th>
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<th>Credits</th>
<th>Exam</th>
<th>Instructor</th>
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<tr>
<td>ENVS3401</td>
<td>Understanding tropical ecosystems in a changing world</td>
<td>Pass in ENVS2001 or ENVS2002 or BIOL2306; 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</td>
<td>6</td>
<td>Y Y</td>
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<tr>
<td>ENVS3402</td>
<td>Qualitative data, social science methods and decision-making in environmental science</td>
<td>Pass in ENVS2002</td>
<td>6</td>
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<tr>
<td>ENVS3403</td>
<td>Spatial analysis in environmental biology</td>
<td>Pass in ENVS2001 or ENVS2002 or EASC2402 or BIOL2306</td>
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<td>ENVS4110</td>
<td>Environmental remediation</td>
<td>Pass in BIOL3109 or BIOL3110 or BIOL3411 or ENVS3042</td>
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**Centre for Applied English Studies**

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<tr>
<td>CAES1000</td>
<td>Core University English</td>
<td>6</td>
<td>NIL</td>
<td>Dr A Yau, English</td>
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<tr>
<td>CAES9820</td>
<td>Academic English for science students</td>
<td>6</td>
<td>NIL</td>
<td>Mr S D Boynton, English</td>
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<tr>
<td>CAES9821</td>
<td>Professional and technical communication for mathematical sciences</td>
<td>6</td>
<td>NIL</td>
<td>Mr S D Boynton, English</td>
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**Department of Chemistry**

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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.</td>
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### List of BSc Courses

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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 or above or any equivalent Chemistry course.</td>
<td>Y Y 1, 2 Dec, May</td>
<td>450 N Dr A P L Tong, Chemistry</td>
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<tr>
<td>CHEM1043</td>
<td>General chemistry II</td>
<td>6</td>
<td>Pass in CHEM1042</td>
<td>Y Y 1, 2 Dec, May</td>
<td>280 N Dr A P L Tong, Chemistry</td>
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<td>CHEM1044</td>
<td>Mathematics in chemistry</td>
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<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 MATH1011 or SCNC1111</td>
<td>Y Y 2 May</td>
<td>80 N Dr A M Y Yuen, Chemistry</td>
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<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 CHEM2441, or have already enrolled in this course; and Not for students who have passed in CHEM2541, or have already enrolled in this course;</td>
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<td>140 N Dr I K Chu, Chemistry</td>
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<td>Pass in CHEM1042; and Pass in CHEM1043, or already enrolled in this</td>
<td>Y Y 1, 2 Dec, May</td>
<td>120 N Dr I K Chu (1st sem); Dr E C M Tse (2nd sem), Chemistry</td>
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<td>Inorganic chemistry I 6 Pass in CHEM1042; or already enrolled in this course</td>
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<td>1, 2 Dec, May 120 N Dr H Y Au Young, Chemistry</td>
<td>Major in Chemistry (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
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<td>Y Y</td>
<td>1, 2 Dec, May 200 N Prof X Y Li (1st sem); Prof P Chu (2nd sem), Chemistry</td>
<td>Major in Biochemistry (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
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<td>Fundamentals of organic chemistry 6 Pass in CHEM1042; and Not for students who have passed CHEM2441, or have already enrolled in this course.</td>
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<td>1 Dec 100 N Dr P H Toy, Chemistry</td>
<td>Major in Environmental Science (2017,2016,2015)</td>
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<td>CHEM2443</td>
<td>Fundamentals of organic chemistry for pharmacy students 6 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>
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<td>--- --- 60 N Dr P H Toy, Chemistry</td>
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<td>CHEM3141</td>
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<td>2 May 50 N Dr Y X Li, Chemistry</td>
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<td>CHEM3142</td>
<td>Chemical process industries and analysis 6 Pass in CHEM2241 or CHEM2241 or CHEM2441 or CHEM2442 or CHEM2541</td>
<td>Y N</td>
<td>1 Dec 60 N Prof G K Y Chan, Chemistry</td>
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### CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory
- Pass in CHEM2541
- Y Y 2 May 50 N Dr. J. Yang, Chemistry

### CHEM3999 Directed studies in chemistry
- Pass in at least 34 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major including a pass in CHEM3341 or CHEM3441 or CHEM242 or CHEM2541 or CHEM314 or CHEM3146. This capstone course is for Chemistry Major Chemistry Major (Intensive) students only. 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.
- Y Y 1, 2 No-exam --- N Prof. D. L. Phillips, Chemistry

### CHEM4142 Symmetry, group theory and applications
- Pass in CHEM3341
- Y Y 1 Dec 60 N Dr. E. C. M. Tse, Chemistry

### CHEM4143 Interfacial science and technology
- Pass in CHEM3143 or CHEM3541 or CHEM3542
- Y N 1 Dec 50 N Prof. G. K. Y. Chan, Chemistry

### CHEM4144 Advanced materials
- Pass in CHEM3143
- Y Y 2 May 30 N Dr. E. C. M. Tse, Chemistry

### CHEM4145 Medicinal chemistry
- Pass in CHEM3441 or CHEM3442 and Not for students who have passed in BPHM3133 or already enrolled in this course.
- Y Y 2 May 40 N Dr. Y. Li, Chemistry

### CHEM4147 Supramolecular chemistry
- Pass in CHEM3341 and CHEM3441
- Y Y 2 May 40 N Dr. H. Y. Au-Yeung, Chemistry

### CHEM4148 Frontiers in Modern Chemical Science
- Pass in CHEM3341 and CHEM3441
- Y Y 2 May 60 N Prof. X. D. Li, Chemistry
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<td>CHEM4911</td>
<td>Capstone experience for chemistry undergraduates: HKUtopia</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 by 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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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.

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.

EASC1402 Principles of geology
6 NIL Y Y 1 Dec --- N Dr M C Cheung, Earth Sciences


EASC2401 Fluid/solid interactions in earth processes
6 Pass in EASC1401 or EASC1402 Y Y 2 No exam --- N Dr K H Lermie, Earth Sciences


EASC2402 Field and laboratory methods
6 Pass in EASC1401 or EASC1402 Y Y 1 No exam 40 N Dr M Y H Li, Earth Sciences


School of Chinese
CSCI9001 Practical Chinese for science students 6 NIL Y Y 1, 2 Dec, May --- Y Dr H F Poon, Chinese

Department of Earth Sciences
EASC1020 Introduction to climate science
6 NIL Y Y 2 May --- N Prof Z H Liu, Earth Sciences


EASC1401 Blue Planet
6 NIL Y Y 1 Dec --- N Dr M H Lee, Earth Sciences


EASC1402 Principles of geology
6 NIL Y Y 1 Dec --- N Dr M C Cheung, Earth Sciences


EASC1403 Geological heritage of Hong Kong
6 NIL Y Y 2 May 35 N Dr M C Cheung, Earth Sciences

EASC1404 Early life on earth
6 NIL N N --- --- 50 N Dr S H Li, Earth Sciences


EASC1405 Peaceful use of nuclear technologies
6 NIL N N --- --- --- N Dr S H Li, Earth Sciences


EASC1406 Introduction to the earth-life system
6 Pass in EASC1401 N N --- --- --- N Prof Z H Liu, Earth Sciences


EASC1407 Dinosaurs ecosystems
6 NIL N N --- --- --- N Dr Michael Pittman, Earth Sciences

EASC2401 Fluid/solid interactions in earth processes
6 Pass in EASC1401 or EASC1402 Y Y 2 No exam --- N Dr K H Lermie, Earth Sciences

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<td>Pass in EASC1401 or EASC1402</td>
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<td>Dr. B. Zhang, Earth Sciences</td>
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<tr>
<td>EASC2410</td>
<td>Data analysis and modeling in earth sciences</td>
<td>Pass in EASC1401</td>
<td>6</td>
<td>Y</td>
<td>2 No exam</td>
<td>--- N</td>
<td>Dr. B. Z. Zhang, Earth Sciences</td>
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<tr>
<td>EASC2411</td>
<td>Introduction to the Earth-Life system</td>
<td>Pass in EASC1401 Not for students who have passed in EASC1406</td>
<td>6</td>
<td>Y</td>
<td>2 May</td>
<td>--- N</td>
<td>Dr. Y. Li, Earth Sciences</td>
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<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
<td>Pass in EASC2404 or ENVIS2001</td>
<td>6</td>
<td>Y</td>
<td>1 Dec</td>
<td>--- N</td>
<td>Prof. Z. H. Liu, Earth Sciences</td>
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<td>EASC3402</td>
<td>Petrology</td>
<td>Pass in EASC2407</td>
<td>6</td>
<td>Y</td>
<td>2 May</td>
<td>--- N</td>
<td>Prof. G. Zhao, Earth Sciences</td>
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<td>EASC3403</td>
<td>Sedimentary environments</td>
<td>Pass in EASC2402 or EASC3402</td>
<td>6</td>
<td>Y</td>
<td>2 No exam</td>
<td>--- N</td>
<td>Dr. N. R. McKenzie, Earth Sciences</td>
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<td>EASC3412</td>
<td>Earth resources</td>
<td>6</td>
<td>Pass in EASC2402 or EASC3402</td>
<td>N Y --- --- 40 N</td>
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List of BSc Courses


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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Level</th>
<th>Offered</th>
<th>Prerequisites</th>
<th>Instructor(s)</th>
<th>Major(s)</th>
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<tr>
<td>EASC4966</td>
<td>Earth sciences internship</td>
<td>6</td>
<td>Y Y Y</td>
<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. 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>Prof M C Cheung, Earth Sciences</td>
<td>Major in Geology (Intensive) (2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015); Minor in Earth Sciences (2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015)</td>
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<tr>
<td>EASC4999</td>
<td>Earth sciences project</td>
<td>12</td>
<td>Y Y Y</td>
<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 2.7 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.</td>
<td>Prof Z H Liu, Earth Sciences</td>
<td>Major in Earth System Science (2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015); Major in Geology (2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015); Minor in Earth Sciences (2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015)</td>
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<tr>
<td>ENV1401</td>
<td>Introduction to environmental science</td>
<td>6</td>
<td>NIL</td>
<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 2.7 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.</td>
<td>Dr C Not, Earth Sciences</td>
<td>Major in Environmental Science (2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015); Minor in Environmental Science (2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015)</td>
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<td>Course Code</td>
<td>Course Title</td>
<td>Credit Hours</td>
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<td>Prerequisites</td>
<td>Final Exam</td>
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<tr>
<td>ENVS3999</td>
<td>Directed studies in environmental science</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary/contributive courses 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, Y, 1, 2, No Exam, ---</td>
<td>N</td>
<td>Dr N S Khan, Earth Sciences</td>
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<tr>
<td>ENVS4955</td>
<td>Environmental science in practice</td>
<td>6</td>
<td>Pass in at least 12 credits of advanced level (level 3 or 4) disciplinary/contributive courses in Environmental Science Major.</td>
<td>N, N, ---, ---</td>
<td>8, N</td>
<td>Dr M Yasuhara, Biological Sciences</td>
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<tr>
<td>ENVS4966</td>
<td>Environmental science internship</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary/contributive courses 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, Y, 1, 2, 3</td>
<td>No Exam, ---</td>
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<tr>
<td>ENVS4999</td>
<td>Environmental science project</td>
<td>12</td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary/contributive courses in Environmental Science Major; and 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, Y, 0</td>
<td>No Exam, ---</td>
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**Department of Mathematics**

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<tr>
<th>Course Code</th>
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<th>Prerequisites</th>
<th>Final Exam</th>
<th>Instructor(s)</th>
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<tr>
<td>MATH1009</td>
<td>Basic mathematics for business and economics</td>
<td>6</td>
<td>NIL</td>
<td>The course has no pre-requisites, but students are expected to have already completed Level 2 or above in HKDSE Mathematics or equivalent. Not for students who have passed MATH1011 or MATH1323, 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, Y, 1, 2</td>
<td>Dec, May</td>
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<tr>
<td>MATH1011</td>
<td>University mathematics I</td>
<td>6</td>
<td>Not for students: (a) with Level 2 or above in M1 or M2 of HKDSE Math or equivalent; (b) have passed or already enrolled in any of following courses: MATH1009, 1321, 1821, 1861, PHYS1100, CHEM1044, level 2 or above math courses; (c) have passed MATH1853.</td>
<td>Y, Y, 1, 2</td>
<td>Dec, May</td>
<td>400</td>
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<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>8</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, Y, 1, 2</td>
<td>Dec, May</td>
<td>500</td>
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<td>Course Code</td>
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<tr>
<td>MATH1641</td>
<td>Mathematical laboratory and modeling</td>
<td>6 NIL</td>
<td>N</td>
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<tr>
<td>MATH1821</td>
<td>Mathematical methods for actuarial science I</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>Y</td>
<td>Y</td>
<td>Dec</td>
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<tr>
<td>MATH1851</td>
<td>Calculus and ordinary differential equations</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>Y</td>
<td>Y</td>
<td>1, 2 Dec, May</td>
<td>700</td>
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<tr>
<td>MATH1853</td>
<td>Linear algebra, probability and statistics</td>
<td>Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or Pass in MATH1011, or take MATH1011 and MATH1853 concurrently in the same semester. (This course is exclusively for Engineering students.)</td>
<td>Y</td>
<td>Y</td>
<td>1, 2 Dec, May</td>
<td>700</td>
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<tr>
<td>MATH2012</td>
<td>Fundamental concepts of mathematics</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 interest in math may also apply for taking this course concurrently with its prerequisites courses (subject to the approval from Course Selection Advisors).</td>
<td>Y</td>
<td>Y</td>
<td>1, 2 Dec, May</td>
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<tr>
<td>MATH2014</td>
<td>Multivariable calculus and linear algebra</td>
<td>Pass in MATH1013 or (MATH1851 and MATH1853). Not for students who have passed MATH2022 or (MATH201 or MATH202) and MATH2211), or have already enrolled in these courses.</td>
<td>Y</td>
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<td>1, 2 Dec, May</td>
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<td>Course Code</td>
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<td>MATH2101</td>
<td>Linear algebra I</td>
<td>6</td>
<td>Pass in MATH1013 or MATH1121 or MATH11651 and MATH11653</td>
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<td>Dr C Y Hui (1st sem), Dr H Y Zhang (2nd sem), Mathematics</td>
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<tr>
<td>MATH2102</td>
<td>Linear algebra II</td>
<td>6</td>
<td>Pass in MATH2101 or (MATH1121 and MATH2102)</td>
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<tr>
<td>MATH2211</td>
<td>Multivariable calculus</td>
<td>6</td>
<td>Pass in MATH1013 or MATH1121 or MATH11651 and MATH11653</td>
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<td>Dr T W Ching, Mathematics</td>
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<tr>
<td>MATH2241</td>
<td>Introduction to mathematical analysis</td>
<td>6</td>
<td>Pass in MATH1013 or MATH11651 or MATH11653 or MATH11652</td>
<td>N</td>
<td>Prof M K P Ng, Mathematics</td>
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<tr>
<td>MATH2822</td>
<td>Mathematical methods for actuarial science II</td>
<td>6</td>
<td>Pass in MATH11621. For BSc(Actuarial) students only.</td>
<td>N</td>
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<tr>
<td>MATH3001</td>
<td>Development of mathematical ideas</td>
<td>6</td>
<td>Pass in MATH2101, MATH2102, MATH2211 and MATH2241</td>
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<tr>
<td>MATH3002</td>
<td>Mathematics seminar</td>
<td>6</td>
<td>Pass in MATH2102, MATH2101, MATH2211 and MATH2241</td>
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<tr>
<td>MATH3301</td>
<td>Algebra I</td>
<td>6</td>
<td>Pass in MATH2101 and MATH2102</td>
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<td>Offered Year</td>
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<td>MATH3904</td>
<td>Introduction to Optimization</td>
<td>6</td>
<td>Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)</td>
<td>Y Y 1 Dec --- ---</td>
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<td>MATH3905</td>
<td>Queueing theory and simulation</td>
<td>6</td>
<td>Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)</td>
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<td>2017,2016,2015</td>
<td>Dr G Han, Mathematics</td>
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<tr>
<td>MATH3906</td>
<td>Financial calculus</td>
<td>6</td>
<td>Pass in MATH2211 or MATH2014 or MATH2022. Students are strongly recommended to have passed or already enrolled in MATH3603 or STAT2601.</td>
<td>Y Y 2 May --- ---</td>
<td>2017,2016,2015</td>
<td>Dr G Li, Mathematics</td>
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<tr>
<td>MATH3911</td>
<td>Game theory and strategy</td>
<td>6</td>
<td>Pass in (MATH2101 and MATH2211) or MATH1821 and MATH2822</td>
<td>Y Y 2 May --- ---</td>
<td>2017,2016,2015</td>
<td>Prof T W Ng, Mathematics</td>
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<td>Course Code</td>
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<td>Core Requirement</td>
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<td>MATH3943</td>
<td>Network models in operations research</td>
<td>Pass in (MATH2101 and MATH2111) or MATH2014.</td>
<td>Y N 1 Dec</td>
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<tr>
<td>MATH3999</td>
<td>Directed studies in mathematics</td>
<td>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; and subject to approval by the Department.</td>
<td>Y Y 1, 2 No exam</td>
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<tr>
<td>MATH4302</td>
<td>Algebra II</td>
<td>Pass in MATH2102 and MATH3301</td>
<td>Y Y 2 May</td>
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<tr>
<td>MATH4402</td>
<td>Analysis II</td>
<td>Pass in MATH3401</td>
<td>Y Y 2 May</td>
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<td>Course Code</td>
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<td>Credit Hours</td>
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<td>Requirement(s)</td>
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<tr>
<td>MATH4501</td>
<td>Geometry</td>
<td>6</td>
<td>Pass in (MATH2101 and MATH2211); and Pass in MATH3401 or MATH3403 or MATH3405. Students are strongly recommended to have taken MATH3401 and MATH3405.</td>
<td>---</td>
<td>Dr Z Hua, Mathematics, Major in Mathematics/Physics (2017, 2016, 2015)</td>
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<tr>
<td>MATH4511</td>
<td>Introduction to differentiable manifolds</td>
<td>6</td>
<td>Pass in MATH3401 or MATH3541. It would be helpful if students have also taken or are concurrently taking MATH4402.</td>
<td>May</td>
<td>Prof J H Lu, Mathematics, Major in Mathematics (2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015)</td>
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<td>Course Code</td>
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<td>Credits</td>
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<tr>
<td>MATH4910</td>
<td>Senior mathematics seminar</td>
<td>6</td>
<td>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. Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematical/ Mathematics (Intensive), and Mathematics/Physics Majors; and subject to approval by the Department.</td>
<td>N</td>
<td>---</td>
<td>12 N Dr X Zhang, Dr T K Wong, Mathematics</td>
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<td>MATH4911</td>
<td>Mathematics capstone project</td>
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<td>This capstone course is for Mathematics / Mathematics (Intensive), and Mathematics/Physics Majors students only. This course is for third and fourth year students only. The earliest that a student is allowed to take this capstone course is their year 3 study. Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematical/ Mathematics (Intensive), and Mathematics/Physics Majors; and subject to approval by the Department.</td>
<td>N</td>
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<td>--- N Prof T W Ng, Mathematics</td>
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<td>MATH4996</td>
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<td>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. Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematical/ Mathematics (Intensive), and Mathematics/Physics Majors; and subject to approval by the Department.</td>
<td>Y</td>
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<td>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. Pass in at least 24 credits of advanced level disciplinary core/elective</td>
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<td>MATH7101</td>
<td>Intermediate complex analysis</td>
<td>6</td>
<td>Pass in a first course in Complex Analysis such as MATH3403, and approval by the course coordinator.</td>
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<td>MATH7201</td>
<td>Topics in geometry</td>
<td>6</td>
<td>Pass in (MATH4402 or MATH4501) and (MATH4511 or the approval of the course coordinator)</td>
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<td>MATH7202</td>
<td>Complex manifolds</td>
<td>6</td>
<td>Pass in MATH3403 or MATH4501 or MATH7101.</td>
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<td>MATH7217</td>
<td>Topics in financial mathematics</td>
<td>6</td>
<td>Pass in an advanced level mathematics courses (MATHXXX, MATH4XXX, or MATH7XXX) and subject to the approval of the course coordinator.</td>
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<td>MATH7219</td>
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<td>6</td>
<td>Pass in MATH401 and MATH4404, or approval of the course coordinator.</td>
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<td>MATH7224</td>
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<td>MATH7501</td>
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<td>Pass in MATH4302</td>
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<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
<td>6</td>
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<td>MATH7503</td>
<td>Topics in advanced optimization</td>
<td>6</td>
<td>Pass in MATH3901, MATH3904 and approval of the course coordinator</td>
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<td>MATH7504</td>
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<td>MATH7505</td>
<td>Real analysis</td>
<td>6</td>
<td>A good grade in Math3401 and approval by the course coordinator</td>
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**List of BSc Courses**

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<th>Department of Physics</th>
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<td>PHYS1000</td>
<td>Introduction to astronomy</td>
<td>6</td>
<td>Nil</td>
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<td>PHYS1001</td>
<td>University physics</td>
<td>6</td>
<td>NIL</td>
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<td>PHYS1050</td>
<td>Physics for engineering students</td>
<td>6</td>
<td>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>
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<td>PHYS1055</td>
<td>How things work</td>
<td>6</td>
<td>NIL</td>
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<td>PHYS1056</td>
<td>Weather, climate and climate change</td>
<td>6</td>
<td>NIL</td>
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<td>PHYS1057</td>
<td>Kitchen science</td>
<td>6</td>
<td>NIL</td>
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<td>PHYS1150</td>
<td>Problem solving in physics</td>
<td>6</td>
<td>Level 3 or above in HKDSE Physics or equivalent, or Pass in PHYS1240</td>
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<td>PHYS1240</td>
<td>Physics by inquiry</td>
<td>6</td>
<td>NIL</td>
<td>Not for students with level 3 or above in HKDSE Physics; and 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.</td>
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<td>Fundamental physics</td>
<td>6</td>
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<td>PHYS1650</td>
<td>Nature of the universe</td>
<td>6</td>
<td>NIL</td>
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<td>PHYS2055</td>
<td>Introductory relativity</td>
<td>6</td>
<td>Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENGG1300</td>
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<td>PHYS2150</td>
<td>Methods in physics I</td>
<td>6</td>
<td>Pass in MATH1013 or MATH1521 or MATH1651 or PHYS1150</td>
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<th>Year</th>
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<td>PHYS2155</td>
<td>Methods in physics II</td>
<td>6</td>
<td>Pass in MATH1011 or MATH11521 or MATH1861 or PHYS1150</td>
<td>Y Y 2</td>
<td>May</td>
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<td>Major in Physics (Intensive)</td>
<td>(2022,2021,2019, 2018,2017,2016)</td>
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<td>PHYS2160</td>
<td>Introductory computational physics</td>
<td>6</td>
<td>Pass in MATH1011 or MATH11521 or MATH1861 or PHYS1150</td>
<td>Y Y 2</td>
<td>May</td>
<td>Dr F K Chow, Physics</td>
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<td>PHYS2250</td>
<td>Introductory mechanics</td>
<td>6</td>
<td>Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENGG1300</td>
<td>Y Y 1, 2</td>
<td>Dec, May</td>
<td>Dr M K Yip, Physics</td>
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<td>Major in Mathematics/Physics</td>
<td>(2017,2016,2015)</td>
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<tr>
<td>PHYS2255</td>
<td>Introductory electricity and magnetism</td>
<td>6</td>
<td>Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENGG1310</td>
<td>Y Y 2</td>
<td>May</td>
<td>Dr J C S Pun, Physics</td>
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<td>Major in Astronomy</td>
<td>(2017,2016,2015)</td>
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<tr>
<td>PHYS2260</td>
<td>Heat and waves</td>
<td>6</td>
<td>Pass in PHYS1050 or PHYS1250</td>
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<td>Introductory heat and thermodynamics</td>
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<td>Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENGG1350</td>
<td>Y Y 1</td>
<td>Dec</td>
<td>Prof M H Xie, Physics</td>
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<td>PHYS2265</td>
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<td>Y Y 1, 2</td>
<td>Dec, May</td>
<td>Dr F K Chow, Physics</td>
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<td>PHYS3551</td>
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<td>PHYS3650</td>
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<td>6</td>
<td>Pass in PHYS2265 or PHYS2265</td>
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<td>PHYS3651</td>
<td>The physical universe</td>
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<td>Pass in PHYS1650 and (PHYS2250 or PHYS2265)</td>
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<td>Principles of astronomy</td>
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<td>PHYS4151</td>
<td>Data analysis and modeling in physics</td>
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<td>PHYS4650</td>
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<td>PHYS4651</td>
<td>Selected topics in astrophysics</td>
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<td>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.</td>
<td>Y</td>
<td>Y</td>
<td>S</td>
<td>No exam</td>
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<td>PHYS4999</td>
<td>Physics project</td>
<td>12</td>
<td>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.</td>
<td>Y</td>
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<td>No exam</td>
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<td>Year</td>
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<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetic field theory</td>
<td>6</td>
<td>Pass in PHYS3150 and PHYS4450</td>
<td>Y</td>
<td>Y</td>
<td>2</td>
<td>May</td>
<td>N</td>
<td>Prof Z D Wang, Physics</td>
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<tr>
<td>PHYS7500</td>
<td>Graduate statistical mechanics</td>
<td>6</td>
<td>Pass in (PHYS3550 and PHYS4551) or PHYS4550</td>
<td>Y</td>
<td>Y</td>
<td>1</td>
<td>Dec</td>
<td>N</td>
<td>Dr G Chen, Physics</td>
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<tr>
<td>PHYS7551</td>
<td>Graduate solid state physics</td>
<td>6</td>
<td>Pass in PHYS3551 and PHYS4351</td>
<td>N</td>
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<tr>
<td>PHYS7650</td>
<td>Stellar atmospheres</td>
<td>6</td>
<td>TBC</td>
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<td>PHYS7750</td>
<td>Nanophysics</td>
<td>6</td>
<td>Pass in PHYS3351 and PHYS4551</td>
<td>Y</td>
<td>N</td>
<td>1</td>
<td>Dec</td>
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<td>ENV53006</td>
<td>Environmental radiation</td>
<td>6</td>
<td>Pass in CHEM2041 or ENVS2001 or ENVS2002 or PHYS2285</td>
<td>N</td>
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<tr>
<td>ENVS3010</td>
<td>Sustainable energy and environment</td>
<td>Pass in CHEM2001 or ENVS2002 or PHYS2280</td>
<td>6</td>
<td>Y</td>
<td>2</td>
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<tr>
<td>ENTR2001</td>
<td>Professional and leadership development</td>
<td>Any level 1 undergraduate course</td>
<td>6</td>
<td>Y</td>
<td>1</td>
<td>No exam</td>
<td>24</td>
<td>N Dr R Law, Faculty</td>
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<tr>
<td>ENTR3001</td>
<td>Science-based innovation development</td>
<td>Pass in IMT1611 and ENTR2001, or already enrolled in these courses</td>
<td>6</td>
<td>Y</td>
<td>2</td>
<td>No exam</td>
<td>24</td>
<td>N Dr M Kotaka, Biomedical Sciences</td>
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<tr>
<td>ENTR3002</td>
<td>Customer analysis and strategic marketing</td>
<td>Pass in IMT1611 and ENTR2001, or already enrolled in these courses</td>
<td>6</td>
<td>Y</td>
<td>2</td>
<td>No exam</td>
<td>24</td>
<td>N Dr R Law, Faculty</td>
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<tr>
<td>ENTR4966</td>
<td>Entrepreneurship internship</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>
<td>6</td>
<td>Y</td>
<td>S</td>
<td>No exam</td>
<td>24</td>
<td>N Dr R Law, Faculty</td>
</tr>
<tr>
<td>ENTR4999</td>
<td>Entrepreneurship project</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>
<td>6</td>
<td>Y</td>
<td>1</td>
<td>No exam</td>
<td>24</td>
<td>N Dr R Law, Faculty</td>
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<tr>
<td>INRE6033</td>
<td>Research ethics for graduate students</td>
<td>For Year 2 or above BSc&amp;MRes (Science Master Class) students only</td>
<td>3</td>
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<td>1, 2</td>
<td>No exam</td>
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<td>N Prof T C Bonesbrake, Biological Sciences</td>
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<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>NI</td>
<td>6</td>
<td></td>
<td>1, 2</td>
<td>Dec, May</td>
<td>---</td>
<td>Y Dr R K W Lui, Faculty</td>
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**Faculty of Science**

**List of BSc Courses**

**ENTR2001** Professional and leadership development

**ENTR3001** Science-based innovation development

**ENTR3002** Customer analysis and strategic marketing

**ENTR4966** Entrepreneurship internship

**ENTR4999** Entrepreneurship project

**INRE6033** Research ethics for graduate students

**INRE7999** Research Project

**SCNC1111** Scientific method and reasoning
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
<th>Offered</th>
<th>Units</th>
<th>Day</th>
<th>Time</th>
<th>Lecturer</th>
<th>Major/Program</th>
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</thead>
</table>

(This course is compulsory for all students taking a Science major offered by the Faculty of Science, except those who are eligible for exemption. Students should take this course in their first year.)

SCNC1113 The big history of our planet: a scientific perspective on everything that has ever happened
6 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.
N Y --- --- 50 N Dr. W M Y Cheung, Faculty

SCNC2121 Sustainable food production
6 Students are expected to have passed at least 30 credits of level 1 and/or level 2 science courses. Students will also need
N Y --- --- 32 N Dr. H S El-Nezami, Biological Sciences
### SCNC2122 Marine life science: a North East Pacific perspective

- 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.

| Y | --- | --- | 32 | N | Dr T Vengatesan, Biological Sciences |

### SCNC3111 Frontiers of science honours seminar course

- Pass in a level 2 science course. The course is for Science students only. Students who participated or will participate in ORF/SRF must take this course.

| Y | Y | 1 | No exam | 120 | N | Dr R K W Lui, Faculty |

### SCNC4988 Science research internship I

- For Year 3 or Year 4 Cambridge-track students only.

| Y | Y | S | No exam | --- | N | Prof T C Bonsdorff, Biological Sciences |

### SCNC4999 Science research internship II

- For Year 4 Cambridge-track students only.

| N | Y | --- | --- | --- | N | Prof T C Bonsdorff, Biological Sciences |

### Department of Statistics & Actuarial Science

#### STAT1005 Essential skills for undergraduates: foundations of data science

- Not for students who have passed or already enrolled in any of the following courses: COMP2501, STAT1015; and Not for Year 2 or above BS(ActuarSc) and BEing(CompSc) students; and Not for Year 2 or above students majoring in Computer Science/Decision Analytics/Risk Management/Statistics; and Not for Year 4 or above students from any curriculum.


#### STAT1015 Introduction to data science

- Not for students who have passed in STAT1005, or already enrolled in this course; and This course is exclusive for BASc(AppSci) and BASc(FinTech) students.

| N | N | --- | --- | 40 | N | TBC, Statistics & Actuarial Science |

#### STAT1600 Statistics: ideas and concepts

- Not for students who have passed in any of the following courses: MATH1853, STAT1602, STAT1603, STAT3902.


#### STAT1601 Elementary statistical methods

- Level 2 or above in HKDSE Mathematics or equivalent; and Not for students with Level 2 or above in HKDSE Mathematics Extended Module 1 or 2; and Not for students who have passed or already enrolled in any of the following courses: STAT2601, STAT1602, STAT2801, STAT1603, ECON1280.


#### STAT1602 Business statistics

- Not for students who have passed or already enrolled in any of the following courses: STAT1601, STAT2601, STAT1603, STAT2801 or ECON1280 (This course is available to students pursuing a major/minor in Business only, except students from Science or Engineering Faculty).


#### STAT1603 Introductory statistics

- (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: STAT1602, STAT2601, STAT2801.

<table>
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<th>Course Code</th>
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<th>Notes</th>
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<tr>
<td>STAT2901</td>
<td>Probability and statistics: foundations of actuarial science</td>
<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>
<td>Y Y 2 May --- N</td>
<td>Prof S M S Lee, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2022,2021,2020,2019, 2018,2017,2016,2015)</td>
</tr>
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</table>
STAT2902 Financial mathematics 6 Pass in STAT2901, or already enrolled in this course; and Not for students who have passed in STAT3615, or already enrolled in this course. Y Y 2 May --- N Prof K C Yuen, Statistics & Actuarial Science BSc in Actuarial Science (2022,2021,2020,2019, 2018,2017,2016,2015)

STAT3010 Image processing and computer vision 6 Pass in (MATH2014 or MATH2101 or STAT2602) and (COMP2113 or COMP2396). Y Y 2 May 15 N Dr K Han, Statistics & Actuarial Science Bachelor of Arts and Sciences in Applied Artificial Intelligence (2022,2021,2020,2019); Minor in Statistics (2022,2021,2020,2019, 2018,2017,2016,2015)


STAT3603 Stochastic processes 6 Pass in STAT2601; and Not for students who have passed in MATH3803, or have already enrolled in this course; and Not for students who have passed in STAT3903, or have already enrolled in this course. Y Y 1 Dec --- N Dr E Wang, Statistics & Actuarial Science Bachelor of Arts and Sciences in Applied Artificial Intelligence (2022,2021,2020,2019, 2018,2017,2016,2015)


STAT3605 Quality control and management 6 Pass in BIOL2102 or (ECON1290 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2602 or (STAT1603 and any University level 2 course) or STAT3902 N N --- --- --- N TBC, Statistics & Actuarial Science Bachelor of Arts and Sciences in Applied Artificial Intelligence (2021,2020,2019, 2018,2017,2016,2015)

STAT3606 Business logistics 6 Pass in BIOL2102 or (ECON1290 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 MATH3801, or have already enrolled in this course. Y Y 1 Dec --- N Dr O T K Choi, Statistics & Actuarial Science Bachelor of Arts and Sciences in Applied Artificial Intelligence (2022,2021,2020,2019, 2018,2017,2016,2015)


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<tr>
<th>Course Code</th>
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<th>Instructor</th>
<th>Major(s)</th>
<th>Minor(s)</th>
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<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); and Not for students who have passed in FINA2320, 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>
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<td>STAT3610</td>
<td>Risk management and insurance</td>
<td>Pass in BIOL2102 or (ECON1120 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. (Not available to Actuarial Science students)</td>
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<td>STAT3611</td>
<td>Computer-aided data analysis</td>
<td>Pass in BIOL2102 or (ECON1120 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 in or have already enrolled in any of these courses: STAT2601, STAT2901, STAT3616</td>
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<tr>
<td>STAT3614</td>
<td>Business forecasting</td>
<td>Pass in BIOL2102 or (ECON1120 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, STAT3607, STAT4601, ECON288.</td>
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<tr>
<td>STAT3616</td>
<td>Advanced SAS programming</td>
<td>6</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>
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<tr>
<td>STAT3617</td>
<td>Sample survey methods</td>
<td>6</td>
<td>Pass or already enrolled in BIOL2102, (ECON1280 and any University level 2 course), or (STAT1603 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 STAT2601.</td>
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<td>Y</td>
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<td>STAT3618</td>
<td>Derivatives and risk management</td>
<td>6</td>
<td>Pass in STAT3618; and Not for students who have passed or already enrolled in any of the following courses: FINA2322, STAT3605, STAT3910; and Not for BSc(Actuarial Science) students.</td>
<td>Y</td>
<td>Y</td>
<td>2 May</td>
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<td>STAT3620</td>
<td>Modern nonparametric statistics</td>
<td>6</td>
<td>Pass in STAT2602 or STAT3902</td>
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<td>STAT3621</td>
<td>Statistical data analysis</td>
<td>6</td>
<td>Pass in STAT3600 or STAT3907; Students are strongly recommended to take STAT2603 or STAT2604 prior to taking this course.</td>
<td>Y</td>
<td>Y</td>
<td>2 May</td>
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<td>STAT3622</td>
<td>Data visualization</td>
<td>6</td>
<td>Pass in STAT2602 or STAT3902</td>
<td>Y</td>
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<td>STAT3655</td>
<td>Survival analysis</td>
<td>6</td>
<td>Pass in STAT3902, or already enrolled in this course, or Pass in STAT3600 or STAT3901; and Not for students who have passed in STAT3655, or already enrolled in this course.</td>
<td>Y</td>
<td>N</td>
<td>2 May</td>
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<td>STAT3799</td>
<td>Directed studies in statistics</td>
<td>6</td>
<td>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 STAT4799 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.</td>
<td>Y</td>
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<td>STAT3901</td>
<td>Life contingencies I</td>
<td>6</td>
<td>Pass in STAT2602 or STAT3615 or (Pass in STAT2902 or (Pass in STAT3902 or already enrolled in this course)) or (Pass in STAT2602 and STAT2902)</td>
<td>Y</td>
<td>Y 1</td>
<td>Dec</td>
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<td>STAT3902</td>
<td>Statistical models</td>
<td>6</td>
<td>Pass in STAT2901; and Not for students who have passed in STAT2602, or already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>Y</td>
<td>Y 1</td>
<td>Dec</td>
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<tr>
<td>STAT3903</td>
<td>Stochastic models</td>
<td>6</td>
<td>Pass in STAT2901; and Not for students who have passed in STAT3603, or have already enrolled in this course; and Not for students who have passed in STAT3603, or have already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>Y</td>
<td>Y 2</td>
<td>May</td>
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<tr>
<td>STAT3904</td>
<td>Corporate finance for actuarial science</td>
<td>6</td>
<td>Pass in ACCT1101 and STAT2602 or (Pass in STAT3615); and Not for students who have passed in FINA1330, or have already enrolled in this course.</td>
<td>Y</td>
<td>Y 2</td>
<td>May</td>
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<tr>
<td>STAT3905</td>
<td>Introduction to financial derivatives</td>
<td>6</td>
<td>Pass in STAT2602, and Not for students who have passed in STAT3618, or have already enrolled in this course; and Not for students who have passed in FINA1330, or have already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>Y</td>
<td>Y 2</td>
<td>May</td>
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<td>STAT3906</td>
<td>Risk theory I</td>
<td>6</td>
<td>Pass in STAT3903, or already enrolled in this course; or Pass in MATH4903 or STAT3603</td>
<td>Y</td>
<td>Y 1</td>
<td>Dec</td>
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<td>STAT3907</td>
<td>Linear models and forecasting</td>
<td>6</td>
<td>Pass in STAT2602 or STAT3902, or already enrolled in this course; and Not for students who have passed in STAT3603, or have already enrolled in this course; and Not for students who have passed in STAT4601, or have already enrolled in this course; and Not for students who have passed in ECON3280, or have already enrolled in this course; and Not for students who have passed in ECON2280, or have already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>Y</td>
<td>Y 2</td>
<td>May</td>
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<tr>
<td>STAT3908</td>
<td>Credibility theory and loss distributions</td>
<td>6</td>
<td>Pass in STAT2602 or STAT3902 or STAT3606</td>
<td>Y</td>
<td>Y 2</td>
<td>May</td>
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<tr>
<td>STAT3909</td>
<td>Life contingencies II</td>
<td>6</td>
<td>Pass in STAT3901, or already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>Y</td>
<td>Y 2</td>
<td>May</td>
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<tr>
<td>Course Code</td>
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<td>Credit Hour</td>
<td>Prerequisite(s)</td>
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<td>Instructor(s)</td>
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<tr>
<td>STAT3910</td>
<td>Financial economics I</td>
<td>6</td>
<td>Pass in STAT2602 or STAT3902; and Not for students who have passed in STAT3918, or have already enrolled in this course; and Not for students who have passed in FINA2322, or have already enrolled in this course.</td>
<td>Y Y</td>
<td>1 Dec</td>
<td>---</td>
<td>N Prof H Yang, Statistics &amp; Actuarial Science</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>N TBC, Statistics &amp; Actuarial Science</td>
</tr>
<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>
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<td>N TBC, Statistics &amp; Actuarial Science</td>
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<tr>
<td>STAT3955</td>
<td>Survival analysis</td>
<td>6</td>
<td>Pass in STAT3902, or already enrolled in this course; or Pass in STAT3800 or STAT3901; Not for students who have passed in STAT3955, or already enrolled in this course.</td>
<td>N N</td>
<td>---</td>
<td>---</td>
<td>N TBC, Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>STAT3956</td>
<td>Pension funds and pension mathematics</td>
<td>6</td>
<td>Pass in STAT3909; and For BSc(Actuarial Science) students only.</td>
<td>N Y</td>
<td>---</td>
<td>---</td>
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</tr>
<tr>
<td>STAT4011</td>
<td>Natural language processing</td>
<td>6</td>
<td>Pass in STAT2602 and (COMP2113 or COMP2119 or COMP2368); Recommended: Similarly with deep learning or machine learning; strong programming skills (e.g., Python)</td>
<td>Y Y</td>
<td>2 No exam</td>
<td>15 N</td>
<td>Dr A S M Lau, Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>STAT4022</td>
<td>Omics data analysis</td>
<td>6</td>
<td>Pass in STAT2602, and pass or already enrolled in STAT3612; Knowledge in basic molecular biology/biochemistry/bioinformatics, undergraduate level statistics knowledge and programming skills are needed.</td>
<td>N N</td>
<td>---</td>
<td>15 N</td>
<td>Dr D Y Zhang, Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>Code</td>
<td>Title</td>
<td>Prerequisites</td>
<td>Type</td>
<td>Tuition Year</td>
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<td>------------------------------------------------------------------------------------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>STAT4023</td>
<td>Medical image analysis</td>
<td>Pass in STAT2602 and (COMP2113 or COMP2119 or COMP2396) Recommended: familiarity with machine learning/deep learning; strong programming skills (we will use Python/PyTorch in this course)</td>
<td>N N --- --- 15 N</td>
<td>TBC, Statistics &amp; Actuarial Science</td>
<td>Major in Decision Analytics (2022,2021,2020,2019, 2018,2017)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT4601</td>
<td>Time-series analysis</td>
<td>Pass in STAT3600; and Not for students who have passed in STAT3814, or have already enrolled in this course; and Not for students who have passed in STAT3907, or have already enrolled in this course.</td>
<td>Y Y 1 Dec. --- N</td>
<td>Prof G Li, Statistics &amp; Actuarial Science</td>
<td>Major in Risk Management (2015); Major in Statistics (2015)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Name</td>
<td>Credits</td>
<td>Prerequisites</td>
<td>Grade Requirement</td>
<td>Exam</td>
<td>Instructor</td>
<td>Major</td>
</tr>
<tr>
<td>------------</td>
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</tr>
<tr>
<td>STAT4710</td>
<td>Capstone experience for statistics undergraduates</td>
<td>6</td>
<td>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 STAT3759, STAT4766 and STAT4793. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 1, 2</td>
<td>No exam</td>
<td>50 N</td>
<td>Prof G Yin, Statistics &amp; Actuarial Science</td>
</tr>
<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 STAT3509, or already enrolled in this course); and This capstone course is only for BSc(Actuarial Science) students, and is mutually exclusive with STAT4757 and STAT4768. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 1, 2</td>
<td>No exam</td>
<td>50 N</td>
<td>Prof G Yin, Statistics &amp; Actuarial Science</td>
</tr>
<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>Y Y 1, 2</td>
<td>No exam</td>
<td>--- N</td>
<td>Dr E A L Li, Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Prerequisites</td>
<td>Exams</td>
<td>Professor(s)</td>
<td>Program(s)</td>
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<tr>
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<td></td>
</tr>
<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, STAT4604, 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>Y</td>
<td>Y</td>
<td>1, 2</td>
<td>No exam</td>
</tr>
<tr>
<td>STAT4799</td>
<td>Statistics project</td>
<td>12</td>
<td>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. 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.</td>
<td>Y</td>
<td>Y</td>
<td>0</td>
<td>No exam</td>
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<tr>
<td>STAT4904</td>
<td>Statistical learning for risk modelling</td>
<td>6</td>
<td>Pass in STAT3907 or STAT3600; 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</td>
<td>Y</td>
<td>2</td>
<td>May</td>
</tr>
<tr>
<td>STAT7610</td>
<td>Advanced probability</td>
<td>6</td>
<td>Pass in STAT3603 or STAT3903</td>
<td>Y</td>
<td>Y</td>
<td>1</td>
<td>Dec</td>
</tr>
<tr>
<td>STAT7611</td>
<td>Computational statistics</td>
<td>6</td>
<td>Pass in STAT3600 or STAT3907</td>
<td>N</td>
<td>N</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>STAT7614</td>
<td>Advanced statistical modelling</td>
<td>6</td>
<td>Pass in STAT3600 or STAT3907</td>
<td>Y</td>
<td>Y</td>
<td>2</td>
<td>May</td>
</tr>
<tr>
<td>STAT7615</td>
<td>Advanced quantitative risk management and finance</td>
<td>6</td>
<td>Pass in STAT4608</td>
<td>N</td>
<td>N</td>
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</table>

**Common Core Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
<th>Exams</th>
<th>Professor(s)</th>
<th>Program(s)</th>
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</thead>
<tbody>
<tr>
<td>CCCH9052</td>
<td>Arts, Science and Artifacts in Chinese Cultural Heritage</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Year</td>
<td>Exam</td>
<td>Credit Points</td>
<td>Instructor, Department</td>
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<tr>
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<tr>
<td>CCGL9016</td>
<td>Feeding the World</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr G V Akom, Faculty</td>
</tr>
<tr>
<td>CCGL9017</td>
<td>Food: Technology, Trade and Culture</td>
<td>6</td>
<td>NIL</td>
<td>N</td>
<td>120</td>
<td>Dr M Yasuhara, Biological Sciences</td>
</tr>
<tr>
<td>CCGL9033</td>
<td>Weapons of Mass Destruction: Science, Proliferation and Terrorism</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr K H Lemke, Earth Sciences</td>
</tr>
<tr>
<td>CCGL9059</td>
<td>Water in a Changing World</td>
<td>6</td>
<td>Y</td>
<td>Y</td>
<td>120</td>
<td>Dr G V Akom</td>
</tr>
<tr>
<td>CCST9012</td>
<td>Our Place in the Universe</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr T D Wotherspoon, Faculty</td>
</tr>
<tr>
<td>CCST9013</td>
<td>Our Living Environment</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr S C Chang, Earth Sciences</td>
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<tr>
<td>CCST9014</td>
<td>Science and Music</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr J C S Pun, Physics</td>
</tr>
<tr>
<td>CCST9017</td>
<td>Hidden Order in Daily Life: A Mathematical Perspective</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Prof T W Ng, Mathematics</td>
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<tr>
<td>CCST9018</td>
<td>Origin and Evolution of Life</td>
<td>6</td>
<td>NIL</td>
<td>N</td>
<td>120</td>
<td>Dr K H Lemke, Earth Sciences</td>
</tr>
<tr>
<td>CCST9019</td>
<td>Understanding Climate Change</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr J Kaplan, Earth Sciences</td>
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<tr>
<td>CCST9021</td>
<td>Hong Kong: Our Marine Heritage</td>
<td>6</td>
<td>NIL</td>
<td>N</td>
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<td>Dr G V Akom</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>
<td>NIL</td>
<td>Y</td>
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<td>Prof H F Chau, Physics</td>
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<tr>
<td>CCST9023</td>
<td>The Oceans: Science and Society</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr M C Cheung, Earth Sciences</td>
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<tr>
<td>CCST9028</td>
<td>Scientific Revolutions: Their Continuing Impact on Our World and Society</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Prof D A Parker, Physics</td>
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<tr>
<td>CCST9030</td>
<td>Forensic Science: Unmasking Evidence, Mysteries and Crimes</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Prof Z X Guo, Faculty</td>
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<tr>
<td>CCST9036</td>
<td>Frontiers in Materials: Civilisation, Industry, and Well-Being</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Prof Z X Guo, Chemistry</td>
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<tr>
<td>CCST9037</td>
<td>Mathematics: A Cultural Heritage</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr B R Kane, Mathematics</td>
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<tr>
<td>CCST9038</td>
<td>Science and Science Fiction</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Prof A B Djurisic, Physics</td>
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<tr>
<td>CCST9043</td>
<td>Time's Arrow</td>
<td>6</td>
<td>NIL</td>
<td>N</td>
<td>120</td>
<td>Dr Y L Li, Earth Sciences</td>
</tr>
<tr>
<td>CCST9045</td>
<td>The Science and Lore of Culinary Culture</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr A M Y Yuen, Chemistry</td>
</tr>
<tr>
<td>CCST9048</td>
<td>Simplifying Complexity</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr T D Wotherspoon, Faculty</td>
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<tr>
<td>CCST9051</td>
<td>What are We Made of - the Fundamental Nature of Matter</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr J C S Pun, Physics</td>
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<tr>
<td>CCST9054</td>
<td>War, Peace, and the Natural World</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr D M Baker, Biological Sciences</td>
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<tr>
<td>CCST9056</td>
<td>The Force is with You: How Things Work</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr F C C Ling, Physics</td>
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<tr>
<td>CCST9065</td>
<td>Women in Science</td>
<td>6</td>
<td>NIL</td>
<td>N</td>
<td>120</td>
<td>Prof A B Djurisic, Physics</td>
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<tr>
<td>CCST9067</td>
<td>Leaving Earth: Our Future in Space</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr J R Michalski, Earth Sciences</td>
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<tr>
<td>CCST9068</td>
<td>Artificial Intelligence: Utopia or Dystopia?</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>120</td>
<td>Dr R K W Lui, Faculty</td>
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Equivalency of HKDSE and other qualifications
### Table of Equivalence between HKDSE and Other Qualifications

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<thead>
<tr>
<th>HKDSE</th>
<th>Grade</th>
<th>Equivalent Qualification to HKDSE</th>
<th>IB</th>
<th>GCE</th>
<th>SATH</th>
<th>AP</th>
<th>Gao Kao (高考)</th>
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<tbody>
<tr>
<td>Biology</td>
<td>3 or above</td>
<td>Biology (SL/HL)</td>
<td>Biology (AL)</td>
<td>Biology</td>
<td>Biology</td>
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<tr>
<td>Chemistry</td>
<td>3 or above</td>
<td>Chemistry (SL/HL)</td>
<td>Chemistry (AL)</td>
<td>Chemistry</td>
<td>Chemistry</td>
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<tr>
<td>Physics</td>
<td>3 or above</td>
<td>Physics (SL/HL)</td>
<td>Physics (AL)</td>
<td>Physics</td>
<td>Physics B or C</td>
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<tr>
<td>Mathematics</td>
<td>2 or above</td>
<td>Mathematics (SL)/Mathematical Studies (SL)</td>
<td>Mathematics (AL)</td>
<td>Mathematics Level 1 or 2</td>
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<tr>
<td>Mathematics + (M1 or M2)</td>
<td>2 or above</td>
<td>Mathematics (HL)/Mathematical Studies (HL)</td>
<td>Pure Mathematics (AL) Further Mathematics (AL)</td>
<td>Calculus AB or BC</td>
<td></td>
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</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 any non-science students admitted through non-JUPAS scheme, they are still required to obtain the approval from the Course Selection Adviser (or designated Course Approver) of the course offering department/school via Science Online Application Submission System (OASS) [https://webapp.science.hku.hk/intranet/OnlineFormUG.html](https://webapp.science.hku.hk/intranet/OnlineFormUG.html), 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 2022/2023

Majors offered by Science Faculty

Majors

Astronomy (only for 2017 cohort or before)
Biochemistry
Biological Sciences
Biological Sciences (Intensive) (for BSc students (2017 cohort and thereafter) only)
Chemistry
Chemistry (Intensive) (for BSc students (2015 cohort and thereafter) only)
Decision Analytics (not for BASc(AppliedAI) students)
Earth System Science
Ecology & Biodiversity
Ecology & Biodiversity (Intensive) (for BSc students (2015 cohort and thereafter) only)
Environmental Science
Food & Nutritional Science
Geology
Geology (Intensive) (for BSc students (2015 cohort and thereafter) only)
Mathematics
Mathematics (Intensive) (for BSc students (2016 cohort and thereafter) only)
Mathematics/Physics (only for 2017 cohort or before)
Molecular Biology & Biotechnology
Molecular Biology & Biotechnology (Intensive) (for BSc students (2015 cohort and thereafter) only)
Physics
Physics (Intensive) (for BSc students (2016 cohort and thereafter) only)
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)
- PHYS2160: Introductory computational physics (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: Selected topics in astrophysics and 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)
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 Biochemistry
Offered to students: 2022
admitted to Year 1 in

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)
  Take either BIOC2600 or BIOL2220 to fulfill this 24 credits requirement, but not both. BIOC2600 and BIOL2220 are mutually exclusive.
- BIOL2220 Principles of biochemistry (6)
  Take either BIOC2600 or BIOL2220 to fulfill this 24 credits requirement, but not both. BIOC2600 and BIOL2220 are mutually exclusive.
- CHEM2441 Organic chemistry I (6)

Disciplinary Electives (6 credits)

- BIOC1600 Perspectives in biochemistry (6)
- BIOL1110 From molecules to cells (6)
  Take either BIOC1600 or BIOL1110 to fulfill this 6 credits requirement, but not both.

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)
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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<th>Credits</th>
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<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>
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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. 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.

5. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

6. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2021

### 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)
  - Take either BIOC2600 or BIOL2220 to fulfill this 24 credits requirement, but not both. BIOC2600 and BIOL2220 are mutually exclusive.
- 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)
### Science Majors

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<tr>
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<th>Credits</th>
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<tbody>
<tr>
<td>BIOL3408</td>
<td>Genetics (6)</td>
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<tr>
<td>CHEM3441</td>
<td>Organic chemistry II (6)</td>
<td></td>
</tr>
<tr>
<td>BIOC4612</td>
<td>Molecular biology of the gene (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4417</td>
<td>'Omics' and systems biology (6)</td>
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<tr>
<td>CHEM4145</td>
<td>Medicinal chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology (6)</td>
<td></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. 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.

5. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

6. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2020

Admitted to Year 1 in

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)

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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)

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<td>Scientific method and reasoning</td>
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<tr>
<td>SCNC1112</td>
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Disciplinary Core Courses (24 credits)

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<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
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<td>CHEM1043</td>
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<td>BIOC2600</td>
<td>Basic biochemistry</td>
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<tbody>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2441</td>
<td>Organic chemistry I</td>
<td>6</td>
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Disciplinary Electives (6 credits)

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<th>Credits</th>
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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>
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2. Advanced level courses (48 credits)

Disciplinary Core Courses (30 credits)

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<td>6</td>
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<td>BIOC3604</td>
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<td>BIOC4613</td>
<td>Advanced techniques in biochemistry &amp; molecular biology</td>
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Disciplinary Electives (18 credits)

At least 18 credits selected from the following courses:

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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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5. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu:
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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 Biochemistry
Offered to students: 2019
admitted to Year 1 in

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 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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</tr>
<tr>
<td>CHEM2441 Organic chemistry I (6)</td>
</tr>
<tr>
<td>Disciplinary Electives (6 credits)</td>
</tr>
<tr>
<td>BIOC1600 Perspectives in biochemistry (6)</td>
</tr>
<tr>
<td>BIOL1110 From molecules to cells (6)</td>
</tr>
<tr>
<td>Take either BIOC1600 or BIOL1110 to fulfill this 6 credits requirement, but not both.</td>
</tr>
</tbody>
</table>

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) |

<p>| 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) |
| Take either BIOC1600 or BIOL1110 to fulfill this 6 credits requirement, but not both. |</p>
<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3408</td>
<td>Genetics</td>
<td>(6)</td>
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<tr>
<td>CHEM3441</td>
<td>Organic chemistry II</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOC4612</td>
<td>Molecular biology of the gene</td>
<td>(6)</td>
</tr>
<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)
- BIOC4999  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 | 2018
admitted to Year 1 in

**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 synergise 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)**

<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 (6)</td>
<td></td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science (6)</td>
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**Disciplinary Core Courses (24 credits)**

<table>
<thead>
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<th>Course Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>CHEM1042</td>
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<td>CHEM1043</td>
<td>General chemistry II (6)</td>
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<tr>
<td>BIOC2600</td>
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<table>
<thead>
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<tr>
<td>BIOC2600</td>
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<tr>
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<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM2441</td>
<td>Organic chemistry I (6)</td>
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**Disciplinary Electives (6 credits)**

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

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

**Disciplinary Core Courses (30 credits)**

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

**Disciplinary Electives (18 credits)**

1. 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>BIOC3605</td>
<td>Sequence bioinformatics (6)</td>
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</tr>
<tr>
<td>BIOC3606</td>
<td>Molecular medicine (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3202</td>
<td>Nutritional biochemistry (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3404</td>
<td>Protein structure and function (6)</td>
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</table>
BIOL3408  Genetics (6)
CHEM3441  Organic chemistry II (6)
BIOL4612  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:
   BIOLC3999  Directed studies in biochemistry (6)
   BIOC4866  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: 2017
admitted to Year 1 in

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)

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<td>Principles of biochemistry (6)</td>
<td></td>
</tr>
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<td>CHEM2441</td>
<td>Organic chemistry I (6)</td>
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</table>

Take either BIOC2600 or BIOL2220 to fulfill this 24 credits requirement, but not both. BIOC2600 and BIOL2220 are mutually exclusive.

Disciplinary Electives (6 credits)

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<tbody>
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<td>BIOC1600</td>
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<td></td>
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<tr>
<td>BIOL1110</td>
<td>From molecules to cells (6)</td>
<td></td>
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</tbody>
</table>

Take either BIOC1600 or BIOL1110 to fulfill this 6 credits requirement, but not both.

2. Advanced level courses (48 credits)

Disciplinary Core Courses (30 credits)

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<tr>
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Disciplinary Electives (18 credits)

At least 18 credits selected from the following courses:

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<td>BIOL3404</td>
<td>Protein structure and function (6)</td>
<td></td>
</tr>
</tbody>
</table>

Take either BIOC1600 or BIOL1110 to fulfill this 6 credits requirement, but not both.
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: 2022

Admitted to Year 1 in Year 1 in

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: describe and explain the key concepts in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 2: analyze and interpret quantitative and qualitative biological data to provide scientifically based conclusions and/or judgements (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 3: tackle biological research problems by formulating hypothesis and designing experimental investigations (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 4: communicate effectively and professionally with scientists, educators, media, and general public in oral and written forms (by means of coursework, laboratory- and/or research-based learning, and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Biological Sciences (Intensive)
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)

<table>
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<td>SCNC1112</td>
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Disciplinary Core Courses (36 credits)

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<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
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<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2102</td>
<td>Biostatistics</td>
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<tr>
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<td>Biological sciences laboratory course</td>
<td>6</td>
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<td>BIOL2220</td>
<td>Principles of biochemistry</td>
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<tr>
<td>BIOL3206</td>
<td>Ecology and evolution</td>
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</tr>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
<td>6</td>
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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)

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3401</td>
<td>Molecular biology</td>
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<tr>
<td>BIOL3402</td>
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<td>Protein structure and function</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3408</td>
<td>Genetics</td>
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(B) Ecology, systematics and evolution (at least 12 credits selected from area B)

<table>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
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<tr>
<td>BIOL3506</td>
<td>Evolutionary biology</td>
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(C) Physiology and organismic biology (at least 18 credits with 6 credits from each of List I, II & III)

List I:

<table>
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<tr>
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<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
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<td>Animal physiology and environmental adaptation</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>
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<tr>
<td>BIOL3406</td>
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<td>Endocrinology: human physiology II</td>
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<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution</td>
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<tr>
<td>ENVSS202</td>
<td>Plant ecophysiology and climate change</td>
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<td>BIOL4411</td>
<td>Plant and food biotechnology</td>
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<tr>
<td>List III</td>
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<tr>
<td>BIOL3109</td>
<td>Environmental and molecular ecology</td>
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<td>BIOL3203</td>
<td>Food microbiology</td>
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<td>BIOL3218</td>
<td>Food hygiene and quality control</td>
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<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
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</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology</td>
<td>6</td>
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</tbody>
</table>

### 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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
- Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

- Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 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: describe and explain the key concepts in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 2: analyze and interpret quantitative and qualitative biological data to provide scientifically based conclusions and/or judgements (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 3: tackle biological research problems by formulating hypothesis and designing experimental investigations (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 4: communicate effectively and professionally with scientists, educators, media, and general public in oral and written forms (by means of coursework, laboratory- and/or research-based learning, and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Biological Sciences (Intensive)
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)

   BIOL2306 Ecology and evolution (6)
   BIOL2600 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)
   BIOL3406 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)

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**List III**

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

### 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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2020

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: describe and explain the key concepts in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 2: analyze and interpret quantitative and qualitative biological data to provide scientifically based conclusions and/or judgements (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 3: tackle biological research problems by formulating hypothesis and designing experimental investigations (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 4: communicate effectively and professionally with scientists, educators, media, and general public in oral and written forms (by means of coursework, laboratory- and/or research-based learning, and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Biological Sciences (Intensive)
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)
   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)
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<td>BIOL4411</td>
<td>Plant and food biotechnology (6)</td>
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<td>BIOL3109</td>
<td>Environmental and molecular ecology (6)</td>
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<td>BIOL3203</td>
<td>Food microbiology (6)</td>
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<tr>
<td>BIOL3218</td>
<td>Food hygiene and quality control (6)</td>
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<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology (6)</td>
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<td>BIOL4401</td>
<td>Medical microbiology and applied immunology (6)</td>
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List III

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

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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 Biological Sciences (Intensive)
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)
   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)
   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)
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<tr>
<td>BIOL3403</td>
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<td>BIOL3503</td>
<td>Endocrinology: human physiology II (6)</td>
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<tr>
<td>BIOL3107</td>
<td>Plant physiology (6)</td>
<td>Take either BIOL3107 or ENVS3202 to fulfill this 6 credits requirement in List II, but not both. BIOL3107 and ENVS3202 are mutually exclusive.</td>
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<td>BIOL3314</td>
<td>Plant structure and evolution (6)</td>
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<tr>
<td>ENVS3202</td>
<td>Plant ecophysiology and climate change (6)</td>
<td>Take either BIOL3107 or ENVS3202 to fulfill this 6 credits requirement in List II, but not both. BIOL3107 and ENVS3202 are mutually exclusive. [previous title: Plant physiology and climate change (6)]</td>
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<td>BIOL4411</td>
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<tr>
<td>BIOL3109</td>
<td>Environmental and molecular ecology (6)</td>
<td>[previous title: Environmental microbiology (6)]</td>
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**3. Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

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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.
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 Biological Sciences (Intensive)
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)

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.
(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>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3105</td>
<td>Animal physiology and environmental adaptation (6)</td>
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</tr>
<tr>
<td>BIOL3205</td>
<td>Human physiology (6)</td>
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</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology (6)</td>
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</tr>
<tr>
<td>BIOL3503</td>
<td>Endocrinology: human physiology II (6)</td>
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**List II**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL3107</td>
<td>Plant physiology (6)</td>
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<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution (6)</td>
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</tr>
<tr>
<td>ENVS3202</td>
<td>Plant ecophysiology and climate change (6)</td>
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</tr>
</tbody>
</table>

**List III**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3108</td>
<td>Environmental and molecular ecology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3203</td>
<td>Food microbiology (6)</td>
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</tr>
<tr>
<td>BIOL3218</td>
<td>Food hygiene and quality control (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology (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</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3994</td>
<td>Directed studies in biological sciences (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4964</td>
<td>Biological sciences internship (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4994</td>
<td>Biological sciences 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 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 Biological Sciences (Intensive)
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.
(C) Physiology and organismic biology (at least 18 credits with 6 credits from each of List I, II & III)

<table>
<thead>
<tr>
<th>List I</th>
<th>List II</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3105 Animal physiology and environmental adaptation (6)</td>
<td>BIOL3107 Plant physiology (6)</td>
<td>Take either BIOL3107 or ENVS3202 to fulfill this 6 credits requirement in List II, but not both. BIOL3107 and ENVS3202 are mutually exclusive.</td>
</tr>
<tr>
<td>BIOL3205 Human physiology (6)</td>
<td>BIOL3314 Plant structure and evolution (6)</td>
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</tr>
<tr>
<td>BIOL3403 Immunology (6)</td>
<td>ENVS3202 Plant ecophysiology and climate change (6)</td>
<td>Take either BIOL3107 or ENVS3202 to fulfill this 6 credits requirement in List II, but not both. BIOL3107 and ENVS3202 are mutually exclusive. [previous title: Plant physiology and climate change (6)]</td>
</tr>
<tr>
<td>BIOL3406 Reproduction and reproductive biotechnology (6)</td>
<td>BIOL4411 Plant and food biotechnology (6)</td>
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<tr>
<td>BIOL3503 Endocrinology: human physiology II (6)</td>
<td>BIOL3109 Environmental and molecular ecology (6)</td>
<td>[previous title: Environmental microbiology (6)]</td>
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</table>

<table>
<thead>
<tr>
<th>List III</th>
<th></th>
<th>Notes</th>
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</thead>
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<tr>
<td>BIOL3203 Food microbiology (6)</td>
<td>BIOL3203 Food microbiology (6)</td>
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<tr>
<td>BIOL3218 Food hygiene and quality control (6)</td>
<td>BIOL3218 Food hygiene and quality control (6)</td>
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<tr>
<td>BIOL3508 Microbial physiology and biotechnology (6)</td>
<td>BIOL3508 Microbial physiology and biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4401 Medical microbiology and applied immunology (6)</td>
<td>BIOL4401 Medical microbiology and applied immunology (6)</td>
<td></td>
</tr>
</tbody>
</table>

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.

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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 Biological Sciences (Intensive)

Offered to students: admitted to Year 1 in 2022

Objectives:
This major is designed for students seeking a broad-based training in conventional and modern biology. Students are guided in a stimulating learning environment to explore major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The curriculum allows students to 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). Students are engaged in scientific learning through a wide range of laboratory and field work. They will acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major prepares graduates for employment as professionals in a variety of careers or for postgraduate study. The intensive major includes additional coursework and a compulsory capstone research project. It is designed for students with a strong desire to acquire knowledge with sufficient depth and breadth in biological sciences.

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 and explain the key concepts in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology, and to appraise the related ethical and moral issues (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 2: equip with sufficient knowledge in chemistry for application within a biological context (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 3: analyze and interpret quantitative and qualitative biological data to provide scientifically based conclusions and/or judgements (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 4: tackle biological research problems by formulating hypothesis and designing experimental investigations (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 5: communicate effectively and professionally with scientists, educators, media, and general public in oral and written forms (by means of coursework, laboratory- and/or research-based learning, and presentation opportunities in the curriculum)

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

Required courses (144 credits)

1. Introductory level courses (60 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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</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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</table>

Disciplinary Core Courses (48 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<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>
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<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
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<td>BIOL2102</td>
<td>Biostatistics</td>
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<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>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
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</table>

2. Advanced level courses (72 credits)

Disciplinary Electives (72 credits with at least 18 credits of Level 4XXX courses)

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</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>
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<td>BIOL3404</td>
<td>Protein structure and function</td>
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<td>BIOL3408</td>
<td>Genetics</td>
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<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology</td>
<td>6</td>
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<tr>
<td>BIOL4417</td>
<td>'Omics' and systems biology</td>
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(B) Ecology, systematics and evolution (at least 12 credits selected from area B)

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOL3301</td>
<td>Marine biology</td>
<td>6</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<tr>
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<tr>
<td>BIOL3302</td>
<td>Systemsatics and phylogenetics</td>
<td>6</td>
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<tr>
<td>BIOL3303</td>
<td>Conservation biology</td>
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<tr>
<td>BIOL3319</td>
<td>Tropical terrestrial ecology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3506</td>
<td>Evolutionary biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment</td>
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</tbody>
</table>

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

**List I**
- BIOL3101 Animal behaviour (6)
- 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**
- BIOL3314 Plant structure and evolution (6)
- ENVS3202 Plant ecophysiology and climate change (6)
- BIOL4411 Plant and food biotechnology (6)

**List III**
- BIOL3109 Environmental and molecular ecology (6)
- BIOL3203 Food microbiology (6)
- BIOL3218 Food hygiene and quality control (6)
- BIOL3508 Microbial physiology and biotechnology (6)
- BIOL4401 Medical microbiology and applied immunology (6)

3. Capstone requirement (12 credits)
- BIOL4994 Biological sciences project (12)

**Notes:**
1. These are core courses in the regular Biological Sciences Major (96 credits) curriculum.

2. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

3. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

4. As this curriculum is accredited by the Royal Society of Biology (RSB), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this 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 Biological Sciences (Intensive)
Offered to students: 2021
Admitted to Year 1 in

Objectives:
This major is designed for students seeking a broad-based training in conventional and modern biology. Students are guided in a stimulating learning environment to explore major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The curriculum allows students to 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). Students are engaged in scientific learning through a wide range of laboratory and field work. They will acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major prepares graduates for employment as professionals in a variety of careers or for postgraduate study. The intensive major includes additional coursework and a compulsory capstone research project. It is designed for students with a strong desire to acquire knowledge with sufficient depth and breadth in biological sciences.

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 and explain the key concepts in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology, and to appraise the related ethical and moral issues (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 2: equip with sufficient knowledge in chemistry for application within a biological context (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 3: analyze and interpret quantitative and qualitative biological data to provide scientifically based conclusions and/or judgements (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 4: tackle biological research problems by formulating hypothesis and designing experimental investigations (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 5: communicate effectively and professionally with scientists, educators, media, and general public in oral and written forms (by means of coursework, laboratory- and/or research-based learning, and presentation opportunities in the curriculum)

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

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 (48 credits)
BIOL1110 From molecules to cells (6) (Note 1)
BIOL1309 Evolutionary diversity (6) (Note 1)
CHEM1042 General chemistry I (6)
CHEM1043 General chemistry II (6)
BIOL2102 Biostatistics (6) (Note 1)
BIOL2103 Biological sciences laboratory course (6) (Note 1)
BIOL2220 Principles of biochemistry (6)
    Take either BIOL2220 or BIOC2600 to fulfill this 48 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive. (Note 1)
BIOL2306 Ecology and evolution (6)
BIOC2600 Basic biochemistry (6)

2. Advanced level courses (72 credits)
Disciplinary Electives (72 credits with at least 18 credits of Level 4XXX courses)
(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)
BIOL4416 Stem cells and regenerative biology (6)
BIOL4417 'Omics' and systems biology (6)

(B) Ecology, systematics and evolution (at least 12 credits selected from area B)
BIOL3301 Marine biology (6)
<table>
<thead>
<tr>
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<th>Course</th>
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<td>Systemsatics and phylogenetics (6)</td>
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<td>BIOL3303</td>
<td>Conservation biology (6)</td>
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<td>BIOL3506</td>
<td>Evolutionary biology (6)</td>
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<td>BIOL4302</td>
<td>Environmental impact assessment (6)</td>
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<tr>
<td></td>
<td><strong>C (Physiology and organismic biology (at least 18 credits with 6 credits from each of List I, II &amp; III)</strong></td>
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</tr>
<tr>
<td>List I</td>
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<tr>
<td>BIOL3101</td>
<td>Animal behaviour (6)</td>
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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>
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<td>Immunology (6)</td>
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<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology (6)</td>
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<td>BIOL3503</td>
<td>Endocrinology: human physiology II (6)</td>
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<td>List II</td>
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<td>BIOL3314</td>
<td>Plant structure and evolution (6)</td>
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<td>ENVS3202</td>
<td>Plant ecophysiology and climate change (6)</td>
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<td>BIOL4411</td>
<td>Plant and food biotechnology (6)</td>
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<td>List III</td>
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<td></td>
</tr>
<tr>
<td>BIOL3109</td>
<td>Environmental and molecular ecology (6)</td>
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<td>BIOL3203</td>
<td>Food microbiology (6)</td>
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<td>BIOL3218</td>
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<td>BIOL3508</td>
<td>Microbial physiology and biotechnology (6)</td>
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<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology (6)</td>
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3. Capstone requirement (12 credits)

<table>
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<th>Credits</th>
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<tbody>
<tr>
<td>BIOL4994</td>
<td>Biological sciences project</td>
<td>12</td>
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</table>

**Notes:**

1. These are core courses in the regular Biological Sciences Major (96 credits) curriculum.

2. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

3. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

4. As this curriculum is accredited by the Royal Society of Biology (RSB), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this 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 Biological Sciences (Intensive)  
Offered to students: admitted to Year 1 in 2020

Objectives:
This major is designed for students seeking a broad-based training in conventional and modern biology. Students are guided in a stimulating learning environment to explore major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The curriculum allows students to 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). Students are engaged in scientific learning through a wide range of laboratory and field work. They will acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major prepares graduates for employment as professionals in a variety of careers or for postgraduate study. The intensive major includes additional coursework and a compulsory capstone research project. It is designed for students with a strong desire to acquire knowledge with sufficient depth and breadth in biological sciences.

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 (C Biol).

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

PLO 1: describe and explain the key concepts in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology, and to appraise the related ethical and moral issues (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 2: equip with sufficient knowledge in chemistry for application within a biological context (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 3: analyze and interpret quantitative and qualitative biological data to provide scientifically based conclusions and/or judgements (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 4: tackle biological research problems by formulating hypothesis and designing experimental investigations (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 5: communicate effectively and professionally with scientists, educators, media, and general public in oral and written forms (by means of coursework, laboratory- and/or research-based learning, and presentation opportunities in the curriculum)

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

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 (48 credits)
- BIOL1110 From molecules to cells (6)  
- BIOL1309 Evolutionary diversity (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)  
- BIOL2306 Ecology and evolution (6)  
- BIOC2600 Basic biochemistry (6)

2. Advanced level courses (72 credits)
Disciplinary Electives (72 credits with at least 18 credits of Level 4XXX courses)
(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)  
- BIOL4416 Stem cells and regenerative biology (6)  
- BIOL4417 ‘Omics’ and systems biology (6)

(B) Ecology, systematics and evolution (at least 12 credits selected from area B)
- BIOL3301 Marine biology (6)
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<td>Evolutionary biology (6)</td>
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<td>BIOL4302</td>
<td>Environmental impact assessment (6)</td>
</tr>
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</table>

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

**List I**
- BIOL3101 Animal behaviour (6)
- 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**
- BIOL3314 Plant structure and evolution (6)
- ENV1320 Plant ecophysiology and climate change (6) [previous title: Plant physiology and climate change (6)]
- BIOL4411 Plant and food biotechnology (6)

**List III**
- BIOL3109 Environmental and molecular ecology (6) [previous title: Environmental microbiology (6)]
- BIOL3203 Food microbiology (6)
- BIOL3218 Food hygiene and quality control (6)
- BIOL3508 Microbial physiology and biotechnology (6)
- BIOL4401 Medical microbiology and applied immunology (6)

3. Capstone requirement (12 credits)
- BIOL4994 Biological sciences project (12)

**Notes:**
1. These are core courses in the regular Biological Sciences Major (96 credits) curriculum.

2. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
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3. As this curriculum is accredited by the Royal Society of Biology (RSB), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this 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 Biological Sciences (Intensive)
Offered to students: 2019
admitted to Year 1 in

**Objectives:**
This major is designed for students seeking a broad-based training in conventional and modern biology. Students are guided in a stimulating learning environment to explore major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The curriculum allows students to 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). Students are engaged in scientific learning through a wide range of laboratory and field work. They will acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major prepares graduates for employment as professionals in a variety of careers or for postgraduate study. The intensive major includes additional coursework and a compulsory capstone research project. It is designed for students with a strong desire to acquire knowledge with sufficient depth and breadth in biological sciences.

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

PLO 1: describe and explain the key concepts in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology, and to appraise the related ethical and moral issues (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 2: equip with sufficient knowledge in chemistry for application within a biological context (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 3: analyze and interpret quantitative and qualitative biological data to provide scientifically based conclusions and/or judgements (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 4: tackle biological research problems by formulating hypothesis and designing experimental investigations (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 5: communicate effectively and professionally with scientists, educators, media, and general public in oral and written forms (by means of coursework, laboratory- and/or research-based learning, and presentation opportunities in the curriculum)

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

**Required courses (144 credits)**

1. **Introductory level courses (60 credits)**

   **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   
<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning (6)</td>
<td>(Note 1)</td>
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<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science (6)</td>
<td>(Note 1)</td>
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</table>

   **Disciplinary Core Courses (48 credits)**
   
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<tr>
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<tbody>
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<td>CHEM1042</td>
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<td>CHEM1043</td>
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<td>BIOL2102</td>
<td>Biostatistics (6)</td>
<td>(Note 1)</td>
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<td>BIOL2103</td>
<td>Biological sciences laboratory course (6)</td>
<td>(Note 1)</td>
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<td>BIOL2220</td>
<td>Principles of biochemistry (6)</td>
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<tr>
<td>BIOL2306</td>
<td>Ecology and evolution (6)</td>
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<tr>
<td>BIOC2600</td>
<td>Basic biochemistry (6)</td>
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2. **Advanced level courses (72 credits)**

   **Disciplinary Electives (72 credits with at least 18 credits of Level 4XXX courses )**

   (A) Genetics, molecular and cell biology (at least 12 credits selected from area A)
   
<table>
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<tr>
<th>Course Code</th>
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<tr>
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   (B) Ecology, systematics and evolution (at least 12 credits selected from area B)
   
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<tbody>
<tr>
<td>BIOL3101</td>
<td>Animal behaviour (6)</td>
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</table>
### BIOL3301
Marine biology (6)

### BIOL3302
Systematics and phylogenetics (6)

### BIOL3303
Conservation biology (6)

### BIOL3319
Tropical terrestrial ecology (6)

### BIOL3506
Evolutionary biology (6)

### BIOL4302
Environmental impact assessment (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**
- BIOL3107 Plant physiology (6)

**List III**
- BIOL3314 Plant structure and evolution (6)
- ENVS3202 Plant ecophysiology and climate change (6)

### BIOL4411
Plant and food biotechnology (6)

**List III**
- BIOL3109 Environmental and molecular ecology (6)

### BIOL3203
Food microbiology (6)

### BIOL3218
Food hygiene and quality control (6)

### BIOL3508
Microbial physiology and biotechnology (6)

### BIOL4401
Medical microbiology and applied immunology (6)

#### 3. Capstone requirement (12 credits)
- BIOL4994 Biological sciences project (12)

**Notes:**
1. These are core courses in the regular Biological Sciences 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 Biological Sciences (Intensive)
Offered to students admitted to Year 1 in 2018

Objectives:
This major is designed for students seeking a broad-based training in conventional and modern biology. Students are guided in a stimulating learning environment to explore major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The curriculum allows students to 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). Students are engaged in scientific learning through a wide range of laboratory and field work. They will acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major prepares graduates for employment as professionals in a variety of careers or for postgraduate study. The intensive major includes additional coursework and a compulsory capstone research project. It is designed for students with a strong desire to acquire knowledge with sufficient depth and breadth in biological sciences.

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Learning Outcomes:
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PLO 5: communicate effectively and professionally with scientists, educators, media, and general public in oral and written forms (by means of coursework, laboratory- and/or research-based learning, and presentation opportunities in the curriculum)

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

Required courses (144 credits)

1. Introductory level courses (60 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

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Disciplinary Core Courses (48 credits)

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2. Advanced level courses (72 credits)

Disciplinary Electives (72 credits with at least 18 credits of Level 4XXX courses)

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

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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>BIOL3404</td>
<td>Protein structure and function</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3408</td>
<td>Genetics</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>'Omics' and systems biology</td>
<td>6</td>
</tr>
</tbody>
</table>

(B) Ecology, systematics and evolution (at least 12 credits selected from area B)

<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>
</tbody>
</table>
### Biology (6 credits)
- **BIOL3301**: Marine biology (6)
- **BIOL3302**: Systematics and phylogenetics (6)
- **BIOL3303**: Conservation biology (6)
- **BIOL3319**: Tropical terrestrial ecology (6)
- **BIOL3506**: Evolutionary biology (6)
- **BIOL4302**: Environmental impact assessment (6)

### 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
- **BIOL3107**: Plant physiology (6)
- **BIOL3107**: Plant physiology (6) **(Note: Take either BIOL3107 or ENVS3202 to fulfill this 6 credits requirement in List II, but not both. BIOL3107 and ENVS3202 are mutually exclusive.)**
- **BIOL3314**: Plant structure and evolution (6)
- **ENVS3202**: Plant ecophysiology and climate change (6) **(Note: Take either BIOL3107 or ENVS3202 to fulfill this 6 credits requirement in List II, but not both. BIOL3107 and ENVS3202 are mutually exclusive.)**
- **BIOL4411**: Plant and food biotechnology (6)

#### List III
- **BIOL3109**: Environmental and molecular ecology (6) **(Note: previous title: Environmental microbiology (6))**
- **BIOL3203**: Food microbiology (6)
- **BIOL3218**: Food hygiene and quality control (6)
- **BIOL3508**: Microbial physiology and biotechnology (6)
- **BIOL4401**: Medical microbiology and applied immunology (6)

### Capstone requirement (12 credits)
- **BIOL4994**: Biological sciences project (12)

### Notes:
1. These are core courses in the regular Biological Sciences 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 Biological Sciences (Intensive)

Offered to students: 2017

admitted to Year 1 in

Objectives:
This major is designed for students seeking a broad-based training in conventional and modern biology. Students are guided in a stimulating learning environment to explore major biological systems at different levels of biological organization. Teaching emphasizes both core concepts and applied aspects in biological sciences. The curriculum allows students to 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). Students are engaged in scientific learning through a wide range of laboratory and field work. They will acquire valuable transferable skills in analysis, organization and communication. The Biological Sciences Major prepares graduates for employment as professionals in a variety of careers or for postgraduate study. The intensive major includes additional coursework and a compulsory capstone research project. It is designed for students with a strong desire to acquire knowledge with sufficient depth and breadth in biological sciences.

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 and explain the key concepts in genetics, molecular & cell biology; ecology, systematics and evolution; physiology and organismic biology, and to appraise the related ethical and moral issues (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 2: equip with sufficient knowledge in chemistry for application within a biological context (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 3: analyze and interpret quantitative and qualitative biological data to provide scientifically based conclusions and/or judgements (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 4: tackle biological research problems by formulating hypothesis and designing experimental investigations (by means of coursework, laboratory- and/or research-based learning in the curriculum)

PLO 5: communicate effectively and professionally with scientists, educators, media, and general public in oral and written forms (by means of coursework, laboratory- and/or research-based learning, and presentation opportunities in the curriculum)

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

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 (48 credits)

BIOL1110 From molecules to cells (6) (Note 1)
BIOL1309 Evolutionary diversity (6) (Note 1)
CHEM1042 General chemistry I (6)
CHEM1043 General chemistry II (6)
BIOL2102 Biostatistics (6) (Note 1)
BIOL2103 Biological sciences laboratory course (6) (Note 1)
BIOL2220 Principles of biochemistry (6)

Take either BIOL2220 or BIOC2600 to fulfill this 48 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive. (Note 1)

BIOL2306 Ecology and evolution (6)
BIOC2600 Basic biochemistry (6)

2. Advanced level courses (72 credits)

Disciplinary Electives (72 credits with at least 18 credits of Level 4XXX courses)

(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)
BIOL4416 Stem cells and regenerative biology (6)
BIOL4417 ‘Omics’ and systems biology (6)

(B) Ecology, systematics and evolution (at least 12 credits selected from area B)

BIOL3101 Animal behaviour (6)
<table>
<thead>
<tr>
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<th>Credits</th>
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</thead>
<tbody>
<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>
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<tr>
<td>BIOL3506</td>
<td>Evolutionary biology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment</td>
<td>(6)</td>
</tr>
</tbody>
</table>

(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 Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOL3105</td>
<td>Animal physiology and environmental adaptation</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>BIOL3406</td>
<td>Reproduction and reproductive biotechnology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3503</td>
<td>Endocrinology: human physiology II</td>
<td>(6)</td>
</tr>
</tbody>
</table>

**List II**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL3107</td>
<td>Plant physiology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS3202</td>
<td>Plant ecophysiology and climate change</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>BIOL4411</td>
<td>Plant and food biotechnology</td>
<td>(6)</td>
</tr>
</tbody>
</table>

**List III**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3109</td>
<td>Environmental and molecular ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3203</td>
<td>Food microbiology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3218</td>
<td>Food hygiene and quality control</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>
</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>BIOL4994</td>
<td>Biological sciences project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

Notes:
1. These are core courses in the regular Biological Sciences 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 Chemistry
Offered to students: 2022
admitted to Year 1 in

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, directed studies of no less than three weeks with chemistry-related companies or research laboratories, or any other relevant capstone experience in chemistry)

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)
   - 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: Inorganic chemistry II (6)
   - CHEM3441: Organic chemistry II (6)
   - CHEM3443: Organic chemistry laboratory (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 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)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<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>CHEM4542</td>
<td>Computational chemistry (6)</td>
</tr>
<tr>
<td>CHEM4543</td>
<td>Advanced physical chemistry (6)</td>
</tr>
<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology (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>CHEM3999</td>
<td>Directed studies in chemistry (6)</td>
</tr>
<tr>
<td>CHEM4910</td>
<td>Chemistry literacy and research (6)</td>
</tr>
<tr>
<td>CHEM4911</td>
<td>Capstone experience for chemistry undergraduates: HKUtopia (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. 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 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.

5. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

6. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2021
admitted to Year 1 in

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, directed studies of no less than three weeks with chemistry-related companies or research laboratories, or any other relevant capstone experience in chemistry)

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 Inorganic chemistry II (6)
   CHEM3441 Organic chemistry II (6)
   CHEM3443 Organic chemistry laboratory (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 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)
### Science Majors

<table>
<thead>
<tr>
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<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM4341</td>
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<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. 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.

5. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

6. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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
2020

### 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, directed studies of no less than three weeks with chemistry-related companies or research laboratories, or any other relevant capstone experience in chemistry)

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

### Required courses (96 credits)

#### 1. Introductory level courses (48 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 (36 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>CHEM1043</td>
<td>General chemistry II</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2241</td>
<td>Analytical chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2341</td>
<td>Inorganic chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2441</td>
<td>Organic chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2541</td>
<td>Introductory physical chemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

#### 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**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>Frontiers in Modern Chemical Science</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>
</tbody>
</table>
Science Majors

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)

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. 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.

5. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
- Mathematics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2019
admitted to Year 1 in

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, directed studies of no less than three weeks with chemistry-related companies or research laboratories, or any other relevant capstone experience in chemistry)

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 Inorganic chemistry II (6)
   CHEM3441 Organic chemistry II (6)
   CHEM3443 Organic chemistry laboratory (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 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)
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM4341</td>
<td>Advanced inorganic chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM4342</td>
<td>Organometallic chemistry</td>
<td>6</td>
</tr>
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<td>CHEM4441</td>
<td>Advanced organic chemistry</td>
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</tr>
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<td>CHEM4443</td>
<td>Integrated organic synthesis</td>
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</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology</td>
<td>6</td>
</tr>
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</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 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:

- 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.

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**Important!** Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2018 admitted to Year 1 in

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, directed studies of no less than three weeks with chemistry-related companies or research laboratories, or any other relevant capstone experience in chemistry)

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

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (48 credits)</strong></td>
</tr>
<tr>
<td>SCNC1111</td>
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<td>SCNC1112</td>
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<td><strong>2. Advanced level courses (42 credits)</strong></td>
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<tr>
<td><strong>Disciplinary Electives (12 credits)</strong></td>
</tr>
<tr>
<td>At least 12 credits of any level 4 Chemistry (CHEM4XXX) courses. The current list include courses in List A.</td>
</tr>
<tr>
<td><strong>List A</strong></td>
</tr>
<tr>
<td>CHEM4142</td>
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<td>CHEM4143</td>
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<td>CHEM4144</td>
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<td>CHEM4543</td>
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<td>CHEM4544</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>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
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<td>(6)</td>
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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:**

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Major Title: Major in Chemistry
Offered to students: 2017
admitted to Year 1 in

Objectives:
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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)

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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 Inorganic chemistry II (6)
   - CHEM3441 Organic chemistry II (6)
   - CHEM3443 Organic chemistry laboratory (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)
   - CHEM4242 Analytical chemistry (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>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 (Intensive)

### Offered to students
2022

### 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 chemistry research project of no less than 24 weeks, or student internship opportunities plus 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)

<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>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM1043</td>
<td>General chemistry II</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM2241</td>
<td>Analytical chemistry I</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM2341</td>
<td>Inorganic chemistry I</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM2441</td>
<td>Organic chemistry I</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM2541</td>
<td>Introductory physical chemistry</td>
<td>(6)</td>
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</table>

#### 2. Advanced level courses (78 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3143</td>
<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>
</tbody>
</table>

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

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

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<tr>
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</thead>
<tbody>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
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<tr>
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<td>General chemistry II</td>
</tr>
<tr>
<td>CHEM2241</td>
<td>Analytical chemistry I</td>
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<td>Organic chemistry II</td>
</tr>
<tr>
<td>CHEM3443</td>
<td>Organic chemistry laboratory</td>
</tr>
<tr>
<td>CHEM3445</td>
<td>Integrated laboratory</td>
</tr>
</tbody>
</table>

### 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.)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1044</td>
<td>Mathematics in chemistry</td>
</tr>
<tr>
<td>COMP1117</td>
<td>Computer programming</td>
</tr>
<tr>
<td>MATH1011</td>
<td>University mathematics I</td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
</tr>
<tr>
<td>STAT1601</td>
<td>Elementary statistical methods</td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics</td>
</tr>
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</table>

### Disciplinary Core Courses (56 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
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<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
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<tr>
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<td>General chemistry I</td>
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<tr>
<td>CHEM1043</td>
<td>General chemistry II</td>
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</tr>
<tr>
<td>CHEM3443</td>
<td>Organic chemistry laboratory</td>
</tr>
<tr>
<td>CHEM3445</td>
<td>Integrated laboratory</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------------------------------</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>CHEM4142</td>
<td>Symmetry, group theory and applications (6)</td>
</tr>
<tr>
<td>CHEM4144</td>
<td>Advanced materials (6)</td>
</tr>
<tr>
<td>CHEM4241</td>
<td>Modern chemical instrumentation and applications (6)</td>
</tr>
</tbody>
</table>

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses:

(At least 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>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<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)</td>
<td>(lab)</td>
</tr>
<tr>
<td>CHEM4341</td>
<td>Advanced inorganic chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM4342</td>
<td>Organometallic chemistry (6)</td>
<td>(lab)</td>
</tr>
<tr>
<td>CHEM4441</td>
<td>Advanced organic chemistry (6)</td>
<td>(lab)</td>
</tr>
<tr>
<td>CHEM4443</td>
<td>Integrated organic synthesis (6)</td>
<td>(lab)</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology (6)</td>
<td>(lab)</td>
</tr>
<tr>
<td>CHEM4542</td>
<td>Computational chemistry (6)</td>
<td>(lab)</td>
</tr>
<tr>
<td>CHEM4543</td>
<td>Advanced physical chemistry (6)</td>
<td>(lab)</td>
</tr>
<tr>
<td>CHEM4544</td>
<td>Electrochemical science and technology (6)</td>
<td>(lab)</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>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. These are core courses in the regular Chemistry Major (96 credits) curriculum.

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.

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.

4. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2021

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 chemistry research project of no less than 24 weeks, or student internship opportunities plus 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)

<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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</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>CHEM1042</td>
<td>General chemistry I (6)</td>
<td></td>
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<td>General chemistry II (6)</td>
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<tr>
<td>CHEM2441</td>
<td>Organic chemistry I (6)</td>
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<tr>
<td>CHEM2541</td>
<td>Introductory physical chemistry (6)</td>
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</table>

Disciplinary Electives (6 credits)

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</tr>
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</table>

2. Advanced level courses (78 credits)

Disciplinary Core Course (66 credits)

<table>
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<tr>
<td>CHEM3443</td>
<td>Organic chemistry laboratory (6)</td>
</tr>
<tr>
<td>CHEM3445</td>
<td>Integrated laboratory (6)</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
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<td>--------------------------------------------------------------</td>
</tr>
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<tr>
<td>CHEM4142</td>
<td>Symmetry, group theory and applications</td>
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<tr>
<td>CHEM4144</td>
<td>Advanced materials</td>
</tr>
<tr>
<td>CHEM4241</td>
<td>Modern chemical instrumentation and applications</td>
</tr>
</tbody>
</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>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>Frontiers in Modern Chemical Science</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4242</td>
<td>Analytical chemistry</td>
<td>(lab)</td>
</tr>
<tr>
<td>CHEM4341</td>
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<td>Integrated organic synthesis</td>
<td>(lab)</td>
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<td>(6)</td>
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<tr>
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<td>(lab)</td>
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<tr>
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<td>CHEM4544</td>
<td>Electrochemical science and technology</td>
<td>(lab)</td>
</tr>
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**3. Capstone requirement (12 credits)**

At least 12 credits selected from the following courses:

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<td>Chemistry project</td>
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**Notes:**

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

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.

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 fulfull the accredited curriculum.

4. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2020  
Admitted to Year 1 in: 

**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 program 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 chemistry research project of no less than 24 weeks, or student internship opportunities plus 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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<td>Analytical chemistry I (6)</td>
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</tr>
<tr>
<td>CHEM2341</td>
<td>Inorganic chemistry I (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM2441</td>
<td>Organic chemistry I (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM2541</td>
<td>Introductory physical chemistry (6)</td>
<td></td>
</tr>
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### 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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<td>Mathematics in chemistry (6)</td>
</tr>
<tr>
<td>COMP1117</td>
<td>Computer programming (6)</td>
</tr>
<tr>
<td>MATH1011</td>
<td>University mathematics I (6)</td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
</tr>
<tr>
<td>STAT1601</td>
<td>Elementary statistical methods (6)</td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics (6)</td>
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### 2. Advanced level courses (78 credits)

**Disciplinary Core Course (66 credits)**

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<tr>
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<tr>
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<td>Integrated laboratory (6)</td>
</tr>
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<td>------------</td>
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<tr>
<td>CHEM4142</td>
<td>Symmetry, group theory and applications</td>
</tr>
<tr>
<td>CHEM4144</td>
<td>Advanced materials</td>
</tr>
<tr>
<td>CHEM4241</td>
<td>Modern chemical instrumentation and applications</td>
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**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>Interfacial science and technology</td>
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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>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4148</td>
<td>Frontiers in Modern Chemical Science</td>
<td>(6)</td>
</tr>
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<td>CHEM4242</td>
<td>Analytical chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>(lab)</td>
<td></td>
</tr>
<tr>
<td>CHEM4341</td>
<td>Advanced inorganic chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>(lab)</td>
<td></td>
</tr>
<tr>
<td>CHEM4342</td>
<td>Organometallic chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4441</td>
<td>Advanced organic chemistry</td>
<td>(6)</td>
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<td></td>
<td>(lab)</td>
<td></td>
</tr>
<tr>
<td>CHEM4443</td>
<td>Integrated organic synthesis</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>(lab)</td>
<td></td>
</tr>
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<td>CHEM4444</td>
<td>Chemical biology</td>
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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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4. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

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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: 2019  
Admitted to Year 1 in

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)

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)

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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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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 chemistry research project of no less than 24 weeks, or student internship opportunities plus 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 1)
     - SCNC1112  Fundamentals of modern science (6)  (Note 1)
   - **Disciplinary Core Courses (36 credits)**
     - CHEM1042  General chemistry I (6)  (Note 1)
     - CHEM1043  General chemistry II (6)  (Note 1)
     - CHEM2241  Analytical chemistry I (6)  (Note 1)
     - CHEM2341  Inorganic chemistry I (6)  (Note 1)
     - CHEM2441  Organic chemistry I (6)  (Note 1)
     - CHEM2541  Introductory physical chemistry (6)  (Note 1)
   - **Disciplinary Core Courses (66 credits)**
     - CHEM3143  Introduction to materials chemistry (6)
     - CHEM3241  Analytical chemistry II: chemical instrumentation (6)  (Note 1)
     - CHEM3341  Inorganic chemistry II (6)  (Note 1)
     - CHEM3441  Organic chemistry II (6)  (Note 1)
     - CHEM3443  Organic chemistry laboratory (6)  (Note 1)
     - CHEM3445  Integrated laboratory (6)  (Note 1)

2. **Advanced level courses (78 credits)**
   - **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)

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Science Majors
<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<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>CHEM4142</td>
<td>Symmetry, group theory and applications (6)</td>
</tr>
<tr>
<td>CHEM4144</td>
<td>Advanced materials (6)</td>
</tr>
<tr>
<td>CHEM4241</td>
<td>Modern chemical instrumentation and applications (6)</td>
</tr>
</tbody>
</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.)

- CHEM4143 Interfacial science and technology (6)
- CHEM4145 Medicinal chemistry (6)
- CHEM4147 Supramolecular chemistry (6)
- CHEM4148 Frontiers in Modern Chemical Science (6)
- CHEM4242 Analytical chemistry (6) (lab)
- CHEM4341 Advanced inorganic chemistry (6)
- CHEM4342 Organometallic chemistry (6) (lab)
- CHEM4441 Advanced organic chemistry (6) (lab)
- CHEM4443 Integrated organic synthesis (6) (lab)
- CHEM4444 Chemical biology (6) (lab)
- CHEM4542 Computational chemistry (6) (lab)
- CHEM4543 Advanced physical chemistry (6) (lab)
- CHEM4544 Electrochemical science and technology (6) (lab)

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

At least 12 credits selected from the following courses:

- CHEM3999 Directed studies in chemistry (6)
- CHEM4966 Chemistry internship (6)
- CHEM4999 Chemistry project (12)

**Notes:**

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

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.

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 2017

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 chemistry research project of no less than 24 weeks, or student internship opportunities plus 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)

<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 (6)</td>
<td></td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science (6)</td>
<td></td>
</tr>
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</table>

Disciplinary Core Courses (36 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1042</td>
<td>General chemistry I (6)</td>
<td></td>
<td>(Note 1)</td>
</tr>
<tr>
<td>CHEM1043</td>
<td>General chemistry II (6)</td>
<td></td>
<td>(Note 1)</td>
</tr>
<tr>
<td>CHEM2241</td>
<td>Analytical chemistry I (6)</td>
<td></td>
<td>(Note 1)</td>
</tr>
<tr>
<td>CHEM2341</td>
<td>Inorganic chemistry I (6)</td>
<td></td>
<td>(Note 1)</td>
</tr>
<tr>
<td>CHEM2441</td>
<td>Organic chemistry I (6)</td>
<td></td>
<td>(Note 1)</td>
</tr>
<tr>
<td>CHEM2541</td>
<td>Introductory physical chemistry (6)</td>
<td></td>
<td>(Note 1)</td>
</tr>
</tbody>
</table>

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>
<th>Course Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>CHEM1044</td>
<td>Mathematics in chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>COMP1117</td>
<td>Computer programming (6)</td>
<td></td>
</tr>
<tr>
<td>MATH1011</td>
<td>University mathematics I (6)</td>
<td></td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
<td></td>
</tr>
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<td>STAT1601</td>
<td>Elementary statistical methods (6)</td>
<td></td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics (6)</td>
<td></td>
</tr>
</tbody>
</table>

2. Advanced level courses (78 credits)

Disciplinary Core Course (66 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3143</td>
<td>Introduction to materials chemistry (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM3241</td>
<td>Analytical chemistry II: chemical instrumentation (6)</td>
<td></td>
<td>(Note 1)</td>
</tr>
<tr>
<td>CHEM3341</td>
<td>Inorganic chemistry II (6)</td>
<td></td>
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<td>Organic chemistry laboratory (6)</td>
<td></td>
<td>(Note 1)</td>
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<tr>
<td>CHEM3445</td>
<td>Integrated laboratory (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
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<td>Credits</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>CHEM4241</td>
<td>Modern chemical instrumentation and applications</td>
<td>(6)</td>
<td></td>
</tr>
</tbody>
</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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<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM4143</td>
<td>Interfacial science and technology</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>Frontiers in Modern Chemical Science</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4242</td>
<td>Analytical chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4341</td>
<td>Advanced inorganic chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4342</td>
<td>Organometallic chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4441</td>
<td>Advanced organic chemistry</td>
<td>(6)</td>
</tr>
<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 (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>CHEM3999</td>
<td>Directed studies in chemistry</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. These are core courses in the regular Chemistry Major (96 credits) curriculum.

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.

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
2022

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:
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)
   STAT3620 Modern nonparametric statistics (6)
   STAT3621 Statistical data analysis (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3622</td>
<td>Data visualization (6)</td>
</tr>
<tr>
<td>STAT3655</td>
<td>Survival analysis (6)</td>
</tr>
<tr>
<td>STAT4011</td>
<td>Natural language processing (6)</td>
</tr>
<tr>
<td>STAT4023</td>
<td>Medical image analysis (6)</td>
</tr>
<tr>
<td>STAT4601</td>
<td>Time-series analysis (6)</td>
</tr>
<tr>
<td>STAT4602</td>
<td>Multivariate data analysis (6)</td>
</tr>
<tr>
<td>STAT4610</td>
<td>Bayesian learning (6)</td>
</tr>
</tbody>
</table>

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
   - STAT3607 Statistics in clinical medicine and bio-medical research
   - STAT3620 Modern nonparametric statistics
   - STAT3621 Statistical data analysis
   - STAT4023 Medical image 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
   - MATH3901 Operations research I
   - 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 elective) 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 elective) 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.

6. 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/useful-resources/handbooks (Student Handbook).

7. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

8. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important: Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2021

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:

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)
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 elective) 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 elective) 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.

6. 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/useful-resources/handbooks (Student Handbook).

7. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

8. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

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:
- 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)
STAT3655 Survival analysis (6)
STAT4011 Natural language processing (6)
STAT4023 Medical image analysis (6)
STAT4601 Time-series analysis (6)
STAT4602 Multivariate data analysis (6)
STAT4610 Bayesian learning (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 elective) 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 elective) 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.

6. 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/useful-resources/handbooks (Student Handbook).

7. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 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:

- **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:**
- 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)

<table>
<thead>
<tr>
<th>Level</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory</td>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6</td>
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<tr>
<td></td>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6</td>
</tr>
<tr>
<td>Advanced</td>
<td>COMP1117</td>
<td>Computer programming</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>COMP2119</td>
<td>Introduction to data structures and algorithms</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
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<td></td>
<td>MATH2014</td>
<td>Multivariable calculus and linear algebra</td>
<td>6</td>
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<td></td>
<td>STAT2601</td>
<td>Probability and statistics I</td>
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<tr>
<td></td>
<td>STAT2602</td>
<td>Probability and statistics II</td>
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### Disciplinary Core Courses (36 credits)

<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<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>
</tr>
<tr>
<td>STAT3600</td>
<td>Linear statistical analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT3612</td>
<td>Statistical machine learning</td>
<td>6</td>
</tr>
<tr>
<td>STAT4609</td>
<td>Big data analytics</td>
<td>6</td>
</tr>
</tbody>
</table>

### Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

- COMP3250: Design and analysis of algorithms
- COMP3270: Artificial intelligence
- COMP3323: Advanced database systems
- COMP3407: Scientific computing
- MATH3408: Computational methods and differential equations with applications
- MATH3600: Discrete mathematics
MATH3601 Numerical analysis (6)
MATH3901 Operations research I (6)
STAT3620 Modern nonparametric statistics (6)
STAT3621 Statistical data analysis (6)
STAT3622 Data visualization (6)
STAT3655 Survival analysis (6)
STAT4011 Natural language processing (6)
STAT4023 Medical image analysis (6)
STAT4601 Time-series analysis (6)
STAT4602 Multivariate data analysis (6)
STAT4610 Bayesian learning (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 elective) 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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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.

6. 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/useful-resources/handbooks (Student Handbook).

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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)

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)
STAT3620  Modern nonparametric statistics (6)
STAT3621  Statistical data analysis (6)
STAT3622  Data visualization (6)
STAT3655  Survival analysis (6)
STAT4011  Natural language processing (6)
STAT4023  Medical image analysis (6)
STAT4601  Time-series analysis (6)
STAT4602  Multivariate data analysis (6)
STAT4610  Bayesian learning (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
   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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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 elective) 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.

6. 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/useful-resources/handbooks (Student Handbook).

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2017
admitted to Year 1 in

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 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)
STAT3620 Modern nonparametric statistics (6)
STAT3621 Statistical data analysis (6)
STAT3622 Data visualization (6)
STAT3655 Survival analysis (6)
STAT4011 Natural language processing (6)
STAT4023 Medical image analysis (6)
STAT4601 Time-series analysis (6)
STAT4602 Multivariate data analysis (6)
STAT4610 Bayesian learning (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 elective) 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 elective) 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.

6. 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/useful-resources/handbooks (Student Handbook).

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2022

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, the biosphere, 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, environment and life 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

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<tr>
<td>3. Capstone requirement (6 credits)</td>
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<tr>
<td>EASC4911 Earth system: contemporary issues (6)</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. 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.

5. 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.

6. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

7. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2021

admitted to Year 1 in

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, the biosphere, 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, environment and life 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 group project learning and presentation opportunities in the curriculum)
6. PLO 6: work with other students and possess an adequate level of communication skills (by means of coursework, tutorial classes and laboratory-based learning 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)
   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)
   EASC2411 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 18 credits from List A:
   List A
   EASC3410 Hydrogeology (6)
   EASC3415 Meteorology (6)
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   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.

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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 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.

5. 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.

6. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
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   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

7. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2020 admitted to Year 1 in

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, the biosphere, 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, environment and life 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 coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Minor in Earth Sciences

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<td>Take either EASC1406 or EASC2411 to fulfill this 36 credits requirement, but not both. EASC1406 and EASC2411 are mutually exclusive.</td>
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2. Advanced level courses (42 credits)

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Take either EASC1406 or EASC2411 to fulfill this 36 credits requirement, but not both. EASC1406 and EASC2411 are mutually exclusive.
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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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 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.

5. 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.

6. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2019
admitted to Year 1 in

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, the biosphere, 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, environment and life 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)
   EASC2411 Introduction to the Earth-Life system (6)
   Take either EASC1406 or EASC2411 to fulfill this 36 credits requirement, but not both.
   EASC1406 and EASC2411 are mutually exclusive.

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)
   ENVS3313 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)

Take either EASC1406 or EASC2411 to fulfill this 36 credits requirement, but not both.
EASC1406 and EASC2411 are mutually exclusive.

159
### Science Majors

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<td>Natural hazards and mitigation</td>
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<td>EASC4408</td>
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<td>6</td>
</tr>
<tr>
<td>EASC4999</td>
<td>Earth sciences project</td>
<td>12</td>
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</table>

#### 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: 2018
admitted to Year 1 in

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, the biosphere, 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, environment and life 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 (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)
EASC2411 Introduction to the Earth-Life system (6)

Take either EASC1406 or EASC2411 to fulfill this 36 credits requirement, but not both. EASC1406 and EASC2411 are mutually exclusive.

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)
ENVS3313 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)
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: 2017
admitted to Year 1 in

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, the biosphere, 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, environment and life 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)
EASC2411 Introduction to the Life-Earth system (6)

Take either EASC1406 or EASC2411 to fulfill this 36 credits requirement, but not both. EASC1406 and EASC2411 are mutually exclusive.

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)
ENVS3313 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)
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<td>(6)</td>
</tr>
<tr>
<td>EASC4999</td>
<td>Earth sciences project</td>
<td>(12)</td>
</tr>
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</table>

#### 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 Ecology & Biodiversity
Offered to students admitted to Year 1 in 2022

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 natural environments have been impacted upon by human activities; 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, eco-toxicology, 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 extracurricular 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 Biological Sciences (Intensive)
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)
   ENVS2002 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)
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<td>BIOL3419</td>
<td>Insect ecology: the little things that run the world (6)</td>
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<td>BIOL3506</td>
<td>Evolutionary biology (6)</td>
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<td>BIOL4302</td>
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<td>Ecosystem functioning and services (6)</td>
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<td>BIOL4505</td>
<td>Oyster aquaculture: business and technology (6)</td>
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### 3. Capstone requirement (12 credits)

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<tr>
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<td>Ecology &amp; biodiversity project (12)</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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2021

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 Biological Sciences (Intensive)
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)
   ENVS2002 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)
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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

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 Biological Sciences (Intensive)
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)

BIOL1100 From molecules to cells (6)
BIOL1309 Evolutionary diversity (6)
BIOL2102 Biostatistics (6)
BIOL2103 Biological sciences laboratory course (6)
BIOL2306 Ecology and evolution (6)
ENVS2002 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)
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<tr>
<th>Course Code</th>
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</tr>
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<td>Urban ecology</td>
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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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<tbody>
<tr>
<td>BIOL4991</td>
<td>Ecology &amp; biodiversity 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, 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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
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   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 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 Biological Sciences (Intensive)
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)
- ENVS2002 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)
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3. **Capstone requirement (12 credits)**

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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 human activities 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 Biological Sciences (Intensive)
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)
   ENVS2002 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:
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   BIOL3303 Conservation biology (6)
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### Science Majors

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### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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<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>
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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.
Major Title: Major in Ecology & Biodiversity
Offered to students: admitted to Year 1 in 2017

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 Biological Sciences (Intensive)
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)
   ENVS2002 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)
### Science Majors

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
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<td>Freshwater ecology (6)</td>
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<td>BIOL3314</td>
<td>Plant structure and evolution (6)</td>
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</tr>
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<td>Experimental intertidal ecology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3322</td>
<td>Marine invertebrate zoology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3328</td>
<td>Nearshore marine and estuarine ecology (6)</td>
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</tr>
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<td>BIOL3341</td>
<td>Insect ecology: the little things that run the world (6)</td>
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<tr>
<td>BIOL3350</td>
<td>Evolutionary biology (6)</td>
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<tr>
<td>BIOL4301</td>
<td>Fish and fisheries (6)</td>
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<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment (6)</td>
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<td>BIOL4304</td>
<td>Ecosystem functioning and services (6)</td>
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<td>BIOL4505</td>
<td>Oyster aquaculture: business and technology (6)</td>
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</tr>
<tr>
<td>BIOL4861</td>
<td>Ecology &amp; biodiversity internship (6)</td>
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</tr>
<tr>
<td>ENVS3019</td>
<td>Urban ecology (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3020</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:

- 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 (Intensive)  
Offered to students: 2022  
admitted to Year 1 in

**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 Biological Sciences (Intensive)
- Major in Ecology & Biodiversity
- Minor in Ecology & Biodiversity

<table>
<thead>
<tr>
<th>Required courses (144 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (60 credits)</strong></td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses: Science Foundation Courses (12 credits)</strong></td>
</tr>
<tr>
<td>SCNC1111</td>
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<td>SCNC1112</td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (42 credits)</strong></td>
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<tr>
<td>BIOL1110</td>
</tr>
<tr>
<td>Course Code</td>
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<td>------------</td>
</tr>
<tr>
<td>BIOL1309</td>
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<tr>
<td>BIOL2102</td>
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<tr>
<td>BIOL2103</td>
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<tr>
<td>BIOL2306</td>
</tr>
<tr>
<td>EASC1401</td>
</tr>
<tr>
<td>ENVS2002</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)

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>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3101</td>
<td>Animal behaviour</td>
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<tr>
<td>BIOL3301</td>
<td>Marine biology</td>
<td>(Note 1)</td>
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<tr>
<td>BIOL3302</td>
<td>Systematics and phylogenetics</td>
<td>(Note 1)</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>

**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)
- BIOL3408 Genetics (6)
- BIOL3419 Insect ecology: the little things that run the world (6)
- BIOL3506 Evolutionary biology (6)
- BIOL4302 Environmental impact assessment (6)
- BIOL4304 Ecosystem functioning and services (6)
- BIOL4505 Oyster aquaculture: business and technology (6)
- BIOL4861 Ecology & biodiversity internship (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)

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**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.

3. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
- Mathematics qualification in Gao Kao will be considered on a case-by-case basis

4. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

- Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

5. As this curriculum is accredited by the Royal Society of Biology (RSB), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this 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.
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 Biological Sciences (Intensive)
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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<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>Credits</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>
<td>(6)</td>
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Disciplinary Core Courses (42 credits)

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<th>Credits</th>
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(Note 1)
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<th>Code</th>
<th>Course</th>
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<td>BIOL2102</td>
<td>Biostatistics</td>
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<td>BIOL2103</td>
<td>Biological sciences laboratory course</td>
<td>(Note 1)</td>
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<td>BIOL2306</td>
<td>Ecology and evolution</td>
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<td>EASC1401</td>
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<td>(6)</td>
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<td>ENVS2002</td>
<td>Environmental data analysis</td>
<td>(Note 1)</td>
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**Disciplinary Electives (6 credits)**

*Plus at least 6 credits selected from the following courses:*

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</thead>
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<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>(6)</td>
</tr>
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2. **Advanced level courses (66 to 72 credits) (Note 2)**

**Disciplinary Core Courses (30 credits)**

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<thead>
<tr>
<th>Code</th>
<th>Course</th>
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<td>BIOL3101</td>
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<td>BIOL3301</td>
<td>Marine biology</td>
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<td>BIOL3302</td>
<td>Systematics and phylogenetics</td>
<td>(Note 1)</td>
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<td>BIOL3303</td>
<td>Conservation biology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3319</td>
<td>Tropical terrestrial ecology</td>
<td>(Note 1)</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>Code</th>
<th>Course</th>
<th>Credits</th>
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</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>
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<tr>
<td>BIOL3318</td>
<td>Experimental intertidal ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3322</td>
<td>Marine invertebrate zooology</td>
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<td>BIOL3328</td>
<td>Nearshore marine and estuarine ecology</td>
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<td>BIOL3408</td>
<td>Genetics</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>
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<td>BIOL4304</td>
<td>Ecosystem functioning and services</td>
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<td>BIOL4505</td>
<td>Oyster aquaculture: business and technology</td>
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</tr>
<tr>
<td>BIOL4861</td>
<td>Ecology &amp; biodiversity internship</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS3019</td>
<td>Urban ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS3020</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>
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<tr>
<td>BIOL4991</td>
<td>Ecology &amp; biodiversity project</td>
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**Disciplinary Electives (6 credits)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>Credits</th>
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</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.

3. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

4. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary
elective course of the science major in lieu.
- Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

5. As this curriculum is accredited by the Royal Society of Biology (RSB), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this 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 Ecology & Biodiversity (Intensive)

Offered to students: 2020

admitted to Year 1 in

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 Biological Sciences (Intensive)
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)
Science Majors

| 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) |
| EASC1401 | Blue Planet (6) |
| ENVS2002 | Environmental data analysis (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)

**2. Advanced level courses (66 to 72 credits) (Note 2)**

**Disciplinary Core Courses (30 credits)**

| BIOL3101 | Animal behaviour (6) (Note 1) |
| BIOL3301 | Marine biology (6) (Note 1) |
| BIOL3302 | Systematics and phylogenetics (6) (Note 1) |
| 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)
- BIOL3408 Genetics (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: business and technology (6) [previous title: Oyster aquaculture (6)]
- BIOL4861 Ecology & biodiversity internship (6)
- ENVS3019 Urban ecology (6)
- ENVS3020 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.

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.

3. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu:
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

4. As this curriculum is accredited by the Royal Society of Biology (RSB), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this 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 Ecology & Biodiversity (Intensive)
Offered to students 2019
admitted to Year 1 in

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 Biological Sciences (Intensive)
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)
### Disciplinary Electives (6 credits)

*Plus at least 6 credits selected from the following courses:*

- CHEM1041: Foundations of chemistry (6)
- CHEM1042: General chemistry I (6)

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)

- 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:*

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- BIOL3313: Freshwater ecology (6)
- BIOL3314: Plant structure and evolution (6)
- BIOL3318: Experimental intertidal ecology (6)
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- BIOL3328: Nearshore marine and estuarine ecology (6)
- BIOL3408: Genetics (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: business and technology (6)  
  [previous title: Oyster aquaculture (6)]
- BIOL4861: Ecology & biodiversity internship (6)
- ENVS3019: Urban environment (6)
- ENVS3020: 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 2018

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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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 Biological Sciences (Intensive)
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)
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<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
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<td>BIOL2102</td>
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<td>BIOL2103</td>
<td>Biological sciences laboratory course</td>
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<td>BIOL2306</td>
<td>Ecology and evolution</td>
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<td>EASC1401</td>
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<td>ENVS2002</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>
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<th>Course Code</th>
<th>Course Title</th>
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<td>CHEM1041</td>
<td>Foundations of chemistry</td>
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<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
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</tbody>
</table>

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>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3101</td>
<td>Animal behaviour</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>
<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>

**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>Credit Hours</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>BIOL3408</td>
<td>Genetics</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>
<tr>
<td>BIOL4304</td>
<td>Ecosystem functioning and services</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL4505</td>
<td>Oyster aquaculture: business and technology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL4861</td>
<td>Ecology &amp; biodiversity internship</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS3019</td>
<td>Urban ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS3020</td>
<td>Global change ecology</td>
<td>(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>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4991</td>
<td>Ecology &amp; biodiversity project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

**Disciplinary Electives (6 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</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.
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 Biological Sciences (Intensive)
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)
**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)
- **BIOL3318** Experimental intertidal ecology (6)
- **BIOL3322** Marine invertebrate zoology (6)
- **BIOL3328** Nearshore marine and estuarine ecology (6)
- **BIOL3408** Genetics (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: business and technology (6) [*previous title: Oyster aquaculture (6)*]
- **BIOL4861** Ecology & biodiversity internship (6)
- **ENVS3019** Urban ecology (6)
- **ENVS3020** 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.

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 2022
admitted to Year 1 in

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)
- ENVIS1401 Introduction to environmental science (6)
- ENVIS2001 Methods in environmental science (6)
- ENVIS2002 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)
- ENVIS1301 Environmental life science (6)
- BIOL2306 Ecology and evolution (6)
- CHEM2241 Analytical chemistry I (6)
- GEOG2120 Introductory spatial analysis (6)

2. Advanced level courses (42 credits)

Disciplinary Core Courses (6 credits)
- ENVIS3004 Environment, society and economics (6)

Disciplinary Electives (36 credits)
At least 36 credits selected from the following courses:
- BIOL3109 Environmental and molecular ecology (6)
- BIOL3216 Food waste management (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)
- EASC3406 Environmental remote sensing (6)
- EASC3419 Earth System Science Field Studies (6)
- ENVIS3007 Natural hazards and mitigation (6)
- ENVIS3010 Sustainable energy and environment (6)
- ENVIS3019 Urban ecology (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVS3020</td>
<td>Global change ecology (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3022</td>
<td>Environmental science field course (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3028</td>
<td>Coastal Sustainability (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3042</td>
<td>Pollution (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3202</td>
<td>Plant ecophysiology and climate change (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3313</td>
<td>Environmental oceanography (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3401</td>
<td>Understanding tropical ecosystems in a changing world (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3402</td>
<td>Qualitative data, social science methods and decision-making in environmental science (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3403</td>
<td>Spatial analysis in environmental biology (6)</td>
<td></td>
</tr>
<tr>
<td>GEOG3202</td>
<td>GIS in environmental studies (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment (6)</td>
<td></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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2021

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)

<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 (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>ENV1401</td>
<td>Introduction to environmental science</td>
<td>6</td>
</tr>
<tr>
<td>ENV2001</td>
<td>Methods in environmental science</td>
<td>6</td>
</tr>
<tr>
<td>ENV2002</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>
<tr>
<td>GEOG2120</td>
<td>Introductory spatial analysis</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>ENV3004</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>BIOL3109</td>
<td>Environmental and molecular ecology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3110</td>
<td>Environmental toxicology</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>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>EASC3406</td>
<td>Environmental remote sensing</td>
<td>6</td>
</tr>
<tr>
<td>EASC3419</td>
<td>Earth System Science Field Studies</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>
</tbody>
</table>

[previous title: Environmental microbiology (6)]
ENVS3019 Urban ecology (6)
ENVS3020 Global change ecology (6)
ENVS3022 Environmental science field course (6)
ENVS3028 Coastal Sustainability (6)
ENVS3042 Pollution (6)
ENVS3202 Plant ecophysiology and climate change (6) [previous title: Plant physiology and climate change (6)]
ENVS3313 Environmental oceanography (6)
ENVS3401 Understanding tropical ecosystems in a changing world (6)
ENVS3402 Qualitative data, social science methods and decision-making in environmental science (6)
ENVS3403 Spatial analysis in environmental biology (6)
GEOG3202 GIS in environmental studies (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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

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)
   GEOG2120   Introductory spatial analysis (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:
   BIOL3109   Environmental and molecular ecology (6)
   BIOL3110   Environmental toxicology (6)
   BIOL3216   Food waste management (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)
   EASC3419   Earth System Science Field Studies (6)
   ENVS3007   Natural hazards and mitigation (6)
   ENVS3010   Sustainable energy and environment (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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2019 admitted to Year 1 in

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)
   GEOG2120 Introductory spatial analysis (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:
   BIOL3109 Environmental and molecular ecology (6)
   BIOL3110 Environmental toxicology (6)
   BIOL3216 Food waste management (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)
   EASC3419 Earth System Science Field Studies (6)
   ENVS3007 Natural hazards and mitigation (6)
   ENVS3010 Sustainable energy and environment (6)

Note: May take either ENVS1301 or BIOL2306 to fulfill this 12 credits requirement, but not both.

Note: May take either ENVS1301 or BIOL2306 to fulfill this 12 credits requirement, but not both.
**Science Majors**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
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<tbody>
<tr>
<td>ENVS3019</td>
<td>Urban ecology (6)</td>
</tr>
<tr>
<td>ENVS3020</td>
<td>Global change ecology (6)</td>
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<tr>
<td>ENVS3022</td>
<td>Environmental science field course (6)</td>
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<tr>
<td>ENVS3028</td>
<td>Coastal Sustainability (6)</td>
</tr>
<tr>
<td>ENVS3042</td>
<td>Pollution (6)</td>
</tr>
<tr>
<td>ENVS3202</td>
<td>Plant ecophysiology and climate change (6)</td>
</tr>
<tr>
<td>ENVS3313</td>
<td>Environmental oceanography (6)</td>
</tr>
<tr>
<td>ENVS3401</td>
<td>Understanding tropical ecosystems in a changing world (6)</td>
</tr>
<tr>
<td>ENVS3402</td>
<td>Qualitative data, social science methods and decision-making in environmental science (6)</td>
</tr>
<tr>
<td>ENVS3403</td>
<td>Spatial analysis in environmental biology (6)</td>
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<tr>
<td>GEOL3202</td>
<td>GIS in environmental studies (6)</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment (6)</td>
</tr>
<tr>
<td>ENVS4110</td>
<td>Environmental remediation (6)</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>
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<tbody>
<tr>
<td>ENVS3999</td>
<td>Directed studies in environmental science (6)</td>
</tr>
<tr>
<td>ENVS4966</td>
<td>Environmental science internship (6)</td>
</tr>
<tr>
<td>ENVS4999</td>
<td>Environmental 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 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)
   GEOG2120  Introductory spatial analysis (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:
   BIOL3109  Environmental and molecular ecology (6)  [previous title: Environmental microbiology (6)]
   BIOL3110  Environmental toxicology (6)
   BIOL3216  Food waste management (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)
   EASC3419  Earth System Science Field Studies (6)
   ENVS3007  Natural hazards and mitigation (6)
   ENVS3010  Sustainable energy and environment (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: 2017 admitted to Year 1 in

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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<tr>
<th>Required courses (96 credits)</th>
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<tbody>
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<td><strong>1. Introductory level courses (48 credits)</strong></td>
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<tr>
<td><strong>Disciplinary Core Courses: Science Foundation Courses (12 credits)</strong></td>
</tr>
<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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<tr>
<td><strong>Disciplinary Core Courses (18 credits)</strong></td>
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<tr>
<td>ENVS1401 Introduction to environmental science (6)</td>
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<td>ENVS2001 Methods in environmental science (6)</td>
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<td>ENVS2002 Environmental data analysis (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (18 credits)</strong></td>
</tr>
<tr>
<td>At least 18 credits selected from the following courses (Level 1 &amp; 2):</td>
</tr>
<tr>
<td>CHEM1042 General chemistry I (6)</td>
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<tr>
<td>EASC1020 Introduction to climate science (6)</td>
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<td>EASC1401 Blue Planet (6)</td>
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<td>ENVS1301 Environmental life science (6)</td>
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<tr>
<td>STAT1601 Elementary statistical methods (6)</td>
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<td>STAT1603 Introductory statistics (6)</td>
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<td>BIOL2102 Biostatistics (6)</td>
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<td>BIOL2306 Ecology and evolution (6)</td>
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<td>CHEM2041 Principles of chemistry (6)</td>
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<td>CHEM2241 Analytical chemistry I (6)</td>
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<td>CHEM2442 Fundamentals of organic chemistry (6)</td>
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<tr>
<td>May take either STAT1601 or STAT1603 to fulfill this 18 credits requirement, but not both.</td>
</tr>
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<td>May take either STAT1601 or STAT1603 to fulfill this 18 credits requirement, but not both.</td>
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<td><strong>2. Advanced level courses (42 credits)</strong></td>
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<td><strong>Disciplinary Core Courses (6 credits)</strong></td>
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<td>ENVS3004 Environment, society and economics (6)</td>
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<td><strong>Disciplinary Electives (36 credits)</strong></td>
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<td>CHEM3242 Food and water analysis (6)</td>
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<td>EASC3020 Global change: anthropogenic impacts (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)
- ENV4966 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 Food & Nutritional Science
Offered to students admitted to Year 1 in 2022

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)

<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 (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>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>BIOL2102</td>
<td>Biostatistics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2103</td>
<td>Biological sciences laboratory</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</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>BIOC2600</td>
<td>Basic biochemistry</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>CHEM1042</td>
<td>General chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2442</td>
<td>Fundamentals of organic chemistry</td>
<td>6</td>
</tr>
<tr>
<td>GEOG2013</td>
<td>Sustainable development</td>
<td>6</td>
</tr>
<tr>
<td>GEOG2030</td>
<td>Global development</td>
<td>6</td>
</tr>
<tr>
<td>GEOG2152</td>
<td>Health and medical geography</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 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 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. 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, BIOL2103, BIOL2220 or BIOC2600; 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, BIOL3206, BIOL3207, BIOL3208, BIOL3209, BIOL3211, BIOL3217, BIOL3606, BIOL4201, BIOL4202, BIOL4209, BIOL4210, BIOL4211, STAT3617, and BBMS4004.
   Capstone requirement: any 1 Capstone Course: BIOL3992, BIOL4922, BIOL4962, and BIOL4992.

5. 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, BIOL2103, BIOL2220 or BIOC2600; 2 Disciplinary Electives: GEOG2013, GEOG2030, GEOG2152 and GEOG2154.
   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, BIOL3216, BIOL3217, BIOL3218, BIOL3606, BIOL3608, BIOL4201, BIOL4205, BIOL4209, BIOL4411, GEOG3202, POLI3121, STAT3617, and BBMS4004.
   Capstone requirement: any 1 Capstone Course: BIOL3992, BIOL4922, BIOL4962, and BIOL4992.

6. 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, BIOL2103, CHEM1042 and CHEM2442 in Year 1/2 of the study. Students should also take BIOL3204, BIOL3503 and one Level 3/4 course related to molecular biology.

7. Specialisation recognition will be allowed for 2014-2018 student intake. Students who already took any two of these CHEM1041, CHEM1042, CHEM1043, CHEM2441, CHEM2442 can be counted as two disciplinary electives for specialization in Nutrition and Public Health.

8. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
- Mathematics qualification in Gao Kao will be considered on a case-by-case basis

9. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
- Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 | 2021 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)

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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 (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) |
| BIOL2600 | Basic biochemistry (6) |

Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

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 selected from the following courses: |
| CHEM1042 | General chemistry I (6) |
| CHEM2442 | Fundamentals of organic chemistry (6) |
| GEOG2013 | Sustainable development (6) |
| GEOG2030 | Global development (6) |
| GEOG2152 | Health and medical geography (6) |

207
2. Advanced level courses (30 credits)

Disciplinary Core Courses (12 credits)
- BIOL3202: Nutritional biochemistry (6)
- BIOL3203: Food microbiology (6)

Disciplinary Electives (18 credits)
At least 12 credits of advanced level BIOL3XXX and/or BIOL4XXX course from the list below:
- BIOL3204: Nutrition and the life cycle (6)
- BIOL3205: Human physiology (6)
- BIOL3207: Principles of toxicology (6)
- BIOL3209: Food and nutrient analysis (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)
- BIOL4201: Public health nutrition (6)
- BIOL4202: Nutrition and sports performance (6)
- BIOL4205: Food technology (6)
- BIOL4209: Functional foods (6)
- BIOL4411: Plant and food biotechnology (6)
- BIOC3606: Molecular medicine (6)
- STAT3617: Sample survey methods (6)
- GEOG3202: GIS in environmental studies (6)
- POLI3121: Environmental policy (6)
- BBMS4004: Public health genetics (6)

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.

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4. 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, BIOL2103, BIOL2202 or BIOC2600; 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, BIOL3606, BIOL4201, BIOL4202, BIOL4209, BIOC3606, STAT3617, and BBMS4004.

Capstone requirement: any 1 Capstone Course: BIOL3992, BIOL4922, BIOL4962, and BIOL4992.

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- Introduction level courses - 2 Disciplinary Core Courses: Science Foundation: SCNC1111 and SCNC1112; 6 Disciplinary Core Courses: BIOL1110, BIOL1201, BIOL2101; BIOL2102, BIOL2103, BIOL2202 or BIOC2600; 2 Disciplinary Electives: GEOG2013, GEOG2030, GEOG2152 and GEOG2154.

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, BIOL3216, BIOL3217, BIOL3218, BIOL3606, BIOL3608, BIOL4201, BIOL4205, BIOL4209, BIOL4411, GEOG3202, POLI3121; STAT3617, and BBMS4004.

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7. Specialisation recognition will be allowed for 2014-2018 student intake. Students who already took any two of these CHEM1041, CHEM1042, CHEM1043, CHEM2441, CHEM2442 can be counted as two disciplinary electives for specialization in Nutrition and Public Health.

8. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
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- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
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9. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
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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 Food & Nutritional Science
Offered to students: 2020
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.

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Learning Outcomes:
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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)
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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: (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)
   BIOC2600 Basic biochemistry (6)

   Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

   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 selected from the following courses:
   CHEM1042 General chemistry I (6)
   CHEM2442 Fundamentals of organic chemistry (6)
   GEOG2013 Sustainable development (6)
   GEOG2030 Global development (6)
   GEOG2152 Health and medical geography (6)
2. Advanced level courses (30 credits)

Disciplinary Core Courses (12 credits)

- BIOL3202: Nutritional biochemistry (6)
- BIOL3203: Food microbiology (6)

Disciplinary Electives (18 credits)

At least 12 credits of advanced level BIOL3XXX and/or BIOL4XXX course from the list below:

- BIOL3204: Nutrition and the life cycle (6)
- BIOL3205: Human physiology (6)
- BIOL3207: Principles of toxicology (6)
- BIOL3209: Food and nutrient analysis (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)
- BIOL4201: Public health nutrition (6)
- BIOL4202: Nutrition and sports performance (6)
- BIOL4205: Food technology (6)
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- BIOL4411: Plant and food biotechnology (6)
- BIOC3606: Molecular medicine (6)
- STAT3617: Sample survey methods (6)
- GEOG3202: GIS in environmental studies (6)
- POLI3121: Environmental policy (6)
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3. Capstone requirement (6 credits)

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. 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, BIOL2103, BIOL2220 or BIOC2600; 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, BIOL3206, BIOL3207, BIOL3208, BIOL3209, BIOL3217, BIOL3606, BIOL4201, BIOL4202, BIOL4209, BIOC3606, STAT3617, and BBMS4004.

Capstone requirement: any 1 Capstone Course: BIOL3992, BIOL4922, BIOL4962, and BIOL4992.

5. 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, BIOL2103, BIOL2220 or BIOC2600; 2 Disciplinary Electives: GEOG2013, GEOG2030 and GEOG2152 and GEOG2154.

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, BIOL3216, BIOL3217, BIOL3218, BIOL3606, BIOL3608, BIOL4201, BIOL4205, BIOL4209, BIOL4411, GEOG3202, POLI3121, STAT3617, and BBMS4004.

Capstone requirement: any 1 Capstone Course: BIOL3992, BIOL4922, BIOL4962, and BIOL4992.

6. 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, BIOL2103, CHEM1042 and CHEM2442 in Year 1/2 of the study. Students should also take BIOL3204, BIOL3503 and one Level 3/4 courses related to molecular biology.

7. Specialisation recognition will be allowed for 2014-2018 student intake. Students who already took any two of these CHEM1041, CHEM1042, CHEM1043, CHEM2441, CHEM2442 can be counted as two disciplinary electives for specialization in Nutrition and Public Health.

8. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
<table>
<thead>
<tr>
<th>Remarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.</td>
</tr>
</tbody>
</table>
Major in Food & Nutritional Science

Offered to students admitted to Year 1 in 2019

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)

<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>
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</tr>
</tbody>
</table>

#### Disciplinary Core Courses (36 credits)

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<tr>
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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>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>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>BIOC2600</td>
<td>Basic biochemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

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 selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2442</td>
<td>Fundamentals of organic chemistry</td>
<td>6</td>
</tr>
<tr>
<td>GEOG2013</td>
<td>Sustainable development</td>
<td>6</td>
</tr>
<tr>
<td>GEOG2030</td>
<td>Global development</td>
<td>6</td>
</tr>
<tr>
<td>GEOG2152</td>
<td>Health and medical geography</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL2220 or BIOC2600 to fulfill this 36 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.
### Science Majors

#### 2. Advanced level courses (30 credits)

**Disciplinary Core Courses (12 credits)**
- BIOL3202: Nutritional biochemistry (6)
- BIOL3203: Food microbiology (6)

**Disciplinary Electives (18 credits)**

At least 12 credits of advanced level BIOL3XXX and/or BIOL4XXX course from the list below:

- BIOL3204: Nutrition and the life cycle (6)
- BIOL3205: Human physiology (6)
- BIOL3207: Principles of toxicology (6)
- BIOL3209: Food and nutrient analysis (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)
- BIOL4201: Public health nutrition (6)
- BIOL4202: Nutrition and sports performance (6)
- BIOL4205: Food technology (6)
- BIOL4209: Functional foods (6)
- BIOL4411: Plant and food biotechnology (6)
- BIOC3606: Molecular medicine (6)
- STAT3617: Sample survey methods (6)
- GEOG3202: GIS in environmental studies (6)
- POLI3121: Environmental policy (6)
- BBMS4004: Public health genetics (6)

#### 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.

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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. 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, BIOL2103, BIOL2220 or BIOC2600; 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. 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, BIOL2103, BIOL2220 or BIOC2600; 2 Disciplinary Electives: GEOG2013, GEOG2030, GEOG2152 and GEOG2154. 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. 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, BIOL2103, CHEM1042 and CHEM2442 in Year 1/2 of the study. Students should also take BIOL3204, BIOL3503 and one Level 3/4 courses related to molecular biology.

8. Specialisation recognition will be allowed for 2014-2018 student intake. Students who already took any two of these CHEM1041, CHEM1042, CHEM2441, CHEM2442 can be counted as two disciplinary electives for specialization in Nutrition and Public Health.

### Remarks:
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Major Title: Major in Food & Nutritional Science
Offered to students: 2018
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 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 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)
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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 (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.

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 to fulfill this 24 credits requirement, but not both.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3207</td>
<td>Principles of toxicology (6)</td>
<td>BIOL3206 and BIOL3606 are mutually exclusive. [previous title: Food and nutritional toxicology (6)]</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>
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<tr>
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</tr>
<tr>
<td>BIOL3218</td>
<td>Food hygiene and quality control (6)</td>
<td></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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<tr>
<td>BIOL4202</td>
<td>Nutrition and sports performance (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4205</td>
<td>Food technology (6)</td>
<td>[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.</td>
</tr>
<tr>
<td>BIOL4208</td>
<td>Meat, dairy and grain sciences (6)</td>
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<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:

   - 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; BIOL4913; 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: 2017 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 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)

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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)

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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)
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- BIOL2220 Principles of biochemistry (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.

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Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
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- BIOL3205 Human physiology (6)
- BIOL3206 Clinical nutrition (6)

Take either BIOL3206 or BIOL3606 to fulfill this 24 credits requirement, but not both.
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<td></td>
</tr>
<tr>
<td>BIOL3216</td>
<td>Food waste management (6)</td>
<td></td>
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<tr>
<td>BIOL3217</td>
<td>Food, environment and health (6)</td>
<td></td>
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<tr>
<td>BIOL3218</td>
<td>Food hygiene and quality control (6)</td>
<td></td>
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<tr>
<td>BIOL3606</td>
<td>Diet and disease (6)</td>
<td></td>
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<tr>
<td>BIOL3608</td>
<td>Food commodities (6)</td>
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<tr>
<td>BIOL4201</td>
<td>Public health nutrition (6)</td>
<td></td>
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<tr>
<td>BIOL4202</td>
<td>Nutrition and sports performance (6)</td>
<td></td>
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<tr>
<td>BIOL4205</td>
<td>Food technology (6)</td>
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<tr>
<td>BIOL4208</td>
<td>Meat, dairy and grain sciences (6)</td>
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<tr>
<td>BIOL4209</td>
<td>Functional foods (6)</td>
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<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology (6)</td>
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<tr>
<td>BIOL3992</td>
<td>Directed studies in food &amp; nutritional science (6)</td>
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<tr>
<td>BIOL4913</td>
<td>Advanced practicum on food and nutrient analysis (6)</td>
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<tr>
<td>BIOL4922</td>
<td>Food product development and evaluation (6)</td>
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<tr>
<td>BIOL4962</td>
<td>Food &amp; nutritional science internship (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4992</td>
<td>Food &amp; nutritional science project (12)</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)
   - 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.

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 elective) 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; BIOL4913; 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 Geology

Offered to students admitted to Year 1 in 2022

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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2021

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) |
| ENV3007   | 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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2020
admitted to Year 1 in

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)
   - ENV3007: 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)
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<thead>
<tr>
<th>Notes:</th>
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<td>4. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.</td>
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</table>
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)

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</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>
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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>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>
<tr>
<td>EASC2402</td>
<td>Field and laboratory methods</td>
<td>6</td>
</tr>
<tr>
<td>EASC2406</td>
<td>Geochemistry</td>
<td>6</td>
</tr>
<tr>
<td>EASC2407</td>
<td>Mineralogy</td>
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3. Advanced level courses (48 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC3402</td>
<td>Petrology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3403</td>
<td>Sedimentary environments</td>
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</tr>
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<td>EASC3404</td>
<td>Structural geology</td>
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<td>EASC3408</td>
<td>Geophysics</td>
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</tr>
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<td>EASC4406</td>
<td>Earth dynamics &amp; global tectonics</td>
<td>6</td>
</tr>
</tbody>
</table>

4. 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>EASC3406</td>
<td>Reconstruction of past climate</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>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>EASC3999</td>
<td>Directed studies in earth sciences</td>
<td>6</td>
</tr>
<tr>
<td>ENVS3007</td>
<td>Natural hazards and mitigation</td>
<td>6</td>
</tr>
<tr>
<td>EASC4403</td>
<td>Biogeochemical cycles</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>EASC4999</td>
<td>Earth sciences project</td>
<td>12</td>
</tr>
</tbody>
</table>

5. Capstone requirement (6 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC4955</td>
<td>Integrated field studies</td>
<td>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

<table>
<thead>
<tr>
<th>Required courses (96 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (42 credits)</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 (30 credits)</strong></td>
</tr>
<tr>
<td>EASC1402</td>
</tr>
<tr>
<td>EASC2401</td>
</tr>
<tr>
<td>EASC2402</td>
</tr>
<tr>
<td>EASC2406</td>
</tr>
<tr>
<td>EASC2407</td>
</tr>
<tr>
<td><strong>2. Advanced level courses (48 credits)</strong></td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (36 credits)</strong></td>
</tr>
<tr>
<td>EASC3402</td>
</tr>
<tr>
<td>EASC3403</td>
</tr>
<tr>
<td>EASC3404</td>
</tr>
<tr>
<td>EASC3408</td>
</tr>
<tr>
<td>EASC3409</td>
</tr>
<tr>
<td>EASC4406</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>EASC3406</td>
</tr>
<tr>
<td>EASC3410</td>
</tr>
<tr>
<td>EASC3412</td>
</tr>
<tr>
<td>EASC3413</td>
</tr>
<tr>
<td>EASC3414</td>
</tr>
<tr>
<td>EASC3416</td>
</tr>
<tr>
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</tr>
<tr>
<td>EASC3999</td>
</tr>
<tr>
<td>ENVS3007</td>
</tr>
<tr>
<td>EASC4403</td>
</tr>
<tr>
<td>EASC4407</td>
</tr>
<tr>
<td>EASC4408</td>
</tr>
<tr>
<td>EASC4999</td>
</tr>
<tr>
<td><strong>3. Capstone requirement (6 credits)</strong></td>
</tr>
<tr>
<td>EASC4955</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 (8 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
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)
- 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 (Intensive)

**Offered to students:** admitted to Year 1 in 2022

**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)**

<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 (42 credits)**

<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>
<tr>
<td>EASC2402</td>
<td>Field and laboratory methods</td>
<td>6</td>
</tr>
<tr>
<td>EASC2406</td>
<td>Geochemistry</td>
<td>6</td>
</tr>
<tr>
<td>EASC2407</td>
<td>Mineralogy</td>
<td>6</td>
</tr>
<tr>
<td>EASC2409</td>
<td>Regional field studies</td>
<td>6</td>
</tr>
</tbody>
</table>

#### 2. Advanced level courses (78 to 90 credits) (Note 1)

**Disciplinary Core Courses (60 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>EASC3408</td>
<td>Geophysics</td>
<td>6</td>
</tr>
<tr>
<td>EASC3409</td>
<td>Igneous and metamorphic petrogenesis</td>
<td>6</td>
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<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>EASC4999</td>
<td>Earth sciences project</td>
<td>12</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing</td>
<td>6</td>
</tr>
<tr>
<td>EASC3413</td>
<td>Engineering geology</td>
<td>6</td>
</tr>
</tbody>
</table>

**List B**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC2404</td>
<td>Introduction to atmosphere and hydrosphere</td>
<td>6</td>
</tr>
<tr>
<td>EASC2406</td>
<td>Planetary geology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
<td>6</td>
</tr>
<tr>
<td>EASC3406</td>
<td>Reconstruction of past climate</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>EASC3414</td>
<td>Soil and rock mechanics</td>
<td>6</td>
</tr>
<tr>
<td>EASC3416</td>
<td>Advanced geochemistry and geochronology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3999</td>
<td>Directed studies in earth sciences</td>
<td>6</td>
</tr>
<tr>
<td>ENVS3007</td>
<td>Natural hazards and mitigation</td>
<td>6</td>
</tr>
<tr>
<td>ENVS3313</td>
<td>Environmental oceanography</td>
<td>6</td>
</tr>
<tr>
<td>EASC4403</td>
<td>Biogeochemical cycles</td>
<td>6</td>
</tr>
</tbody>
</table>
233

Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>EASC4966</td>
<td>Earth sciences internship</td>
<td>(6)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC4955</td>
<td>Integrated field studies</td>
<td>(6)</td>
</tr>
</tbody>
</table>

(Note 1)

**Notes:**

1. These are core courses in the regular Geology Major (96 credits) curriculum.

2. 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.

3. 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.

4. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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:
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)

<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 (12 credits)

<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>
<tr>
<td>EASC2402</td>
<td>Field and laboratory methods</td>
<td>(6)</td>
</tr>
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<td>EASC2406</td>
<td>Geochemistry</td>
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</tr>
<tr>
<td>EASC2407</td>
<td>Mineralogy</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC2409</td>
<td>Regional field studies</td>
<td>(6)</td>
</tr>
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</table>

#### 2. Advanced level courses (78 to 90 credits) (Note 1)

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<th>Course Code</th>
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<td>EASC3402</td>
<td>Petrology</td>
<td>(6)</td>
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<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>EASC3408</td>
<td>Geophysics</td>
<td>(6)</td>
</tr>
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<td>(6)</td>
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<td>EASC3417</td>
<td>Earth through time</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>EASC4999</td>
<td>Earth sciences project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

#### 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**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC3413</td>
<td>Engineering geology</td>
<td>(6)</td>
</tr>
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</table>

**List B**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC2404</td>
<td>Introduction to atmosphere and hydrosphere</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC2408</td>
<td>Planetary geology</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC3406</td>
<td>Reconstruction of past climate</td>
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<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>EASC3414</td>
<td>Soil and rock mechanics</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC3416</td>
<td>Advanced geochemistry and geochronology</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC3999</td>
<td>Directed studies in earth sciences</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS3007</td>
<td>Natural hazards and mitigation</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS3313</td>
<td>Environmental oceanography</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC4403</td>
<td>Biogeochemical cycles</td>
<td>(6)</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------</td>
<td>---------</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>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>

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

**Notes:**

1. These are core courses in the regular Geology Major (96 credits) curriculum.

2. 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.

3. 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.

4. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

### 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:

1. **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)

2. **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)

3. **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)

4. **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)

5. **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)**

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**Disciplinary Core Courses (42 credits)**

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</tr>
<tr>
<td>EASC1402</td>
<td>Principles of geology</td>
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2. **Advanced level courses (78 to 90 credits) (Note 1)**

**Disciplinary Core Courses (60 credits)**

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<td>Structural geology</td>
<td>(6)</td>
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<td>EASC3408</td>
<td>Geophysics</td>
<td>(6)</td>
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<td>EASC3409</td>
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<td>(6)</td>
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**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:

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<td>Hydrogeology</td>
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</tr>
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<td>Earth resources</td>
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</tr>
<tr>
<td>EASC3414</td>
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<td>EASC3999</td>
<td>Directed studies in earth sciences</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS3007</td>
<td>Natural hazards and mitigation</td>
<td>(6)</td>
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<td>ENVS3313</td>
<td>Environmental oceanography</td>
<td>(6)</td>
</tr>
<tr>
<td>EASC4403</td>
<td>Biogeochemical cycles</td>
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</table>
### 3. Capstone requirement (6 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>EASC4955</td>
<td>Integrated field studies</td>
<td>6</td>
</tr>
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</table>

(Note 1)

#### Notes:

1. These are core courses in the regular Geology Major (96 credits) curriculum.

2. 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.

3. 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.

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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 Geology (Intensive)
Offered to students: 2019
admitted to Year 1 in

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)

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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 1)
   - SCNC1112 Fundamentals of modern science (6) (Note 1)

   **Disciplinary Core Courses (42 credits)**
   - EASC1401 Blue Planet (6)
   - EASC1402 Principles of geology (6) (Note 1)
   - EASC2401 Fluid/solid interactions in earth processes (6) (Note 1)
   - EASC2402 Field and laboratory methods (6) (Note 1)
   - EASC2406 Geochemistry (6) (Note 1)
   - EASC2407 Mineralogy (6) (Note 1)
   - EASC2409 Regional field studies (6)

2. Advanced level courses (78 to 90 credits) (Note 1)

   **Disciplinary Core Courses (60 credits)**
   - EASC3402 Petrology (6) (Note 1)
   - EASC3403 Sedimentary environments (6) (Note 1)
   - EASC3404 Structural geology (6) (Note 1)
   - EASC3408 Geophysics (6) (Note 1)
   - EASC3409 Igneous and metamorphic petrogenesis (6) (Note 1)
   - EASC3417 Earth through time (6)
   - EASC4406 Earth dynamics & global tectonics (6) (Note 1)
   - EASC4407 Regional geology (6)
   - EASC4999 Earth sciences project (12) (Note 2)

   **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**
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   - EASC2406 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)
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<tbody>
<tr>
<td>EASC4408</td>
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<td>Earth sciences internship (6)</td>
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3. Capstone requirement (6 credits)

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
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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 Geology (Intensive)
Offered to students: 2018
admitted to Year 1 in

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)

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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)

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<tr>
<td>EASC2409</td>
<td>Regional field studies (6)</td>
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</tr>
</tbody>
</table>

2. Advanced level courses (78 to 90 credits) (Note 1)
Disciplinary Core Courses (60 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC3402</td>
<td>Petrology (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>EASC3403</td>
<td>Sedimentary environments (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>EASC3404</td>
<td>Structural geology (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>EASC3408</td>
<td>Geophysics (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>EASC3409</td>
<td>Igneous and metamorphic petrogenesis (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>EASC3417</td>
<td>Earth through time (6)</td>
<td></td>
</tr>
<tr>
<td>EASC4406</td>
<td>Earth dynamics &amp; global tectonics (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>EASC4407</td>
<td>Regional geology (6)</td>
<td></td>
</tr>
<tr>
<td>EASC4999</td>
<td>Earth sciences project (12)</td>
<td>(Note 2)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3413</td>
<td>Engineering geology (6)</td>
<td></td>
</tr>
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</table>

List B

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC2404</td>
<td>Introduction to atmosphere and hydrosphere (6)</td>
<td></td>
</tr>
<tr>
<td>EASC2408</td>
<td>Planetary geology (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3406</td>
<td>Reconstruction of past climate (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3410</td>
<td>Hydrogeology (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3412</td>
<td>Earth resources (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3414</td>
<td>Soil and rock mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3416</td>
<td>Advanced geochemistry and geochronology (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3999</td>
<td>Directed studies in earth sciences (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3007</td>
<td>Natural hazards and mitigation (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3313</td>
<td>Environmental oceanography (6)</td>
<td></td>
</tr>
<tr>
<td>EASC4403</td>
<td>Biogeochemical cycles (6)</td>
<td></td>
</tr>
</tbody>
</table>
### 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 1)*

### Notes:
1. These are core courses in the regular Geology Major (96 credits) curriculum.
2. 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.
3. 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.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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  
2017

admitted to Year 1 in

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)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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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 (42 credits)

<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>
<tr>
<td>EASC2402</td>
<td>Field and laboratory methods</td>
<td>6</td>
</tr>
<tr>
<td>EASC2406</td>
<td>Geochemistry</td>
<td>6</td>
</tr>
<tr>
<td>EASC2407</td>
<td>Mineralogy</td>
<td>6</td>
</tr>
<tr>
<td>EASC2409</td>
<td>Regional field studies</td>
<td>6</td>
</tr>
</tbody>
</table>

2. Advanced level courses (78 to 90 credits) (Note 1)

Disciplinary Core Courses (60 credits)

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</thead>
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<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>EASC3408</td>
<td>Geophysics</td>
<td>6</td>
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<tr>
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<td>Earth dynamics &amp; global tectonics</td>
<td>6</td>
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<tr>
<td>EASC4407</td>
<td>Regional geology</td>
<td>6</td>
</tr>
<tr>
<td>EASC4999</td>
<td>Earth sciences project</td>
<td>12</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
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<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing</td>
<td>6</td>
</tr>
<tr>
<td>EASC3413</td>
<td>Engineering geology</td>
<td>6</td>
</tr>
</tbody>
</table>

List B

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC2404</td>
<td>Introduction to atmosphere and hydrosphere</td>
<td>6</td>
</tr>
<tr>
<td>EASC2406</td>
<td>Planetary geology</td>
<td>6</td>
</tr>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
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<td>EASC3406</td>
<td>Reconstruction of past climate</td>
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<td>Hydrogeology</td>
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<td>Earth resources</td>
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</tr>
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<td>EASC3999</td>
<td>Directed studies in earth sciences</td>
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<td>ENVS3007</td>
<td>Natural hazards and mitigation</td>
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<tr>
<td>ENVS3313</td>
<td>Environmental oceanography</td>
<td>6</td>
</tr>
<tr>
<td>EASC4403</td>
<td>Biogeochemical cycles</td>
<td>6</td>
</tr>
</tbody>
</table>
### Notes:

1. These are core courses in the regular Geology Major (96 credits) curriculum.

2. 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.

3. 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.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2022

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 (Intensive)
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)
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 advanced 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.

6. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

7. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2021

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 (Intensive)
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)
### Science Majors

<table>
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<th>Course Title</th>
<th>Credits</th>
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<td>Algebra II (6)</td>
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<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>
<td></td>
</tr>
<tr>
<td>MATH4501</td>
<td>Geometry (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4511</td>
<td>Introduction to differentiable manifolds (6)</td>
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</tr>
<tr>
<td>MATH4602</td>
<td>Scientific computing (6)</td>
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</tr>
<tr>
<td>MATH4902</td>
<td>Operations research II (6)</td>
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<td>MATH4907</td>
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<td>Topics in applied functional analysis (6)</td>
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<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory (6)</td>
<td></td>
</tr>
<tr>
<td>MATH7501</td>
<td>Topics in algebra (6)</td>
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#### 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 the 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.

6. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu:
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

7. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu:
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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**  
2020  

**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 (Intensive)  
- 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)  
   - MATH2102 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)
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<td>MATH4602</td>
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<td>Operations research II (6)</td>
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3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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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.

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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.

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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
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.

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

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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 (Intensive)
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)
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   MATH2012 Fundamental concepts of mathematics (6)
   MATH2101 Linear algebra I (6)
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   MATH2211 Multivariable calculus (6)
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**Remarks:**

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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.

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Impermissible Combinations:
Major in Mathematics (Intensive)
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</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
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 (Intensive)
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)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3943</td>
<td>Network models in operations research</td>
<td>6</td>
</tr>
<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>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>
<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>
<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>
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<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>
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<td>MATH7503</td>
<td>Topics in advanced 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>

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - MATH3999 Directed studies in mathematics
   - MATH4910 Mathematics seminar
   - MATH4911 Mathematics capstone project
   - MATH4966 Mathematics internship
   - 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 (Intensive)  
Offered to students: admitted to Year 1 in 2022

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
- 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>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6 (Note 1)</td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6 (Note 1)</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>MATH1013</td>
<td>University mathematics II</td>
<td>6 (Note 1)</td>
</tr>
<tr>
<td>MATH2012</td>
<td>Fundamental concepts of mathematics</td>
<td>6 (Note 1)</td>
</tr>
<tr>
<td>MATH2101</td>
<td>Linear algebra I</td>
<td>6 (Note 1)</td>
</tr>
<tr>
<td>MATH2102</td>
<td>Linear algebra II</td>
<td>6 (Note 1)</td>
</tr>
<tr>
<td>MATH2211</td>
<td>Multivariable calculus</td>
<td>6 (Note 1)</td>
</tr>
<tr>
<td>MATH2241</td>
<td>Introduction to mathematical analysis</td>
<td>6 (Note 1)</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>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3002</td>
<td>Mathematics seminar</td>
<td>6</td>
</tr>
<tr>
<td>MATH3301</td>
<td>Algebra I</td>
<td>6</td>
</tr>
<tr>
<td>MATH3401</td>
<td>Analysis I</td>
<td>6 (Note 1)</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>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization</td>
<td>6</td>
</tr>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3304</td>
<td>Introduction to number theory</td>
<td>6</td>
</tr>
<tr>
<td>MATH3541</td>
<td>Introduction to topology</td>
<td>6</td>
</tr>
<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>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH3601</td>
<td>Numerical analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH3901</td>
<td>Operations research I</td>
<td>6</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------</td>
<td>---------</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>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 advanced optimization</td>
<td>(6)</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>MATH4966</td>
<td>Mathematics internship</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH4999</td>
<td>Mathematics project</td>
<td>(12)</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.

4. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisites of selected courses 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: 2021
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
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) (Note 1)
SCNC1112 Fundamentals of modern science (6) (Note 1)

Disciplinary Core Courses (36 credits)
MATH1013 University mathematics II (6) (Note 1)
MATH2012 Fundamental concepts of mathematics (6) (Note 1)
MATH2101 Linear algebra I (6) (Note 1)
MATH2102 Linear algebra II (6) (Note 1)
MATH2211 Multivariable calculus (6) (Note 1)
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) (Note 1)
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)
MATH3304 Introduction to number theory (6)
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)
MATH7501 Topics in algebra (6)
MATH7505 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)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<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>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>
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</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory</td>
<td>6</td>
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<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH7503</td>
<td>Topics in advanced optimization</td>
<td>6</td>
</tr>
<tr>
<td>MATH7217</td>
<td>Topics in advanced optimization</td>
<td>6</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>Credit</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>Mathematics project</td>
<td>12</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.

4. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

**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:

1. **PLO 1:** describe and present a variety of concepts and theories in mathematics (by means of coursework and learning activities in the curriculum)
2. **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)
3. **PLO 3:** communicate in mathematical language, and present mathematical ideas and scientific arguments (by means of coursework, seminars, guided studies and projects)
4. **PLO 4:** collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
5. **PLO 5:** appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

**Impermissible Combinations:**  
Major in Mathematics  
Minor in Computational & Financial Mathematics  
Minor in Mathematics  
Minor in Operations Research & Mathematical Programming

**Required courses (144 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</td>
</tr>
<tr>
<td>SCNC1112</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disciplinary Core Courses (36 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013</td>
</tr>
<tr>
<td>MATH2012</td>
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<tr>
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<td>MATH2102</td>
</tr>
<tr>
<td>MATH2211</td>
</tr>
<tr>
<td>MATH2241</td>
</tr>
</tbody>
</table>

2. **Advanced level courses (84 credits)**

<table>
<thead>
<tr>
<th>Disciplinary Core Course (60 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3002</td>
</tr>
<tr>
<td>MATH3301</td>
</tr>
<tr>
<td>MATH3401</td>
</tr>
<tr>
<td>MATH3403</td>
</tr>
<tr>
<td>MATH3405</td>
</tr>
<tr>
<td>MATH3600</td>
</tr>
<tr>
<td>MATH3603</td>
</tr>
<tr>
<td>MATH3904</td>
</tr>
<tr>
<td>MATH4404</td>
</tr>
<tr>
<td>MATH4406</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disciplinary Electives (24 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Stream (A) or Stream (B):</td>
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<tr>
<td>(A) Pure Mathematics (at least 24 credits with 12 credits from MATH7XXX level, subject to pre-requisite requirement)</td>
</tr>
<tr>
<td>MATH3304</td>
</tr>
<tr>
<td>MATH3541</td>
</tr>
<tr>
<td>MATH4302</td>
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<td>MATH4402</td>
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</tr>
<tr>
<td>MATH7101</td>
</tr>
<tr>
<td>MATH7201</td>
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<tr>
<td>MATH7202</td>
</tr>
<tr>
<td>MATH7501</td>
</tr>
<tr>
<td>MATH7505</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(B) Applied Mathematics (at least 24 credits with 12 credits from MATH4XXX or MATH7XXX level, subject to pre-requisite requirement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3601</td>
</tr>
<tr>
<td>MATH3901</td>
</tr>
</tbody>
</table>
### MATH3906 Financial calculus (6)
### MATH3911 Game theory and strategy (6)
### MATH3943 Network models in operations research (6)
### MATH4602 Scientific computing (6)
### MATH4902 Operations research II (6)
### MATH4907 Numerical methods for financial calculus (6)
### MATH7217 Topics in financial mathematics (6)
### MATH7224 Topics in advanced probability theory (6)
### MATH7502 Topics in applied discrete mathematics (6)
### MATH7503 Topics in advanced optimization (6)

#### 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).
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- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
- Mathematics qualification in Gao Kao will be considered on a case-by-case basis

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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
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>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science (6)</td>
<td>(Note 1)</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>MATH1013</td>
<td>University mathematics II (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>MATH2012</td>
<td>Fundamental concepts of mathematics (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>MATH2101</td>
<td>Linear algebra I (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>MATH2102</td>
<td>Linear algebra II (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>MATH2211</td>
<td>Multivariable calculus (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>MATH2241</td>
<td>Introduction to mathematical analysis (6)</td>
<td>(Note 1)</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>
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</tr>
</thead>
<tbody>
<tr>
<td>MATH3002</td>
<td>Mathematics seminar (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3301</td>
<td>Algebra I (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3401</td>
<td>Analysis I (6)</td>
<td>(Note 1)</td>
</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>MATH3600</td>
<td>Discrete mathematics (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3603</td>
<td>Probability theory (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4404</td>
<td>Functional analysis (6)</td>
<td></td>
</tr>
<tr>
<td>MATH4406</td>
<td>Introduction to partial differential equations (6)</td>
<td>(Note 1)</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)

- MATH3304: Introduction to number theory (6)
- 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)
- MATH7501: Topics in algebra (6)
- MATH7505: 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)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<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>MATH4602</td>
<td>Scientific computing (6)</td>
</tr>
<tr>
<td>MATH4902</td>
<td>Operations research II (6)</td>
</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus (6)</td>
</tr>
<tr>
<td>MATH7217</td>
<td>Topics in financial mathematics (6)</td>
</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory (6)</td>
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<tr>
<td>MATH7502</td>
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</tbody>
</table>

### 3. Capstone requirement (12 credits)

At least 12 credits selected from the following courses:

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<td>Mathematics project (12)</td>
</tr>
</tbody>
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**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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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
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)  (Note 1)
   SCNC1112  Fundamentals of modern science (6)  (Note 1)

   Disciplinary Core Courses (36 credits)
   MATH1013  University mathematics II (6)  (Note 1)
   MATH2012  Fundamental concepts of mathematics (6)  (Note 1)
   MATH2101  Linear algebra I (6)  (Note 1)
   MATH2102  Linear algebra II (6)  (Note 1)
   MATH2211  Multivariable calculus (6)  (Note 1)
   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)  (Note 1)
   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):
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   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)
   MATH7501  Topics in algebra (6)
   MATH7505  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)
MATH3906  Financial calculus (6)
MATH3911  Game theory and strategy (6)
MATH3943  Network models in operations research (6)
MATH4602  Scientific computing (6)
MATH4902  Operations research II (6)
MATH4907  Numerical methods for financial calculus (6)
MATH7217  Topics in financial mathematics (6)
MATH7224  Topics in advanced probability theory (6)
MATH7502  Topics in applied discrete mathematics (6)
MATH7503  Topics in advanced optimization (6)  [previous title: Topics in mathematical programming and optimization (6)]

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:
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Major Title: Major in Mathematics (Intensive)
Offered to students admitted to Year 1 in 2017

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.

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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)
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<td>MATH2241</td>
<td>Introduction to mathematical analysis</td>
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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>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3002</td>
<td>Mathematics seminar</td>
<td>6</td>
</tr>
<tr>
<td>MATH3301</td>
<td>Algebra I</td>
<td>6</td>
</tr>
<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>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization</td>
<td>6</td>
</tr>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3304</td>
<td>Introduction to number theory</td>
<td>6</td>
</tr>
<tr>
<td>MATH3541</td>
<td>Introduction to topology</td>
<td>6</td>
</tr>
<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>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3601</td>
<td>Numerical analysis</td>
<td>6</td>
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</table>
### Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3901</td>
<td>Operations research I (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>MATH4602</td>
<td>Scientific computing (6)</td>
</tr>
<tr>
<td>MATH4902</td>
<td>Operations research II (6)</td>
</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus (6)</td>
</tr>
<tr>
<td>MATH7217</td>
<td>Topics in financial mathematics (6)</td>
</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory (6)</td>
</tr>
<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics (6)</td>
</tr>
<tr>
<td>MATH7503</td>
<td>Topics in advanced optimization (6)</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>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3999</td>
<td>Directed studies in mathematics (6)</td>
</tr>
<tr>
<td>MATH4910</td>
<td>Senior mathematics seminar (6)</td>
</tr>
<tr>
<td>MATH4911</td>
<td>Mathematics capstone project (6)</td>
</tr>
<tr>
<td>MATH4966</td>
<td>Mathematics internship (6)</td>
</tr>
<tr>
<td>MATH4999</td>
<td>Mathematics project (12)</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.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 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:

|----------------------|-----------------|-----------------------------------------------|----------------------|-------------------------------------------------------|-----------------|

### 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)
- **PHYS2160**: Introductory computational physics (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.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3001</td>
<td>Development of mathematical ideas</td>
<td>6</td>
</tr>
<tr>
<td>MATH3002</td>
<td>Mathematics seminar</td>
<td>6</td>
</tr>
<tr>
<td>MATH3303</td>
<td>Matrix theory and its applications</td>
<td>6</td>
</tr>
<tr>
<td>MATH3304</td>
<td>Introduction to number theory</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>MATH3408</td>
<td>Computational methods and differential equations with applications</td>
<td>6</td>
</tr>
<tr>
<td>MATH3541</td>
<td>Introduction to topology</td>
<td>6</td>
</tr>
<tr>
<td>MATH3600</td>
<td>Discrete mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH3601</td>
<td>Numerical analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH3603</td>
<td>Probability theory</td>
<td>6</td>
</tr>
<tr>
<td>MATH3901</td>
<td>Operations research I</td>
<td>6</td>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization</td>
<td>6</td>
</tr>
<tr>
<td>MATH3905</td>
<td>Queueing theory and simulation</td>
<td>6</td>
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<tr>
<td>MATH3906</td>
<td>Financial calculus</td>
<td>6</td>
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<tr>
<td>MATH3911</td>
<td>Game theory and strategy</td>
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<tr>
<td>MATH3943</td>
<td>Network models in operations research</td>
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<td>MATH4302</td>
<td>Algebra II</td>
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<td>MATH4402</td>
<td>Analysis II</td>
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<td>MATH4404</td>
<td>Functional analysis</td>
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<td>MATH4406</td>
<td>Introduction to partial differential equations</td>
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</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>
<td>6</td>
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<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus</td>
<td>6</td>
</tr>
<tr>
<td>MATH7201</td>
<td>Intermediate complex analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH7202</td>
<td>Topics in geometry</td>
<td>6</td>
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<tr>
<td>MATH7217</td>
<td>Complex manifolds</td>
<td>6</td>
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<tr>
<td>MATH7219</td>
<td>Topics in financial mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory</td>
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<td>Topics in algebra</td>
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<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
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<td>MATH7503</td>
<td>Topics in advanced optimization</td>
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<td>MATH7504</td>
<td>Geometric topology</td>
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<tr>
<td>MATH7505</td>
<td>Real analysis</td>
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<tr>
<td>PHYS3150</td>
<td>Theoretical physics</td>
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<td>PHYS3151</td>
<td>Machine learning in physics</td>
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<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>
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<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>PHYS3653</td>
<td>Astrophysics</td>
<td>6</td>
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<tr>
<td>PHYS3660</td>
<td>Astronomy laboratory</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3750</td>
<td>Foundations of laser and spectroscopy</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3751</td>
<td>Physics of nanomaterials</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3760</td>
<td>Physics laboratory</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3850</td>
<td>Physical Optics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3851</td>
<td>Atomic and nuclear 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>
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<tr>
<td>PHYS4350</td>
<td>Advanced classical mechanics</td>
<td>6</td>
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<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>PHYS4650</td>
<td>Stellar physics</td>
<td>6</td>
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<tr>
<td>PHYS4651</td>
<td>Selected topics in astrophysics</td>
<td>6</td>
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<tr>
<td>PHYS4652</td>
<td>Planetary science</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4653</td>
<td>Selected topics in astrophysics and cosmology</td>
<td>6</td>
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<tr>
<td>PHYS4654</td>
<td>General relativity</td>
<td>6</td>
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<td>PHYS4655</td>
<td>Interstellar medium</td>
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<td>PHYS4656</td>
<td>Advanced astrophysics</td>
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<td>PHYS4750</td>
<td>Experimental physics</td>
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<td>PHYS4850</td>
<td>Particle physics</td>
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<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics</td>
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<td>PHYS7351</td>
<td>Graduate quantum mechanics</td>
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<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetic field theory</td>
<td>6</td>
</tr>
<tr>
<td>PHYS7550</td>
<td>Graduate statistical mechanics</td>
<td>6</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

(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 Molecular Biology & Biotechnology

Offered to students admitted to Year 1 in 2022

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 Biological Sciences (Intensive)
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.

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 (6 credits)
At least 6 credits selected from the following courses:
- BIOL1309: Evolutionary diversity (6)
- BIOL2409: Biotechnology industry and entrepreneurship (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)
### 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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4417</td>
<td>'Omics' and systems biology (6)</td>
<td></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)
Major Title: Major in Molecular Biology & Biotechnology

Offered to students admitted to Year 1 in 2021

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 Biological Sciences (Intensive)
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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Disciplinary Core Courses (24 credits)

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<td>6</td>
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<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>BIOC2600</td>
<td>Basic biochemistry</td>
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</table>

Disciplinary Electives (6 credits)

At least 6 credits selected from the following courses:

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<tr>
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</thead>
<tbody>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2409</td>
<td>Biotechnology industry and entrepreneurship</td>
<td>6</td>
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</table>

2. Advanced level courses (48 credits)

Disciplinary Core Courses (24 credits)

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<thead>
<tr>
<th>Course Code</th>
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</tr>
</thead>
<tbody>
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<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>
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</table>

Disciplinary Electives (24 credits)

At least 24 credits selected from the following courses:

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<tbody>
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<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>
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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>
</tr>
<tr>
<td>BIOL4409</td>
<td>General virology</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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

5. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

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 Biological Sciences (Intensive)
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.

   - **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 (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: Immunochemistry (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)
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. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 Biological Sciences (Intensive)  
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.

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)
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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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 opportunities in the curriculum)

PLO 2: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-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 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 Biological Sciences (Intensive)
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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<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>
</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>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>
</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.
重大标题：分子生物学与生物技术

面向2017年入学的一年级学生

目标：
近年来，分子生物学与生物技术的最新进展不仅解决了生命科学的重要和基本问题，而且成为21世纪科学和技术的主干。这些领域的创新已经在农业、渔业、水族养殖、生物制药和临床医学、生物燃料作为替代能源来源、生物修复和废水处理等方面产生了深远影响。本专业将提供在分子生物学和生物技术方面最先进的培训，以及将基本知识转化为现代工业和医学应用的技术。学生将能够理解尖端分子生物学和生物技术应用，涵盖生物活性物质的利用、基因工程在农业、渔业和水族养殖中的应用、生物制药和临床医学研究、生物燃料作为替代能源、生物修复和废水处理。

学习成果：
通过本课程，学生应能够：
1. PLO 1：描述分子生物学和现代生物技术中的关键概念，包括细胞生物学、微生物学、生物化学、免疫学、组学和系统生物学（通过课程工作和基于实验室的实践机会）
2. PLO 2：应用现代分子科学的实验室技术（通过课程工作和基于实验室的实践机会）
3. PLO 3：沟通书面和口头沟通技能，并与其他学生有效合作（通过课程工作、基于研究的学习和演讲机会）
4. PLO 4：获得科学探究和批判性思维能力，包括理解、分析和评估辩论问题的能力，并评估相关的伦理问题（通过课程工作和基于实验室和基于研究的机会）
5. PLO 5：获得在人类健康、农业和环境方面的实际应用的见解（通过课程工作、基于实验室的实践和经验学习）

不可组合的专业：
- 生物科学专业（强化型）
- 分子生物学与生物技术专业（强化型）
- 分子生物学与生物技术专业

必修课程（96学分）

1. 本科课程（42学分）
   - SCNC1111 科学方法和推理（6学分）
   - SCNC1112 现代科学原理（6学分）
   - BIOL1110 从分子到细胞（6学分）
   - BIOL2102 生物统计（6学分）
   - BIOL2103 生物科学实验课程（6学分）
   - BIOL2220 原理生物化学（6学分）
   - BIOC2600 基本生物化学（6学分）

   选修课程（6学分）
   - BIOL1309 进化多样性（6学分）
   - BIOL2306 生态学和进化（6学分）

2. 高级课程（48学分）
   - BIOL3401 分子生物学（6学分）
   - BIOL3402 细胞生物学和细胞技术（6学分）
   - BIOL3508 微生物生理学和生物技术（6学分）
   - BIOL4411 植物和食品生物技术（6学分）
   - BIOL4415 医疗生物技术（6学分）

   选修课程（18学分）
   - 至少选修以下课程中的18学分
   - BIOL3403 免疫学（6学分）
   - BIOL3404 蛋白质结构和功能（6学分）
   - BIOL3406 生殖和生殖生物技术（6学分）
   - BIOL3408 遗传学（6学分）
   - BIOL3409 生物技术商业方面的应用（6学分）
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.
## 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)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity (6)</td>
<td>May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution (6)</td>
<td>May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.</td>
</tr>
<tr>
<td>COMP1117</td>
<td>Computer programming (6)</td>
<td></td>
</tr>
<tr>
<td>MATH1011</td>
<td>University mathematics I (6)</td>
<td></td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
<td></td>
</tr>
</tbody>
</table>

2. Advanced level courses (66 credits)

**Disciplinary Core Courses (30 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3401</td>
<td>Molecular biology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>BIOL4111</td>
<td>Plant and food biotechnology (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>BIOL4115</td>
<td>Healthcare biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4417</td>
<td>'Omnics' and systems biology (6)</td>
<td>(Note 1)</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>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3205</td>
<td>Human physiology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3404</td>
<td>Protein structure and function (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3408</td>
<td>Genetics (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3202</td>
<td>Plant ecophysiology and climate change (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4409</td>
<td>General virology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology (6)</td>
<td></td>
</tr>
</tbody>
</table>

3. Capstone requirement (12 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4993</td>
<td>Molecular biology &amp; biotechnology project (12)</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. These are core courses in the regular Molecular Biology and Biotechnology Major (96 credits) curriculum.

2. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

3. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

4. As this curriculum is accredited by the Royal Society of Biology (RSB), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this 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 Molecular Biology & Biotechnology (Intensive)
Offered to students admitted to Year 1 in 2021

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 unbiassedly 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 Biological Sciences (Intensive)
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)

<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 (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</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>CHEM1043</td>
<td>General chemistry II</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>

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL2409</td>
<td>Biotechnology industry and entrepreneurship</td>
<td>6</td>
</tr>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
<td>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)

2. Disciplinary Electives (12 credits)

Plus at least 12 credits selected from the following courses:
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity (6)</td>
<td>May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution (6)</td>
<td>May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.</td>
</tr>
<tr>
<td>BIOL2408</td>
<td>Green earth-plants and mankind (6)</td>
<td></td>
</tr>
<tr>
<td>COMP1117</td>
<td>Computer programming (6)</td>
<td></td>
</tr>
<tr>
<td>MATH1011</td>
<td>University mathematics I (6)</td>
<td></td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
<td></td>
</tr>
</tbody>
</table>

2. Advanced level courses (66 credits)

Disciplinary Core Courses (30 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3401</td>
<td>Molecular biology (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>BIOL4141</td>
<td>Plant and food biotechnology (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>BIOL4145</td>
<td>Healthcare biotechnology (6)</td>
<td>(Note 1)</td>
</tr>
<tr>
<td>BIOL4147</td>
<td>‘Omics’ and systems biology (6)</td>
<td></td>
</tr>
</tbody>
</table>

Disciplinary Electives (36 credits)

Plus at least 36 credits selected from the following courses:

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOL3205</td>
<td>Human physiology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3404</td>
<td>Protein structure and function (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3408</td>
<td>Genetics (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>ENV/3302</td>
<td>Plant ecophysiology and climate change (6)</td>
<td>[previous title: Plant physiology and climate change (6)]</td>
</tr>
<tr>
<td>BIOL4101</td>
<td>Medical microbiology and applied immunology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4109</td>
<td>General virology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4116</td>
<td>Stem cells and regenerative biology (6)</td>
<td></td>
</tr>
<tr>
<td>ENV/4110</td>
<td>Environmental remediation (6)</td>
<td></td>
</tr>
</tbody>
</table>

3. Capstone requirement (12 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>BIOL4993</td>
<td>Molecular biology &amp; biotechnology project (12)</td>
<td></td>
</tr>
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</table>

Notes:

1. These are core courses in the regular Molecular Biology and Biotechnology Major (96 credits) curriculum.

2. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu:
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

3. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu:
   - Level 4 or above in Mathematics, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

4. As this curriculum is accredited by the Royal Society of Biology (RSB), students must follow the curriculum in full (i.e. no replacement courses are possible) in order to graduate with this 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 Molecular Biology & Biotechnology (Intensive)
Offered to students admitted to Year 1 in 2020

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 Biological Sciences (Intensive)
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)
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</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>
<td>(6)</td>
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</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</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM1043</td>
<td>General chemistry II</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>BIOL2409</td>
<td>Biotechnology industry and entrepreneurship</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
<td>(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)

Disciplinary Electives (12 credits)
Plus at least 12 credits selected from the following courses:
### Science Majors

**Core Courses (30 credits)**

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity (6)</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution (6)</td>
</tr>
<tr>
<td>BIOL2408</td>
<td>Green earth-plants and mankind (6)</td>
</tr>
<tr>
<td>COMP1117</td>
<td>Computer programming (6)</td>
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<tr>
<td>MATH1011</td>
<td>University mathematics I (6)</td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
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**Advanced Level Courses (66 credits)**

#### Disciplinary Core Courses (30 credits)

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<td>Molecular biology (6)</td>
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<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology (6)</td>
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<tr>
<td>BIOL4415</td>
<td>Healthcare biotechnology (6)</td>
</tr>
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<td>BIOL4417</td>
<td>'Omics' and systems biology (6)</td>
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#### Disciplinary Electives (36 credits)

*Plus at least 36 credits selected from the following courses:*

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<tr>
<td>BIOL3205</td>
<td>Human physiology (6)</td>
</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology (6)</td>
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<tr>
<td>BIOL3404</td>
<td>Protein structure and function (6)</td>
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<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology (6)</td>
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<tr>
<td>BIOL3408</td>
<td>Genetics (6)</td>
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<tr>
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<tr>
<td>ENVS3202</td>
<td>Plant ecophysiology and climate change (6)</td>
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<td>Medical microbiology and applied immunology (6)</td>
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<td>General virology (6)</td>
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<td>BIOL4416</td>
<td>Stem cells and regenerative biology (6)</td>
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<tr>
<td>ENV4110</td>
<td>Environmental remediation (6)</td>
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#### Capstone Requirement (12 credits)

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<th>Course Code</th>
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<tr>
<td>BIOL4993</td>
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### Remarks:

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Major Title: Major in Molecular Biology & Biotechnology (Intensive)
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 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:

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Impermissible Combinations:
Major in Biological Sciences
Major in Biological Sciences (Intensive)
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)
   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)

2. Disciplinary Electives (12 credits)
   Plus at least 12 credits selected from the following courses:

(continued)
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2. Advanced level courses (66 credits)

**Disciplinary Core Courses (30 credits)**

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**Disciplinary Electives (36 credits)**

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3. Capstone requirement (12 credits)

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Offered to students admitted to Year 1 in 2018

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Impermissible Combinations:
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Major in Biological Sciences (Intensive)
Major in Molecular Biology & Biotechnology
Minor in Molecular Biology & Biotechnology

Required courses (144 credits)
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Disciplinary Core Courses: Science Foundation Courses (12 credits)
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Disciplinary Core Courses (42 credits)
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BIOL2103 Biological sciences laboratory course (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)

BIOL2409 Biotechnology industry and entrepreneurship (6) (Note 1)
BIOC2600 Basic biochemistry (6) (Note 1)

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.

### BIOL2408  Green earth-plants and mankind (6)

### COMP1117  Computer programming (6)

### MATH1011  University mathematics I (6)

### MATH1013  University mathematics II (6)

#### 2. Advanced level courses (66 credits)

**Disciplinary Core Courses (30 credits)**

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<td>Plant physiology</td>
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Take either BIOL3107 or ENVS3202 to fulfill this 36 credits requirement, but not both. BIOL3107 and ENVS3202 are mutually exclusive.

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Take either BIOL3107 or ENVS3202 to fulfill this 36 credits requirement, but not both. BIOL3107 and ENVS3202 are mutually exclusive. [previous title: Plant physiology and climate change (6)]

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<td></td>
</tr>
<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology</td>
<td></td>
</tr>
<tr>
<td>ENVS4110</td>
<td>Environmental remediation</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>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>

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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.
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 Biological Sciences (Intensive)
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)
   BIOL2103  Biological sciences laboratory course (6)  (Note 1)
   BIOL2220  Principles of biochemistry (6)  (Note 1)
   BIOL2409  Biotechnology industry and entrepreneurship (6)  (Note 1)
   BIOC2600  Basic biochemistry (6)  (Note 1)

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:
<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>
<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>

### 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>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>'Omics' and systems biology</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Disciplinary Electives (36 credits)

- Plus at least 36 credits selected from the following courses:
  - BIOL3107 Plant physiology (6)
  - BIOL3205 Human physiology (6)
  - BIOL3403 Immunology (6)
  - BIOL3404 Protein structure and function (6)
  - BIOL3406 Reproduction and reproductive biotechnology (6)
  - BIOL3408 Genetics (6)
  - BIOL3508 Microbial physiology and biotechnology (6)
  - ENVS3202 Plant ecophysiology and climate change (6)
  - BIOL4401 Medical microbiology and applied immunology (6)
  - BIOL4409 General virology (6)
  - BIOL4416 Stem cells and regenerative biology (6)
  - ENVS4110 Environmental remediation (6)

### 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.
Major in Physics

Offered to students admitted to Year 1 in 2022

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 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)

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 Physics (Intensive)
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)
- 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 Foundations of laser and spectroscopy (6)
- PHYS3850 Physical 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)
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. 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.

6. 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.

7. 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.

8. Those who want to specialize in the experimental physics theme should pass PHYS3760 Physics laboratory, plus any two of the following courses: PHYS3650 Astronomy laboratory, PHYS3750 Laser and spectroscopy, PHYS3850 Optical physics, PHYS3851 Atomic and nuclear physics, PHYS4151 Data analysis and modeling in physics, PHYS4851 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.

9. 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, PHYS4350 Electromagnetism, PHYS3350 Statistical mechanics & thermodynamics, PHYS4351 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4551 Solid state physics, PHYS4654 General relativity, PHYS4850 Particle physics, PHYS7350 Graduate quantum mechanics, PHYS7450 Graduate electromagnetism, and PHYS7550 Graduate statistics and 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.

10. 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.

11. 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.

12. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
- Mathematics qualification in Gao Kao will be considered on a case-by-case basis
13. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
- Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2021  
admitted to Year 1 in

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 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)

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 Physics (Intensive)  
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)

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 Foundations of laser and spectroscopy (6) [previous title: Laser and spectroscopy (6)]
- PHYS3850 Physical 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)
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>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 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 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.

6. Those who want to specialize in the astrophysics theme should pass any three of the following courses: PHYS3650 Observational astronomy, PHYS3660 Astronomy laboratory, PHYS4650 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.

7. 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.

8. Those who want to specialize in the experimental physics theme should pass PHYS3760 Physics laboratory, plus any two of the following courses: PHYS3760 Observational astronomy, 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.

9. 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, PHYS4554 General relativity, PHYS4850 Particle physics, PHYS7351 Graduate quantum mechanics, and PHYS7450 Graduate electromagnetism.

10. 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.

11. 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.

12. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
13. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
- Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

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 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)

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 Physics (Intensive)
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)

   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 Foundations of laser and spectroscopy (6) [previous title: Laser and spectroscopy (6)]
   PHYS3850 Physical 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)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PHYS4450</td>
<td>Advanced electromagnetism (6)</td>
<td></td>
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<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>
<td></td>
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<tr>
<td>PHYS4652</td>
<td>Planetary science (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4653</td>
<td>Selected topics in astrophysics and cosmology (6)</td>
<td></td>
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<tr>
<td>PHYS4654</td>
<td>General relativity (6)</td>
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<td>PHYS4655</td>
<td>Interstellar medium (6)</td>
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<tr>
<td>PHYS4656</td>
<td>Advanced astrophysics (6)</td>
<td></td>
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<td>PHYS7351</td>
<td>Graduate quantum mechanics (6)</td>
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<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetic field theory (6)</td>
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<tr>
<td>PHYS7550</td>
<td>Graduate statistical mechanics (6)</td>
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<tr>
<td>PHYS7750</td>
<td>Nanophysics (6)</td>
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</tbody>
</table>

### 3. Capstone requirement (6 credits)

<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 (6)</td>
<td></td>
</tr>
<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. 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. 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.

6. Those who want to specialize in the astrophysics theme should pass any three of the following courses: 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.

7. 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.

8. 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.

9. 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.

10. 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.

11. 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.

12. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
- Mathematics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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:

- **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 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)
- **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 Physics (Intensive)  
Minor in Physics

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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 (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)

   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: Foundations of laser and spectroscopy (6) [previous title: Laser and spectroscopy (6)]
   - PHYS3850: Physical Optics (6) [previous title: 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)
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<td>Interstellar medium</td>
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<tr>
<td>PHYS4656</td>
<td>Advanced astrophysics</td>
<td>(6)</td>
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<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:

- 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, 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 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)

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 Physics (Intensive)
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 Foundations of laser and spectroscopy (6)  [previous title: Laser and spectroscopy (6)]
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   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)
PHYS4550 Advanced statistical mechanics (6)
PHYS4551 Solid state physics (6)
PHYS4650 Stellar physics (6)
PHYS4652 Planetary science (6)
PHYS4653 Selected topics in astrophysics and cosmology (6) [previous title: Cosmology (6)]
PHYS4654 General relativity (6)
PHYS4655 Interstellar medium (6)
PHYS4656 Advanced astrophysics (6)
PHYS4850 Particle physics (6)
PHYS7350 Graduate classical mechanics (6)
PHYS7450 Graduate quantum mechanics (6)
PHYS7550 Graduate statistical mechanics (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. 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.

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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: PHYS3150 Theoretical physics, PHYS3151 Machine learning in physics, PHYS3660 Astronomy laboratory, PHYS3750 Laser and spectroscopy, PHYS3850 Physical optics, PHYS3851 Atomic and nuclear physics, PHYS4150 Particle physics, 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 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, PHYS3450 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: 2017 admitted to Year 1 in

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
Major in Physics (Intensive)
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)
   - PHYS2160: Introductory computational 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
   - PHYS3350: Classical mechanics (6)
   - PHYS3351: Quantum mechanics (6)
   - PHYS3450: Electromagnetism (6)
   - PHYS3550: Statistical mechanics & thermodynamics (6)
   - PHYS3650: Observational astronomy (6)
   - PHYS3651: The physical universe (6)
   - PHYS3652: Principles of astronomy (6)
   - PHYS3653: Astrophysics (6)
   - PHYS3660: Astronomy laboratory (6)
   - PHYS3750: Foundations of laser and spectroscopy (6)
   - PHYS3751: Physics of nanomaterials (6)
   - PHYS3760: Physics laboratory (6)
PHYS3850  Physical 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  Selected topics in astrophysics and cosmology (6)  
PHYS4654  General relativity (6)  
PHYS4655  Interstellar medium (6)  
PHYS4656  Advanced astrophysics (6)  
PHYS4750  Experimental physics (6)  
PHYS4850  Particle physics (6)  
PHYS7350  Graduate classical mechanics (6)  
PHYS7351  Graduate quantum mechanics (6)  
PHYS7450  Graduate electromagnetic field theory (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. 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 (Intensive)

Offered to students: 2022

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)

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 (48 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS1150</td>
<td>Problem solving in physics</td>
</tr>
<tr>
<td>PHYS2055</td>
<td>Introductory relativity</td>
</tr>
<tr>
<td>PHYS2150</td>
<td>Methods in physics I</td>
</tr>
<tr>
<td>PHYS2155</td>
<td>Methods in physics II</td>
</tr>
<tr>
<td>PHYS2250</td>
<td>Introductory mechanics</td>
</tr>
<tr>
<td>PHYS2255</td>
<td>Introductory electricity and magnetism</td>
</tr>
<tr>
<td>PHYS2261</td>
<td>Introductory heat and thermodynamics</td>
</tr>
<tr>
<td>PHYS2265</td>
<td>Introductory quantum physics</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>
</tr>
</thead>
<tbody>
<tr>
<td>COMP1117</td>
<td>Computer programming</td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
</tr>
<tr>
<td>PHYS1650</td>
<td>Nature of the universe</td>
</tr>
<tr>
<td>PHYS2160</td>
<td>Introductory computational physics</td>
</tr>
<tr>
<td>PHYS2650</td>
<td>Modern astronomy</td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics</td>
</tr>
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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>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3150</td>
<td>Theoretical physics</td>
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<tr>
<td>PHYS3350</td>
<td>Classical mechanics</td>
</tr>
<tr>
<td>PHYS3351</td>
<td>Quantum mechanics</td>
</tr>
<tr>
<td>PHYS3450</td>
<td>Electromagnetism</td>
</tr>
<tr>
<td>PHYS3550</td>
<td>Statistical mechanics &amp; thermodynamics</td>
</tr>
<tr>
<td>PHYS3760</td>
<td>Physics laboratory</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>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3151</td>
<td>Machine learning in physics</td>
</tr>
<tr>
<td>PHYS3650</td>
<td>Observational astronomy</td>
</tr>
<tr>
<td>PHYS3653</td>
<td>Astrophysics</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>PHYS3660</td>
<td>Astronomy laboratory (6)</td>
</tr>
<tr>
<td>PHYS3750</td>
<td>Foundations of laser and spectroscopy (6)</td>
</tr>
<tr>
<td>PHYS3850</td>
<td>Physical Optics (6)</td>
</tr>
<tr>
<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>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>
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<td>PHYS4551</td>
<td>Solid state physics (6)</td>
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<td>Stellar physics (6)</td>
</tr>
<tr>
<td>PHYS4652</td>
<td>Planetary science (6)</td>
</tr>
<tr>
<td>PHYS4653</td>
<td>Selected topics in astrophysics and cosmology (6)</td>
</tr>
<tr>
<td>PHYS4654</td>
<td>General relativity (6)</td>
</tr>
<tr>
<td>PHYS4655</td>
<td>Interstellar medium (6)</td>
</tr>
<tr>
<td>PHYS4656</td>
<td>Advanced astrophysics (6)</td>
</tr>
<tr>
<td>PHYS4850</td>
<td>Particle physics (6)</td>
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<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 electromagnetic field theory (6)</td>
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<td>PHYS7550</td>
<td>Graduate statistical mechanics (6)</td>
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<td>PHYS7750</td>
<td>Nanophysics (6)</td>
</tr>
<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. 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 PHYS3750 Physics laboratory, plus any two of the following courses: PHYS3650 Astronomy laboratory, PHYS3760 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, PHYS3451 Advanced quantum mechanics, PHYS4450 Advanced electromagnetism, PHYS4551 Solid state physics, PHYS4654 General relativity, PHYS4655 Particle physics, PHYS4656 Advanced astrophysics, PHYS4660 Astronomy laboratory, PHYS4661 Laser and spectroscopy, PHYS4665 Planetary science, PHYS4666 Interstellar medium, and PHYS4667 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.

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.

10. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

11. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2021

### 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:

1. **Identify and describe physical systems with their professional knowledge** (PLO 1): (by means of coursework and tutorial classes in the curriculum)
2. **Have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature** (PLO 2): (by means of coursework, tutorial classes and laboratory works in the curriculum)
3. **Analyze problems qualitatively and quantitatively based on a broad foundation of theoretical and experimental knowledge in physics, and appraise the related ethical issues** (PLO 3): (by means of coursework, tutorial classes and research-based projects in the curriculum)
4. **Communicate and collaborate with people of different background, culture, gender and nationality effectively in scientific issues** (PLO 4): (by means of group project, tutorial session, presentation, exchange, internship and capstone opportunities in the curriculum)
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** (PLO 5): (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)**

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</table>

**Disciplinary Core Courses (48 credits)**

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<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>
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<td>PHYS2261</td>
<td>Introductory heat and thermodynamics</td>
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<tr>
<td>PHYS2265</td>
<td>Introductory quantum physics</td>
<td>6</td>
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</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>
<td>6</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>
</tr>
<tr>
<td>PHYS3350</td>
<td>Classical mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3351</td>
<td>Quantum mechanics</td>
<td>6</td>
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<tr>
<td>PHYS3450</td>
<td>Electromagnetism</td>
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</tr>
<tr>
<td>PHYS3550</td>
<td>Statistical mechanics &amp; thermodynamics</td>
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</tr>
<tr>
<td>PHYS3760</td>
<td>Physics laboratory</td>
<td>6</td>
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</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>
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</table>
### Course Offerings

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3660</td>
<td>Astronomy laboratory</td>
</tr>
<tr>
<td>PHYS3750</td>
<td>Foundations of laser and spectroscopy</td>
</tr>
<tr>
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<td>Atomic and nuclear physics</td>
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<tr>
<td>PHYS4150</td>
<td>Computational physics</td>
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<tr>
<td>PHYS4151</td>
<td>Data analysis and modeling in physics</td>
</tr>
<tr>
<td>PHYS4351</td>
<td>Advanced quantum mechanics</td>
</tr>
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<td>PHYS4450</td>
<td>Advanced electromagnetism</td>
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<tr>
<td>PHYS4550</td>
<td>Advanced statistical mechanics</td>
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<td>PHYS4551</td>
<td>Solid state physics</td>
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<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics</td>
</tr>
<tr>
<td>PHYS7351</td>
<td>Graduate quantum mechanics</td>
</tr>
<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetic field theory</td>
</tr>
<tr>
<td>PHYS7550</td>
<td>Graduate statistical mechanics</td>
</tr>
<tr>
<td>PHYS7750</td>
<td>Nanophysics</td>
</tr>
<tr>
<td>PHYS3999</td>
<td>Directed studies in physics</td>
</tr>
<tr>
<td>PHYS4966</td>
<td>Physics internship</td>
</tr>
<tr>
<td>PHYS4999</td>
<td>Physics project</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, 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: PHYS3850 Astronomy laboratory, PHYS3850 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, PHYS4350 Electromagnetism, PHYS3350 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 PHYS4999 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.
10. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis
11. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

### 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)

**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 (48 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<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>
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</thead>
<tbody>
<tr>
<td>COMP1117</td>
<td>Computer programming</td>
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</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>
<td>6</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>
</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>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>
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</tbody>
</table>
### 1. Core Courses (96 credits)

<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3350</td>
<td>Classical mechanics</td>
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<tr>
<td>PHYS3351</td>
<td>Quantum mechanics</td>
</tr>
<tr>
<td>PHYS3450</td>
<td>Electromagnetism</td>
</tr>
<tr>
<td>PHYS3455</td>
<td>Statistical mechanics</td>
</tr>
<tr>
<td>PHYS3456</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>PHYS3459</td>
<td>Advanced quantum mechanics</td>
</tr>
<tr>
<td>PHYS4150</td>
<td>Computational physics</td>
</tr>
<tr>
<td>PHYS4151</td>
<td>Machine learning</td>
</tr>
<tr>
<td>PHYS4152</td>
<td>Data analysis and modeling in physics</td>
</tr>
<tr>
<td>PHYS4153</td>
<td>Graduate quantum mechanics</td>
</tr>
<tr>
<td>PHYS4154</td>
<td>Quantum mechanics</td>
</tr>
<tr>
<td>PHYS4155</td>
<td>Advanced quantum mechanics</td>
</tr>
<tr>
<td>PHYS4156</td>
<td>Advanced electromagnetic field theory</td>
</tr>
<tr>
<td>PHYS4157</td>
<td>Interstellar medium</td>
</tr>
<tr>
<td>PHYS4158</td>
<td>Advanced astrophysics</td>
</tr>
<tr>
<td>PHYS4159</td>
<td>General relativity</td>
</tr>
<tr>
<td>PHYS4160</td>
<td>Planetary science</td>
</tr>
<tr>
<td>PHYS4161</td>
<td>Stellar physics</td>
</tr>
<tr>
<td>PHYS4162</td>
<td>Graduate statistical mechanics</td>
</tr>
<tr>
<td>PHYS4163</td>
<td>Cosmology</td>
</tr>
<tr>
<td>PHYS4164</td>
<td>Advanced astrophysics</td>
</tr>
<tr>
<td>PHYS4165</td>
<td>General relativity</td>
</tr>
<tr>
<td>PHYS4166</td>
<td>Directed studies in physics</td>
</tr>
<tr>
<td>PHYS4167</td>
<td>Physics internship</td>
</tr>
<tr>
<td>PHYS4168</td>
<td>Physics project</td>
</tr>
<tr>
<td>PHYS4169</td>
<td>Astronomy laboratory</td>
</tr>
<tr>
<td>PHYS4170</td>
<td>Laser and spectroscopy</td>
</tr>
<tr>
<td>PHYS4171</td>
<td>Physical optics</td>
</tr>
<tr>
<td>PHYS4172</td>
<td>Atomic and nuclear physics</td>
</tr>
<tr>
<td>PHYS4173</td>
<td>Advanced electromagnetism</td>
</tr>
<tr>
<td>PHYS4174</td>
<td>Planetary science</td>
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<tr>
<td>PHYS4175</td>
<td>Stellar physics</td>
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<td>PHYS4176</td>
<td>Graduate statistical mechanics</td>
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<tr>
<td>PHYS4177</td>
<td>Cosmology</td>
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<tr>
<td>PHYS4178</td>
<td>Advanced astrophysics</td>
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<tr>
<td>PHYS4179</td>
<td>General relativity</td>
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<tr>
<td>PHYS4180</td>
<td>Directed studies in physics</td>
</tr>
<tr>
<td>PHYS4181</td>
<td>Physics internship</td>
</tr>
<tr>
<td>PHYS4182</td>
<td>Physics project</td>
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</tbody>
</table>

### 2. Elective Courses (60 credits)

1. **Astrophysics Theme**
   - PHYS3650 Observational astronomy
   - PHYS3660 Astronomy laboratory
   - PHYS3661 Planetary science
   - PHYS3662 Cosmology
   - PHYS3663 General relativity
   - PHYS3664 Interstellar medium
   - PHYS3665 Advanced astrophysics

2. **Experimental Physics Theme**
   - PHYS3760 Physics laboratory
   - PHYS3761 Particle physics
   - PHYS3762 Advanced photonics
   - PHYS3763 Atomic and nuclear physics
   - PHYS3764 Solid state physics
   - PHYS3765 General relativity
   - PHYS3766 Advanced astrophysics

3. **Theoretical Physics Theme**
   - PHYS3150 Theoretical physics
   - PHYS3151 Machine learning in physics
   - PHYS3152 Data analysis and modeling in physics
   - PHYS3153 Advanced quantum mechanics
   - PHYS3154 Advanced electromagnetic field theory
   - PHYS3155 Interstellar medium
   - PHYS3156 Advanced astrophysics

4. **Quantum Mechanics**
   - PHYS3856 Quantum mechanics
   - PHYS3857 Statistical mechanics
   - PHYS3858 Electromagnetism
   - PHYS3859 Thermodynamics
   - PHYS3860 Advanced quantum mechanics
   - PHYS3861 Solid state physics
   - PHYS3862 General relativity
   - PHYS3863 Interstellar medium
   - PHYS3864 Advanced astrophysics

### 3. Capstone Requirement (12 credits)

At least 12 credits selected from the following courses:

- PHYS3999 Directed studies in physics
- PHYS4966 Physics internship
- PHYS4999 Physics project

### 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: PHYS3850 Observational astronomy, PHYS3960 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, PHYS3760 Laser and spectroscopy, PHYS3850 Physical optics, PHYS3851 Atomic and nuclear physics, PHYS4151 Data analysis and modeling in physics, PHYS4450 Advanced astrophysics, PHYS4550 Advanced electromagnetism, PHYS4651 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, PHYS3455 Statistical mechanics, PHYS4450 Advanced quantum mechanics, PHYS4451 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.
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.
10. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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-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)

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

**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)
- 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:
- 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)
- PHYS3351 Quantum mechanics (6)
- PHYS3450 Electromagnetism (6)
- PHYS3550 Statistical mechanics & thermodynamics (6)
- 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)
- PHYS3653 Astrophysics (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3660</td>
<td>Astronomy laboratory (6)</td>
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<tr>
<td>PHYS3750</td>
<td>Foundations of laser and spectroscopy (6)</td>
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<td>PHYS3850</td>
<td>Physical Optics (6)</td>
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<td>PHYS3851</td>
<td>Atomic and nuclear physics (6)</td>
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</tr>
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<td>PHYS4150</td>
<td>Computational physics (6)</td>
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<td>PHYS4151</td>
<td>Data analysis and modeling in physics (6)</td>
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<td>PHYS4351</td>
<td>Advanced quantum mechanics (6)</td>
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<td>Advanced electromagnetism (6)</td>
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<td>Advanced statistical mechanics (6)</td>
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<td>PHYS4551</td>
<td>Solid state physics (6)</td>
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<td>PHYS4652</td>
<td>Planetary science (6)</td>
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<tr>
<td>PHYS4653</td>
<td>Selected topics in astrophysics and cosmology (6)</td>
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<tr>
<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>Particle physics (6)</td>
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<tr>
<td>PHYS7750</td>
<td>Nanophysics (6)</td>
<td></td>
</tr>
</tbody>
</table>

### 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: PHYS3850 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 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: 2018
admitted to Year 1 in

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)
   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)  
   (Note 1)
   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)
   PHYS3351 Quantum mechanics (6)
   PHYS3450 Electromagnetism (6)
   PHYS3550 Statistical mechanics & thermodynamics (6)
   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)
   PHYS3653 Astrophysics (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: PHYS3850 Observational astronomy, 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, 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 PHYS3660 Astronomy laboratory, plus any two of the following courses: 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, 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.

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 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)
- 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)**

**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 (48 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<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 (6)</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2255</td>
<td>Introductory electricity and magnetism (6)</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2261</td>
<td>Introductory heat and thermodynamics (6)</td>
<td>6</td>
</tr>
<tr>
<td>PHYS2265</td>
<td>Introductory quantum physics (6)</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>
<td>6</td>
</tr>
</tbody>
</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>
</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>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.

<table>
<thead>
<tr>
<th>Class A</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>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3660</td>
<td>Astronomy laboratory (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3750</td>
<td>Foundations of laser and spectroscopy (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3850</td>
<td>Physical Optics (6)</td>
<td></td>
</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>PHYS4351</td>
<td>Advanced quantum mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4450</td>
<td>Advanced electromagnetism (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4550</td>
<td>Advanced statistical mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4551</td>
<td>Solid state physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4650</td>
<td>Stellar physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4652</td>
<td>Planetary science (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4653</td>
<td>Selected topics in astrophysics and cosmology (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4654</td>
<td>General relativity (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4655</td>
<td>Interstellar medium (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4656</td>
<td>Advanced astrophysics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4850</td>
<td>Particle physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS7351</td>
<td>Graduate quantum mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetic field theory (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS7550</td>
<td>Graduate statistical mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS7750</td>
<td>Nanophysics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3999</td>
<td>Directed studies in physics (6)</td>
<td></td>
</tr>
<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>

### 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, 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, PHYS4655 Particle physics, PHYS5751 Graduate quantum mechanics, PHYS5746 Graduate relativistic quantum mechanics, PHYS5750 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 2022

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

2. 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)

3. Capstone requirement (6 credits)
   - STAT3799 Directed studies in statistics (6)

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

2. 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)

3. Capstone requirement (6 credits)
   - 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 elective) 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 elective) 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.

6. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

7. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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**: admittance to Year 1 in 2021

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

**Disciplinary Core Courses: Science Foundation Courses (12 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)**
- **STAT3600**: Linear statistical analysis (6)
- **STAT3609**: The statistics of investment risk (6)
- **STAT3615**: Practical mathematics for investment (6)

**Disciplinary Core Courses (30 credits)**
- **STAT3603**: Stochastic processes (6)
- **STAT3610**: Risk management and insurance (6)
- **STAT3612**: Statistical machine learning (6)
- **STAT3618**: Derivatives and risk management (6)
- **STAT3655**: Survival analysis (6)
- **STAT3911**: Financial economics II (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)

**3. Capstone requirement (6 credits)**
- **STAT3799**: Directed studies in statistics (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 elective) 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 elective) 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).

6. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

7. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

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)

<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>

2. 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>MATH2014</td>
<td>Multivariable calculus and linear algebra</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>
</tbody>
</table>

3. Advanced level courses (48 credits)

2. Disciplinary Core Courses (18 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>
</tbody>
</table>

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>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>STAT3655</td>
<td>Survival analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT3911</td>
<td>Financial economics II</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>

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>Course Code</td>
<td>Course Title</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------------------------------</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. 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 elective) 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 elective) 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.

6. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 (18 credits)
- STAT3600: Linear statistical analysis (6)
- STAT3609: The statistics of investment risk (6)
- STAT3615: Practical mathematics for investment (6)
Disciplinary Electives (30 credits)
At least 30 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)
- STAT3655: Survival analysis (6)
- STAT3911: Financial economics II (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)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
- STAT3799: Directed studies in statistics (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 elective) 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 elective) 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 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)

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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)
   MATH2013 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 (18 credits)
   STAT3601 Linear statistical analysis (6)
   STAT3609 The statistics of investment risk (6)
   STAT3615 Practical mathematics for investment (6)

   Disciplinary Electives (30 credits)
   At least 30 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)
   STAT3655 Survival analysis (6)
   STAT3901 Financial economics II (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)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   STAT3799 Directed studies in statistics (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 elective) 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 elective) 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 Risk Management
Offered to students: 2017
admitted to Year 1 in

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 (18 credits)
   STAT3600 Linear statistical analysis (6)
   STAT3609 The statistics of investment risk (6)
   STAT3615 Practical mathematics for investment (6)

   Disciplinary Electives (30 credits)

   At least 30 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)
   STAT3655 Survival analysis (6)
   STAT3911 Financial economics II (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)

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:
   STAT3799 Directed studies in statistics (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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. 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 elective) 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 elective) 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 Statistics
Offered to students: 2022
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 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 (12 credits)

STAT3600 Linear statistical analysis (6)
STAT4602 Multivariate data analysis (6)

Disciplinary Electives (36 credits)
At least 36 credits from Lists A and B, among which at least 18 credits from List A:

List A

STAT3602 Statistical inference (6)
STAT3603 Stochastic processes (6)
STAT3620 Modern nonparametric statistics (6)
STAT3621 Statistical data analysis (6)
STAT3655 Survival analysis (6)
STAT4601 Time-series analysis (6)

List B

STAT3604 Design and analysis of experiments (6)
STAT3606 Business logistics (6)
STAT3607 Statistics in clinical medicine and bio-medical research (6)
STAT3608 Statistical genetics (6)
STAT3612 Statistical machine learning (6)
### 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 STAT2604 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 elective) 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 elective) 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.

6. 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.

7. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

8. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2021

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 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 (12 credits)
   STAT3600 Linear statistical analysis (6)
   STAT4602 Multivariate data analysis (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
   STAT3602 Statistical inference (6)
   STAT3603 Stochastic processes (6)
   STAT3620 Modern nonparametric statistics (6)
   STAT3621 Statistical data analysis (6)
   STAT3655 Survival analysis (6)
   STAT4601 Time-series analysis (6)
   List B
   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)
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 or STAT2604 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 elective) 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 elective) 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.

6. 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.

7. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

8. Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
   - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2020

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 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 Science 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 (12 credits)
   STAT3600 Linear statistical analysis (6)
   STAT4602 Multivariate data analysis (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
   STAT3602 Statistical inference (6)
   STAT3603 Stochastic processes (6)
   STAT3620 Modern nonparametric statistics (6)
   STAT3621 Statistical data analysis (6)
   STAT3655 Survival analysis (6)
   STAT4601 Time-series analysis (6)
   List B
   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)
### Statistics Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>STAT3612</td>
<td>Statistical machine learning</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3613</td>
<td>Marketing analytics</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3617</td>
<td>Sample survey methods</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4610</td>
<td>Bayesian learning</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 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 or STAT2604 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 elective) 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 elective) 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.

6. 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).

7. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu.
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 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)
  - STAT2601 Probability and statistics I (6)
  - STAT2602 Probability and statistics II (6)

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

- **Disciplinary Core Courses (12 credits)**
  - STAT3600 Linear statistical analysis (6)
  - STAT4602 Multivariate data analysis (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**
      - STAT3602 Statistical inference (6)
      - STAT3603 Stochastic processes (6)
      - STAT3620 Modern nonparametric statistics (6)
      - STAT3621 Statistical data analysis (6)
      - STAT3655 Survival analysis (6)
      - STAT3955 Survival analysis (6)
    - **List B**
      - STAT3604 Design and analysis of experiments (6)
      - STAT4601 Time-series analysis (6)

Take either STAT3655 or STAT3955 to fulfill the requirement; but not both. STAT3655 and STAT3955 are mutually exclusive.

- **List A**
  - STAT3602 Statistical inference (6)
  - STAT3603 Stochastic processes (6)
  - STAT3620 Modern nonparametric statistics (6)
  - STAT3621 Statistical data analysis (6)
  - STAT3655 Survival analysis (6)

- **List B**
  - 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)
STAT3612  Statistical machine learning (6)
STAT3613  Marketing analytics (6)
STAT3617  Sample survey methods (6)
STAT4610  Bayesian learning (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 or STAT2604 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 elective) 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 elective) 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.
6. 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 Statistics
Offered to students admitted to Year 1 in 2018

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 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 (12 credits)
STAT3600 Linear statistical analysis (6)
STAT4602 Multivariate data analysis (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
STAT3602 Statistical inference (6)
STAT3603 Stochastic processes (6)
STAT3620 Modern nonparametric statistics (6)
STAT3621 Statistical data analysis (6)
STAT3655 Survival analysis (6)

STAT3955 Survival analysis (6)

List B
STAT3604 Design and analysis of experiments (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3605</td>
<td>Quality control and management</td>
<td>(6)</td>
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<td>STAT3606</td>
<td>Business logistics</td>
<td>(6)</td>
</tr>
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<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>

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 or STAT2604 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 elective) 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 elective) 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.

6. 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:
Import! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 admits 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 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 (12 credits)**
   - STAT3600: Linear statistical analysis (6)
   - STAT4602: Multivariate data analysis (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**
   - STAT3602: Statistical inference (6)
   - STAT3603: Stochastic processes (6)
   - STAT3620: Modern nonparametric statistics (6)
   - STAT3621: Statistical data analysis (6)
   - STAT3655: Survival analysis (6)
   - STAT3955: Survival analysis (6)

   **List B**
   - STAT4601: Time-series analysis (6)
   - STAT3604: Design and analysis of experiments (6)

   [previous title: Probability modelling (6)]

   Take either STAT3655 or STAT3955 to fulfill the requirement; but not both. STAT3655 and STAT3955 are mutually exclusive.

   Take either STAT3655 or STAT3955 to fulfill the requirement; but not both. STAT3655 and STAT3955 are mutually exclusive.
### 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 or STAT2604 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 elective) 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 elective) 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.

6. 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.
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 (only for 2021 cohort or before)
Risk Management
Science Entrepreneurship (for 2017 cohort and thereafter)
Statistics
Minor Title: Minor in Actuarial Studies  
Offered to students: 2022 admitted to Year 1 in

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

<table>
<thead>
<tr>
<th>Required courses (42 credits)</th>
<th>Disciplinary Electives (12 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (12 credits)</td>
<td>At least 12 credits selected from the following courses:</td>
</tr>
</tbody>
</table>

- FINA1310 Corporate finance (6)
- MATH1013 University mathematics II (6)
- STAT2601 Probability and statistics I (6)
- STAT2602 Probability and statistics II (6)
- STAT2604 Introduction to R/Python 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:

- STAT3612 Statistical machine learning (6)
- 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)
- STAT3953 Fundamentals of actuarial practice (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: 2021
admitted to Year 1 in

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:

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<tr>
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<th>Credits</th>
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</thead>
<tbody>
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<td>FINA1310</td>
<td>Corporate finance</td>
<td>6</td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
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<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>STAT2604</td>
<td>Introduction to R/Python programming and elementary data analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT2605</td>
<td>Demographic and socio-economic statistics</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>
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<tr>
<th>Course Code</th>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3612</td>
<td>Statistical machine learning</td>
<td>6</td>
</tr>
<tr>
<td>STAT3615</td>
<td>Practical mathematics for investment</td>
<td>6</td>
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<tr>
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<td>6</td>
</tr>
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<td>STAT3904</td>
<td>Corporate finance for actuarial science</td>
<td>6</td>
</tr>
<tr>
<td>STAT3906</td>
<td>Risk theory I</td>
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</tr>
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<td>Credibility theory and loss distributions</td>
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<tr>
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<td>Financial economics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT3953</td>
<td>Fundamentals of actuarial practice</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 2020

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)
   STAT2604 Introduction to R/Python programming and elementary data analysis (6)  [previous title: Introduction to R programming and elementary data analysis (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:
   STAT3612 Statistical machine learning (6)
   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)
   STAT3953 Fundamentals of actuarial practice (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: 2019 admitted to Year 1 in

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)
STAT2604 Introduction to R/Python programming and elementary data analysis (6)  
[previous title: Introduction to R programming and elementary data analysis (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:
STAT3612 Statistical machine learning (6)
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)
STAT3953 Fundamentals of actuarial practice (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 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)
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- STAT2604 Introduction to R/Python programming and elementary data analysis (6) [previous title: Introduction to R programming and elementary data analysis (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:
- STAT3612 Statistical machine learning (6)
- STAT3615 Practical mathematics for investment (6)
- STAT3901 Life contingencies I (6)
- STAT3904 Corporate finance for actuarial science (6)
- STAT3906 Risk theory I (6)
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- STAT3911 Financial economics II (6)
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- 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: 2017
admitted to Year 1 in

**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)**

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<tr>
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</tr>
</thead>
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<td>FINA1310</td>
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<tr>
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</table>

#### 2. Advanced level courses (30 credits)

**Disciplinary Electives (30 credits)**

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</tr>
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</tr>
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</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 Astronomy
Offered to students: 2022
admitted to Year 1 in

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

<table>
<thead>
<tr>
<th>Required courses (36 credits)</th>
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<tr>
<td>1. Introductory level courses (18 credits)</td>
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</tr>
<tr>
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<td>Disciplinary Electives (6 credits)</td>
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<tr>
<td>At least 6 credits selected from the following courses:</td>
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<td>PHYS1250 Fundamental physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2055 Introductory relativity (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2160 Introductory computational physics (6)</td>
<td></td>
</tr>
<tr>
<td>EASC2408 Planetary geology (6)</td>
<td></td>
</tr>
<tr>
<td>2. Advanced level courses (18 credits)</td>
<td></td>
</tr>
<tr>
<td>Disciplinary Core Courses (6 credits)</td>
<td></td>
</tr>
<tr>
<td>PHYS3650 Observational astronomy (6)</td>
<td></td>
</tr>
<tr>
<td>Disciplinary Electives (12 credits)</td>
<td></td>
</tr>
<tr>
<td>At least 12 credits selected from the following courses:</td>
<td></td>
</tr>
<tr>
<td>PHYS3653 Astrophysics (6)</td>
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<tr>
<td>PHYS3660 Astronomy laboratory (6)</td>
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</tr>
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</tr>
<tr>
<td>PHYS4655 Interstellar medium (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS4656 Advanced astrophysics (6)</td>
<td></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.

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 2021

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)
- PHYS4650 Stellar physics (6)
- PHYS4652 Planetary science (6)
- PHYS4653 Selected topics in astrophysics and cosmology (6) [previous title: 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 2020

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)
   - PHYS4650: Stellar physics (6)
   - PHYS4652: Planetary science (6)
   - PHYS4653: Selected topics in astrophysics and cosmology (6) [previous title: 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**: 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)
       - PHYS4650 Stellar physics (6)
       - PHYS4652 Planetary science (6)
       - PHYS4653 Selected topics in astrophysics and cosmology (6) [previous title: 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: 2018 admitted to Year 1

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:
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       - PHYS3660 Astronomy laboratory (6)
       - PHYS4650 Stellar physics (6)
       - PHYS4652 Planetary science (6)
       - PHYS4653 Selected topics in astrophysics and 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: 2017 admitted to Year 1 in  

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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<td>PHYS1650 Nature of the universe (6)</td>
<td></td>
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<tr>
<td>PHYS2265 Introductory quantum physics (6) [previous title: Modern physics (6)]</td>
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</tr>
<tr>
<td>2. Advanced level courses (24 credits)</td>
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<tr>
<td><strong>Disciplinary Electives (24 credits)</strong></td>
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<tr>
<td>At least 24 credits selected from the following courses:</td>
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<tr>
<td>PHYS3650 Observational astronomy (6)</td>
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<tr>
<td>PHYS3651 The physical universe (6)</td>
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<tr>
<td>PHYS3652 Principles of astronomy (6)</td>
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<tr>
<td>PHYS3653 Astrophysics (6)</td>
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<td>PHYS4656 Advanced astrophysics (6)</td>
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<tr>
<td>PHYS7650 Stellar atmospheres (6)</td>
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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 2022

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

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</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**: 2021 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)**

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**Notes:**

- 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)**

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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.
**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

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| BIOC4613 Advanced techniques in biochemistry & molecular biology (6) |
| BIOL4417 'Omics' and systems biology (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 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)
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Impermissible Combinations:

**Major in Biochemistry**

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Minor Title: Minor in Biochemistry

Offered to students: 2018 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)

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Impermissible Combinations:
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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 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)
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### 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)
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Take either BIOC2600 or BIOL2220 to fulfill this 12 credits requirement, but not both. BIOC2600 and BIOL2220 are mutually exclusive.

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**Disciplinary Electives (24 credits)**

At least 24 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.
Minor Title: Minor in Chemistry
Offered to students admitted to Year 1 in 2022

**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**
         - 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)
         - CHEM3341 Inorganic chemistry II (6)
         - CHEM3342 Bioinorganic chemistry (6)
         - CHEM3344 Organic chemistry of biomolecules (6)
         - CHEM33443 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)
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<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>
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<tr>
<td>CHEM4966</td>
<td>Chemistry internship</td>
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**Notes:**
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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: 2021
admitted to Year 1 in

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
   - 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)
   - CHEM3341 Inorganic chemistry II (6)
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   - CHEM3443 Organic chemistry laboratory (6)
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   - 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)
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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 in Chemistry
Offered to students admitted to Year 1 in 2020

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:
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   CHEM3443 Organic chemistry laboratory (6)
   CHEM3445 Integrated laboratory (6)
   CHEM3541 Physical chemistry: Introduction to quantum chemistry (6)
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### Science Minors

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**Notes:**
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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.
**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)
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**Impermissible Combinations:**
Major in Chemistry
Major in Chemistry (Intensive)

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<p>| <strong>2. Advanced level courses (18 credits)</strong> |
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| 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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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.
### 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)
  - 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)
  - CHEM2241 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**
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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  2017
admitted to Year 1 in

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)
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CHEM2441 and CHEM2442 are mutually exclusive.

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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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**Notes:**

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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: 2022
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
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**: 2021  
**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:  
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. **Introduction 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](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 2020

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

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 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:

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

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 in Computational & Financial Mathematics

**Offered to students** 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

## 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](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)

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)

3. **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 Earth Sciences
Offered to students: 2022
admitted 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:
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: 2021  
admitted 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:

<table>
<thead>
<tr>
<th>List A</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC3020: Global change: anthropogenic impacts (6)</td>
</tr>
<tr>
<td>EASC3403: Sedimentary environments (6)</td>
</tr>
<tr>
<td>EASC3404: Structural geology (6)</td>
</tr>
<tr>
<td>EASC3405: Environmental remote sensing (6)</td>
</tr>
<tr>
<td>EASC3406: Reconstruction of past climate (6)</td>
</tr>
<tr>
<td>EASC3408: Geophysics (6)</td>
</tr>
<tr>
<td>EASC3409: Igneous and metamorphic petrogenesis (6)</td>
</tr>
<tr>
<td>EASC3410: Hydrogeology (6)</td>
</tr>
<tr>
<td>EASC3412: Earth resources (6)</td>
</tr>
<tr>
<td>EASC3413: Engineering geology (6)</td>
</tr>
<tr>
<td>EASC3414: Soil and rock mechanics (6)</td>
</tr>
<tr>
<td>EASC3415: Meteorology (6)</td>
</tr>
<tr>
<td>EASC3416: Advanced geochemistry and geochronology (6)</td>
</tr>
<tr>
<td>EASC3417: Earth through time (6)</td>
</tr>
<tr>
<td>EASC3999: Directed studies in earth sciences (6)</td>
</tr>
<tr>
<td>EASC4403: Biogeochemical cycles (6)</td>
</tr>
<tr>
<td>EASC4406: Earth dynamics &amp; global tectonics (6)</td>
</tr>
<tr>
<td>EASC4407: Regional geology (6)</td>
</tr>
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<td>EASC4408: Special topics in earth sciences (6)</td>
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<td>EASC4911: Earth system: contemporary issues (6)</td>
</tr>
<tr>
<td>EASC4955: Integrated field studies (6)</td>
</tr>
<tr>
<td>EASC4966: Earth sciences internship (6)</td>
</tr>
<tr>
<td>EASC4999: Earth sciences project (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 2020

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
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:

<table>
<thead>
<tr>
<th>List A</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3402</td>
<td>Petrology</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3403</td>
<td>Sedimentary environments</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3404</td>
<td>Structural geology</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3405</td>
<td>Environmental remote sensing</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3406</td>
<td>Reconstruction of past climate</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3408</td>
<td>Geophysics</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3409</td>
<td>Igneous and metamorphic petrogenesis</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3410</td>
<td>Hydrogeology</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3412</td>
<td>Earth resources</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3413</td>
<td>Engineering geology</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3414</td>
<td>Soil and rock mechanics</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3415</td>
<td>Meteorology</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3416</td>
<td>Advanced geochemistry and geochronology</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3417</td>
<td>Earth through time</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC3999</td>
<td>Directed studies in earth sciences</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC4403</td>
<td>Biogeochemical cycles</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC4406</td>
<td>Earth dynamics &amp; global tectonics</td>
<td>(6)</td>
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<tr>
<td></td>
<td>EASC4407</td>
<td>Regional geology</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC4408</td>
<td>Special topics in earth sciences</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC4911</td>
<td>Earth system: contemporary issues</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC4955</td>
<td>Integrated field studies</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>EASC4966</td>
<td>Earth sciences internship</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<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 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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- 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)
- EASC4405 Earth dynamics & global tectonics (6)
- EASC4407 Regional geology (6)
- EASC4408 Special topics in earth sciences (6)
- EASC4411 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 Ecology & Biodiversity

**Offered to students**  
2022

admited to Year 1 in

**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)
     - 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: 2021
admitted to Year 1 in

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.
Minor Title: Minor in Ecology & Biodiversity
Offered to students admitted to Year 1 in 2020

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.
Minor Title: Minor in Ecology & Biodiversity
Offered to students: 2019
admitted to Year 1 in

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)
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   - BIOL3303 Conservation biology (6)
   - BIOL3313 Freshwater ecology (6)
   - BIOL3314 Plant structure and evolution (6)
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Notes:
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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
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)

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<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Evolutionary diversity (6)</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution (6)</td>
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</table>

#### 2. Advanced level courses (24 credits)

<table>
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<tr>
<th>Course Code</th>
<th>Course Name</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>
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<tr>
<td>BIOL3303</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.
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:
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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.
Minor Title: Minor in Environmental Science  
Offered to students: 2022  
admitted to Year 1 in

**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:
     - BIOL3303 Conservation biology (6)
     - BIOL4302 Environmental impact assessment (6)
     - CHEM3141 Environmental chemistry (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)
     - ENVS3202 Plant ecophysiology and climate change (6)
     - ENVS3313 Environmental oceanography (6)
     - ENVS3401 Understanding tropical ecosystems in a changing world (6)
     - ENVS3402 Qualitative data, social science methods and decision-making in environmental science (6)
     - ENVS3403 Spatial analysis in environmental 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 Environmental Science
Offered to students admitted to Year 1 in 2021

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

<table>
<thead>
<tr>
<th>Required courses (42 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (18 credits)</td>
</tr>
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</tr>
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<td>CHEM1042 General chemistry I (6)</td>
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<tr>
<td>ENVS2001 Methods in environmental science (6)</td>
</tr>
<tr>
<td>ENVS2002 Environmental data analysis (6)</td>
</tr>
</tbody>
</table>

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:

| ENVS3007 Natural hazards and mitigation (6) |
| ENVS3010 Sustainable energy and environment (6) |
| ENVS3019 Urban ecology (6) |
| ENVS3020 Global change ecology (6) |
| ENVS3042 Pollution (6) |
| ENVS3202 Plant ecophysiology and climate change (6) [previous title: Plant physiology and climate change (6)] |
| ENVS3313 Environmental oceanography (6) |
| ENVS3401 Understanding tropical ecosystems in a changing world (6) |
| ENVS3402 Qualitative data, social science methods and decision-making in environmental science (6) |
| ENVS3403 Spatial analysis in environmental 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 in Environmental Science

Offered to students admitted to Year 1 in 2020

**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)
       - ENVS3202 Plant ecophysiology and climate change (6)
         [previous title: Plant physiology and climate change (6)]
       - ENVS3313 Environmental oceanography (6)
       - ENVS3401 Understanding tropical ecosystems in a changing world (6)
       - ENVS3402 Qualitative data, social science methods and decision-making in environmental science (6)
       - ENVS3403 Spatial analysis in environmental 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
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</tbody>
</table>
Minor Title: Minor in Environmental Science
Offered to students: 2019
admitted to Year 1 in

**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:

1. **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)
2. **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)
3. **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)
4. **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)
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       - ENVS3010 Sustainable energy and environment (6)
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       - ENVS3042 Pollution (6)
       - ENVS3202 Plant ecophysiology and climate change (6) [previous title: Plant physiology and climate change (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 Environmental Science
Offered to students: 2018 admitted to Year 1 in

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)
ENVS3202 Plant ecophysiology and climate change (6)
ENVS3313 Environmental oceanography (6)
ENVS3401 Understanding tropical ecosystems in a changing world (6)
ENVS3402 Qualitative data, social science methods and decision-making in environmental science (6)
ENVS3403 Spatial analysis in environmental 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 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)
   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)
   ENVS3202 Plant ecophysiology and climate change (6) [previous title: Plant physiology and climate change (6)]
   ENVS3313 Environmental oceanography (6)
   ENVS3401 Understanding tropical ecosystems in a changing world (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 Food & Nutritional Science
Offered to students admitted to Year 1 in 2022

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:
       - BIOL1110 From molecules to cells (6)
       - BIOL1201 Introduction to food and nutrition (6)
       - BIOL2101 Principles of food chemistry (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:
       - BIOL3202 Nutritional biochemistry (6)
       - BIOL3203 Food microbiology (6)
       - BIOL3204 Nutrition and the life cycle (6)
       - BIOL3205 Human physiology (6)
       - BIOL3207 Principles of toxicology (6)
       - BIOL3209 Food and nutrient analysis (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)
       - BIOL4201 Public health nutrition (6)
       - BIOL4202 Nutrition and sports performance (6)
       - BIOL4205 Food technology (6)
       - BIOL4209 Functional foods (6)
       - BIOL4411 Plant and food biotechnology (6)

     [previous title: Food and nutritional toxicology (6)]
     [previous title: Food processing and engineering (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 2021

## 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)**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells (6)</td>
<td></td>
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<tr>
<td>BIOL1201</td>
<td>Introduction to food and nutrition (6)</td>
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<tr>
<td>BIOL2101</td>
<td>Principles of food chemistry (6)</td>
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<tr>
<td>BIOL2600</td>
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</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)**

<table>
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<tr>
<th>Course Code</th>
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*Take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOL2600 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 Food & Nutritional Science

**Offered to students admitted to Year 1 in 2020**

### 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:

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#### 2. Advanced level courses (24 credits)

**Disciplinary Electives (24 credits)**

At least 24 credits selected from the following courses:

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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 Food & Nutritional Science  
Offered to students: 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:

- BIOL1110: From molecules to cells (6)
- BIOL1201: Introduction to food and nutrition (6)
- BIOL2101: Principles of food chemistry (6)
- BIOL2220: Principles of biochemistry (6)

Take either BIOL2220 or BIOC2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

- BIOC2600: Basic biochemistry (6)

2. **Advanced level courses (24 credits)**

Disciplinary Electives (24 credits)

At least 24 credits selected from the following courses:

- BIOL3202: Nutritional biochemistry (6)
- BIOL3203: Food microbiology (6)
- BIOL3204: Nutrition and the life cycle (6)
- BIOL3205: Human physiology (6)
- BIOL3207: Principles of toxicology (6)

Take either BIOL2220 or BIOC2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

- BIOL3209: Food and nutrient analysis (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)
- BIOL4201: Public health nutrition (6)
- BIOL4202: Nutrition and sports performance (6)
- BIOL4204: Diet, brain function, and behavior (6)
- BIOL4205: Food technology (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 Food & Nutritional Science

## Offered to students
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)
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## Impermissible Combinations:
Major in Food & Nutritional Science

## Required courses (36 credits)

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Take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOL2600 are mutually exclusive.

Take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both. BIOL2220 and BIOL2600 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)]

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:
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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: 2017
admitted to Year 1 in

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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- **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)

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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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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 BIOL4208 to fulfill this 24 credits requirement, but not both. BIOL3206 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.

[previous title: Food processing and engineering (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 2022

**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)
         - BIOL3322 Marine invertebrate zoology (6)
         - BIOL3328 Nearshore marine and estuarine ecology (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 syllabi.

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

418
Minor Title: Minor in Marine Biology
Offered to students: 2021
admitted to Year 1 in

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)
  - 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-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)
- 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: 2019
admitted to Year 1 in

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)
   - 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 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-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)
   - 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: 2017 admitted to Year 1 in

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)
- 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 2022

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
MATH2012 Fundamental concepts of mathematics (6)
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
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)
MATH4302 Algebra II (6)
MATH4302 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)
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<td>Complex manifolds</td>
<td>(6)</td>
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<td>MATH7217</td>
<td>Topics in financial mathematics</td>
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<td>Topics in applied functional analysis</td>
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<td>Topics in algebra</td>
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<td>(6)</td>
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<td>Real analysis</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.

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: 2021  
Admitted to Year 1 in  

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**
- MATH2012 Fundamental concepts of mathematics (6)
- MATH2014 Multivariable calculus and linear algebra (6)

2. **Advanced level courses (18 credits)**

**Disciplinary Electives (12 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)
- 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)
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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. 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: 2020 students admitted to Year 1

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
   - MATH2012 Fundamental concepts of mathematics (6)
   - MATH2014 Multivariable calculus and linear algebra (6)

2. Advanced level courses (18 credits)
   Disciplinary Electives (12 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)
   - 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)
### Science Minors

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<td>Topics in financial mathematics (6)</td>
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<tr>
<td>MATH7219</td>
<td>Topics in applied functional analysis (6)</td>
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<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory (6)</td>
</tr>
<tr>
<td>MATH7501</td>
<td>Topics in algebra (6)</td>
</tr>
<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics (6)</td>
</tr>
<tr>
<td>MATH7503</td>
<td>Topics in advanced optimization (6)</td>
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</table>

[previous title: Topics in mathematical programming and optimization (6)]

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<tr>
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<tr>
<td>MATH7504</td>
<td>Geometric topology (6)</td>
</tr>
<tr>
<td>MATH7505</td>
<td>Real analysis (6)</td>
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</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 in Mathematics

## 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**
         - MATH2012 Fundamental concepts of mathematics (6)
         - MATH2014 Multivariable calculus and linear algebra (6)

2. **Advanced level courses (18 credits)**
   - **Disciplinary Electives (12 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)
         - 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)
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<td>MATH7202</td>
<td>Complex manifolds</td>
<td>(6)</td>
</tr>
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<td>MATH7217</td>
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<td>MATH7219</td>
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<td>Topics in advanced probability theory</td>
<td>(6)</td>
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<td>MATH7501</td>
<td>Topics in algebra</td>
<td>(6)</td>
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<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
<td>(6)</td>
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<tr>
<td>MATH7503</td>
<td>Topics in advanced optimization</td>
<td>(6)</td>
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<tr>
<td>MATH7504</td>
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<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.
**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**
   - MATH2012 Fundamental concepts of mathematics (6)
   - 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**
   - 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)
   - 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)
### Science Minors

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<td>Topics in geometry (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>Topics in advanced optimization (6)</td>
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<td>Geometric topology (6)</td>
</tr>
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<td>MATH7505</td>
<td>Real analysis (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](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 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.

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)  
Major in Mathematics/Physics  
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  
   MATH2012 Fundamental concepts of mathematics (6)  
   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  
   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)  
   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)  
   MATH4600 Scientific computing (6)  
   MATH4902 Operations research II (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. 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: 2022
admitted to Year 1 in

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)

   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)
   - BIOL3508 Microbial physiology and 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)

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: 2021

admitted to Year 1 in

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)

   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.

   BIOC2600 and BIOL2220 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)
   - 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 ("discipline 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: 2020
admitted to Year 1 in

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)
   - 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

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:

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<th>Credits</th>
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<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity (6)</td>
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</tr>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry (6)</td>
<td></td>
</tr>
<tr>
<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>BIOL2220</td>
<td>Principles of biochemistry (6)</td>
<td></td>
</tr>
</tbody>
</table>

May take either BIOL1309 or BIOC2600 to fulfill this 12 credits requirement, but not both.
BIOL2220 and BIOC2600 are mutually exclusive.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution (6)</td>
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2. Advanced level courses (24 credits)

Disciplinary Core Courses (6 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
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<tr>
<td>BIOL3401</td>
<td>Molecular biology (6)</td>
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Disciplinary Electives (18 credits)
At least 18 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3403</td>
<td>Immunology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3409</td>
<td>Business aspects of biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3508</td>
<td>Microbial physiology and biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4415</td>
<td>Healthcare biotechnology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4417</td>
<td>'Omnics' and systems biology (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS4110</td>
<td>Environmental remediation (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.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2018
admitted to Year 1 in

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)
   - 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)

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

BIOL1110 From molecules to cells (6)
BIOL1309 Evolutionary diversity (6)
BIOL2102 Biostatistics (6)
BIOL2103 Biological sciences laboratory course (6)
BIOL2210 Principles of biochemistry (6)
BIOL2220 Principles of biochemistry (6)
BIOL2306 Ecology and evolution (6)
BIOC2600 Basic biochemistry (6)
May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.

May take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both.

BIOL2220 and BIOL2600 are mutually exclusive.

May take either BIOL2220 or BIOL2600 to fulfill this 12 credits requirement, but not both.

BIOL2220 and BIOL2600 are mutually exclusive.

May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.

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 2022

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 advanced 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 fulfil 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.scfac.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 2021

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 discrete mathematics (6)
   MATH7503 Topics in advanced optimization (6)  
   [previous title: 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:** 2020

**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 advanced optimization (6)  
  
  [previous title: 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 syllabus.
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 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 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 advanced optimization (6)  [previous title: 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 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

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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)**
     - 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)
       - MATH7501 Topics in applied discrete mathematics (6)
       - MATH7503 Topics in advanced optimization (6)

   [previous title: 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.
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)

<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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</tbody>
</table>

Disciplinary Electives (12 credits)

Select either List A or List B:

List A
- MATH2101 Linear algebra I (6)
- MATH2211 Multivariable calculus (6)

List B
- MATH2202 Fundamental concepts of mathematics (6)
- MATH2214 Multivariable calculus and linear algebra (6)

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</td>
<td>6</td>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization</td>
<td>6</td>
</tr>
</tbody>
</table>

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 advanced optimization (6)

[previous title: 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: 2022

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 Foundations of laser and spectroscopy (6)
   PHYS3760 Physics laboratory (6)
   PHYS3850 Physical 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)
   PHYS4550 Advanced statistical mechanics (6)
   PHYS4551 Solid state physics (6)
   PHYS4650 Stellar physics (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Selected topics in astrophysics and 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 electromagnetic field theory (6)
   PHYS7550 Graduate statistical mechanics (6)
   PHYS7750 Nanophysics (6)
<table>
<thead>
<tr>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (&quot;disciplinary core&quot;) 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 &quot;Students taking double Majors, Major-Minor or double Minors with overlapping course requirements&quot; in the BSc syllabuses.</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.</td>
</tr>
</tbody>
</table>
Minor Title: Minor in Physics
Offered to students: 2021
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 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 Foundations of laser and spectroscopy (6) [previous title: Laser and spectroscopy (6)]
   PHYS3760 Physics laboratory (6)
   PHYS3850 Physical 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)
   PHYS4550 Advanced statistical mechanics (6)
   PHYS4551 Solid state physics (6)
   PHYS4650 Stellar physics (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Selected topics in astrophysics and cosmology (6) [previous title: 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 electromagnetic field theory (6) [previous title: Graduate electromagnetism (6)]
   PHYS7550 Graduate statistical mechanics (6)
Science Minors

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 2020

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 Foundations of laser and spectroscopy (6)  
           [previous title: Laser and spectroscopy (6)]
         - PHYS3760 Physics laboratory (6)
         - PHYS3850 Physical 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)
         - PHYS4550 Advanced statistical mechanics (6)
         - PHYS4551 Solid state physics (6)
         - PHYS4650 Stellar physics (6)
         - PHYS4652 Planetary science (6)
         - PHYS4653 Selected topics in astrophysics and cosmology (6)  
           [previous title: 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 electromagnetic field theory (6)  
           [previous title: Graduate electromagnetism (6)]
         - PHYS7550 Graduate statistical mechanics (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 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)
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       - PHYS2250 Introductory mechanics (6)
       - PHYS2255 Introductory electricity and magnetism (6)
       - PHYS2260 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 Foundations of laser and spectroscopy (6) [previous title: Laser and spectroscopy (6)]
         - PHYS3760 Physics laboratory (6)
         - PHYS3850 Physical Optics (6) [previous title: 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)
         - PHYS4550 Advanced statistical mechanics (6)
         - PHYS4551 Solid state physics (6)
         - PHYS4650 Stellar physics (6)
         - PHYS4652 Planetary science (6)
         - PHYS4653 Selected topics in astrophysics and cosmology (6) [previous title: 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 electromagnetic field theory (6) [previous title: Graduate electromagnetism (6)]
         - PHYS7550 Graduate statistical mechanics (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 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:

- **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)

<table>
<thead>
<tr>
<th>Required courses (42 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (24 credits)</strong></td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (6 credits)</strong></td>
</tr>
<tr>
<td>PHYS1250</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (18 credits)</strong></td>
</tr>
<tr>
<td>At least 18 credits selected from the following courses:</td>
</tr>
<tr>
<td>PHYS1150</td>
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<tr>
<td>PHYS2055</td>
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<tr>
<td>PHYS2150</td>
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<tr>
<td>PHYS2155</td>
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<tr>
<td>PHYS2160</td>
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<tr>
<td>PHYS2250</td>
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<tr>
<td>PHYS2255</td>
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<tr>
<td>PHYS2261</td>
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<tr>
<td>PHYS2265</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Advanced level courses (18 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disciplinary Electives (18 credits)</strong></td>
</tr>
<tr>
<td>At least 18 credits selected from the following courses:</td>
</tr>
<tr>
<td>List A</td>
</tr>
<tr>
<td>PHYS3150</td>
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<tr>
<td>PHYS3151</td>
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<td>PHYS3350</td>
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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  2017
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
Major in Physics (Intensive)

Required courses (42 credits)

1. Introductory level courses (18 credits)
Disciplinary Core Courses (18 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS1250</td>
<td>Fundamental physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2250</td>
<td>Introductory mechanics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS2265</td>
<td>Introductory quantum physics (6)</td>
<td></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:

<table>
<thead>
<tr>
<th>List A</th>
<th>Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>PHYS3150</td>
<td>Theoretical physics (6)</td>
<td></td>
</tr>
<tr>
<td>PHYS3151</td>
<td>Machine learning in physics (6)</td>
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<td>PHYS3350</td>
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<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>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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<td>Astrophysics (6)</td>
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<td>PHYS3660</td>
<td>Astronomy laboratory (6)</td>
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<td>PHYS3750</td>
<td>Foundations of laser and spectroscopy (6)</td>
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<td>PHYS3751</td>
<td>Physics of nanomaterials (6)</td>
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<td>PHYS3760</td>
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<tr>
<td>PHYS3850</td>
<td>Physical Optics (6)</td>
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</table>

[previous title: Waves and optics (6) ]

<p>| 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 | Selected topics in astrophysics and cosmology (6) |         |
| PHYS4654 | General relativity (6)                     |         |
| PHYS4655 | Interstellar medium (6)                    |         |
| PHYS4656 | Advanced astrophysics (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)             |         |</p>
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>PHYS7450</td>
<td>Graduate electromagnetic field theory</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>

**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 Plant Science
Offered to students: 2021
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: 2020
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
2019

### 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: 2018

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, labtoratory-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, labtoratory-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, labtoratory-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</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>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</th>
<th>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>
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<td>Plant structure and evolution</td>
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<tr>
<td>BIOL3408</td>
<td>Genetics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4209</td>
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<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: 2017
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 Risk Management
Offered to students admitted to Year 1 in 2022

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)
   STAT1602 Business statistics (6)
   STAT1603 Introductory statistics (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)
   STAT2604 Introduction to R/Python 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)
   STAT3612 Statistical machine learning (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: 2021
admitted to Year 1 in

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/Python programming and elementary data analysis (6) [previous title: 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.
Minor Title: Minor in Risk Management
Offered to students: 2020
admitted to Year 1 in

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 Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT1601</td>
<td>Elementary statistical methods (6)</td>
<td></td>
</tr>
<tr>
<td>STAT1602</td>
<td>Business statistics (6)</td>
<td></td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics (6)</td>
<td></td>
</tr>
<tr>
<td>STAT2601</td>
<td>Probability and statistics I (6)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>List B</th>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT2602</td>
<td>Probability and statistics II (6)</td>
<td></td>
</tr>
<tr>
<td>STAT2603</td>
<td>Data management with SAS (6)</td>
<td></td>
</tr>
<tr>
<td>STAT2604</td>
<td>Introduction to R/Python programming and elementary data analysis (6)</td>
<td>[previous title: Introduction to R programming and elementary data analysis (6)]</td>
</tr>
</tbody>
</table>

2. Advanced level courses (30 credits)
Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:

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<tr>
<th>Course</th>
<th>Course Description</th>
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<tbody>
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<td>The statistics of investment risk (6)</td>
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<td>Credit risk analysis (6)</td>
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<td>STAT4608</td>
<td>Market risk analysis (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 Risk Management  
Offered to students  
2019  
admitted to Year 1 in

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 Title</th>
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</thead>
<tbody>
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<td>Introductory statistics</td>
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<tr>
<td>STAT2601</td>
<td>Probability and statistics I</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>List B</th>
<th>Course Title</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/Python programming and elementary data analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

[previous title: 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:

<table>
<thead>
<tr>
<th>Course编号</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>
<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: 2018  
admitted to Year 1 in

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

<table>
<thead>
<tr>
<th>Required courses (42 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (12 credits)</td>
</tr>
<tr>
<td>Disciplinary Electives (12 credits)</td>
</tr>
<tr>
<td>At least 12 credits from List A and List B, with at least 6 credits from List B:</td>
</tr>
<tr>
<td>List A</td>
</tr>
<tr>
<td>STAT1601</td>
</tr>
<tr>
<td>STAT1602</td>
</tr>
<tr>
<td>STAT1603</td>
</tr>
<tr>
<td>STAT2601</td>
</tr>
<tr>
<td>List B</td>
</tr>
<tr>
<td>STAT2602</td>
</tr>
<tr>
<td>STAT2603</td>
</tr>
<tr>
<td>STAT2604</td>
</tr>
</tbody>
</table>

Note: [previous title: 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.
**Minor Title**  Minor in Risk Management  
**Offered to students**  2017  
**admitted to Year 1 in**

**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/Python programming and elementary data analysis (6)  
   
   [previous title: 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 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:

<table>
<thead>
<tr>
<th>PLO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLO 1</td>
<td>apprehend the entrepreneurial process and the principles/models relevant to its different key stages</td>
</tr>
<tr>
<td>PLO 2</td>
<td>gain insights into how a broad range of disciplines contribute to the success of the entrepreneurial</td>
</tr>
<tr>
<td>PLO 3</td>
<td>evaluate how scientific knowledge can cause impact to the society via entrepreneurship</td>
</tr>
<tr>
<td>PLO 4</td>
<td>develop appropriate action plans for transforming ideas into start-up companies</td>
</tr>
<tr>
<td>PLO 5</td>
<td>effectively collaborate with team members with different expertise and communicate their ideas to a</td>
</tr>
<tr>
<td></td>
<td>range of audiences during the entrepreneurial process</td>
</tr>
</tbody>
</table>

### 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**: 2021  
**admitted to Year 1 in**:  

**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)**
     - ENTR2001: Professional and leadership development (6)
     - IIMT1611: Principles of Technology Entrepreneurship (6)

2. **Advanced level courses (24 credits)**
   - **Disciplinary Core Courses (24 credits)**
     - ENTR3001: Science-based innovation development (6)
     - ENTR3002: Customer analysis and strategic marketing (6)
     - 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: 2020
admitted to Year 1 in

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 Science Entrepreneurship

### Offered to students
admitted to Year 1 in 2019

### 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 training in his/her internship 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)**
   - ENTR2001 Professional and leadership development (6)
   - IIMT1611 Principles of Technology Entrepreneurship (6)

2. **Advanced level courses (24 credits)**
   **Disciplinary Core Courses (24 credits)**
   - ENTR3001 Science-based innovation development (6)
   - ENTR3002 Customer analysis and strategic marketing (6)
   - 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: 2018 admitted to Year 1 in  

**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 Science Entrepreneurship
Offered to students: 2017
admitted to Year 1 in

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: 2022
admitted to Year 1 in

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)
   STAT1005 Essential skills for undergraduates: foundations of data science (6)
   STAT1602 Business statistics (6)
   STAT1603 Introductory statistics (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)
   STAT2604 Introduction to R/Python 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:
   STAT3600 Linear statistical analysis (6)
   STAT3602 Statistical inference (6)
   STAT3603 Stochastic processes (6)
   STAT3604 Design and analysis of experiments (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)
   STAT3620 Modern nonparametric statistics (6)
   STAT3621 Statistical data analysis (6)
   STAT3655 Survival analysis (6)
   STAT4601 Time-series analysis (6)
   STAT4602 Multivariate data analysis (6)
   STAT4610 Bayesian learning (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 | 2021  
admitted to Year 1 in |  

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

<table>
<thead>
<tr>
<th>Required courses (42 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (12 credits)</strong></td>
</tr>
</tbody>
</table>
| **Disciplinary Electives (12 credits)**  
At least 12 credits from List A and List B, with at least 6 credits from List B:  
**List A**  
STAT1005 Essential skills for undergraduates: foundations of data science (6)  
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/Python 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)  
STAT3655 Survival analysis (6)  
STAT4601 Time-series analysis (6)  
STAT4602 Multivariate data analysis (6)  
STAT4610 Bayesian learning (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: 2020  
admitted to Year 1 in

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  
STAT1005 Essential skills for undergraduates: foundations of data science (6)  
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/Python 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)  
STAT3655 Survival analysis (6)  
STAT4601 Time-series analysis (6)  
STAT4602 Multivariate data analysis (6)  
STAT4610 Bayesian learning (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 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
- STAT1005: Essential skills for undergraduates: foundations of data science (6)
- 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/Python programming and elementary data analysis (6) [previous title: 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)
- STAT3655: Survival analysis (6) Take either STAT3655 or STAT3955 to fulfill the requirement; but not both. STAT3655 and STAT3955 are mutually exclusive.
- STAT3955: Survival analysis (6) Take either STAT3655 or STAT3955 to fulfill the requirement; but not both. STAT3655 and STAT3955 are mutually exclusive.
- STAT3601: Time-series analysis (6)
- STAT3602: Multivariate data analysis (6)
- STAT3610: Bayesian learning (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: 2018  
Admitted to Year 1 in:

**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>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT1005</td>
<td>Essential skills for undergraduates: foundations of data science</td>
<td>6</td>
</tr>
<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>Course Title</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/Python programming and elementary data analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT2605</td>
<td>Demographic and socio-economic statistics</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>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3600</td>
<td>Linear statistical analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT3602</td>
<td>Statistical inference</td>
<td>6</td>
</tr>
<tr>
<td>STAT3603</td>
<td>Stochastic processes</td>
<td>6</td>
</tr>
<tr>
<td>STAT3604</td>
<td>Design and analysis of experiments</td>
<td>6</td>
</tr>
<tr>
<td>STAT3605</td>
<td>Quality control and management</td>
<td>6</td>
</tr>
<tr>
<td>STAT3606</td>
<td>Business logistics</td>
<td>6</td>
</tr>
<tr>
<td>STAT3607</td>
<td>Statistics in clinical medicine and bio-medical research</td>
<td>6</td>
</tr>
<tr>
<td>STAT3608</td>
<td>Statistical genetics</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>STAT3613</td>
<td>Marketing analytics</td>
<td>6</td>
</tr>
<tr>
<td>STAT3614</td>
<td>Business forecasting</td>
<td>6</td>
</tr>
<tr>
<td>STAT3617</td>
<td>Sample survey methods</td>
<td>6</td>
</tr>
<tr>
<td>STAT3620</td>
<td>Modern nonparametric statistics</td>
<td>6</td>
</tr>
<tr>
<td>STAT3621</td>
<td>Statistical data analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT3655</td>
<td>Survival analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either STAT3655 or STAT3955 to fulfill the requirement; but not both. STAT3655 and STAT3955 are mutually exclusive.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Survival analysis</td>
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<tr>
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<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td>STAT4610</td>
<td>Bayesian learning</td>
<td>6</td>
</tr>
</tbody>
</table>

### Notes:

- Science Minors
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

### 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>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT1005</td>
<td>Essential skills for undergraduates: foundations of data science</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>STAT1601</td>
<td>Elementary statistical methods (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT1602</td>
<td>Business statistics (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT1603</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>STAT2601</td>
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<td></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 (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT2603</td>
<td>Data management with SAS (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT2604</td>
<td>Introduction to R/Python programming and elementary data analysis (6)</td>
<td>[previous title: Introduction to R programming and elementary data analysis (6)]</td>
<td></td>
</tr>
<tr>
<td>STAT2605</td>
<td>Demographic and socio-economic statistics (6)</td>
<td></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>STAT3600</th>
<th>Linear statistical analysis (6)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3602</td>
<td>Statistical inference (6)</td>
<td></td>
</tr>
<tr>
<td>STAT3603</td>
<td>Stochastic processes (6)</td>
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<td>STAT3607</td>
<td>Statistics in clinical medicine and bio-medical research (6)</td>
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<td>STAT3608</td>
<td>Statistical genetics (6)</td>
<td></td>
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<tr>
<td>STAT3611</td>
<td>Computer-aided data analysis (6)</td>
<td></td>
</tr>
<tr>
<td>STAT3612</td>
<td>Statistical machine learning (6)</td>
<td></td>
</tr>
<tr>
<td>STAT3613</td>
<td>Marketing analytics (6)</td>
<td></td>
</tr>
<tr>
<td>STAT3614</td>
<td>Business forecasting (6)</td>
<td></td>
</tr>
<tr>
<td>STAT3616</td>
<td>Advanced SAS programming (6)</td>
<td></td>
</tr>
<tr>
<td>STAT3617</td>
<td>Sample survey methods (6)</td>
<td></td>
</tr>
<tr>
<td>STAT3620</td>
<td>Modern nonparametric statistics (6)</td>
<td></td>
</tr>
<tr>
<td>STAT3621</td>
<td>Statistical data analysis (6)</td>
<td></td>
</tr>
<tr>
<td>STAT3655</td>
<td>Survival analysis (6)</td>
<td></td>
</tr>
</tbody>
</table>

| STAT3955        | Survival analysis (6)                           |         |

<table>
<thead>
<tr>
<th>STAT4601</th>
<th>Time-series analysis (6)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT4602</td>
<td>Multivariate data analysis (6)</td>
<td></td>
</tr>
<tr>
<td>STAT4610</td>
<td>Bayesian learning (6)</td>
<td></td>
</tr>
</tbody>
</table>

Take either STAT3655 or STAT3955 to fulfill the requirement; but not both. STAT3655 and STAT3955 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.
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 should include SCNC1111 and SCNC1112 (unless otherwise exempted). 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>2017</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Physics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major in Biochemistry</td>
<td>All years</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Chemistry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major in Biological Sciences</td>
<td>All years</td>
<td>7 (42 credits)</td>
<td>3 (18 credits)</td>
</tr>
<tr>
<td>Major in Ecology &amp; Biodiversity</td>
<td>All years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major in Biological Sciences</td>
<td>All years</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Food &amp; Nutritional Science</td>
<td>All years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major in Molecular Biology &amp; Biotechnology</td>
<td>All years</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
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<td>All years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major in Food &amp; Nutritional Science</td>
<td>All years</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></td>
<td></td>
</tr>
</tbody>
</table>

If more than 24 credits (including SCNC1111 & SCNC1112, unless otherwise exempted) are listed as required courses (‘disciplinary core’) 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(s) 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 second major in Molecular Biology & Biotechnology to make up for BIOL2102 or BIOL2103.

3. Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111:
   - Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HDKSE)
   - Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
   - Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
   - Mathematics qualification in Gao Kao will be considered on a case-by-case basis

It is optional for them to take the course SCNC1111. Those who are eligible for exemption and do not take this course in their first year of study should take a 6-credit disciplinary elective course of the science major in lieu.
Candidates who have been admitted to Year 1 in 2021-22 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1112:

- Level 4 or above in Biology, Chemistry, and Physics in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
- Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
- Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis.

It is optional for them to take the course SCNC1112. Those who are eligible for exemption and do not take this course in their first year of study should take a 6-credit disciplinary elective course of the science major in lieu.

The eligible students will be informed by the Faculty, via email, of the granting of an exemption from taking SCNC1111 and/or SCNC1112 in late August (before the start of your first year of study). You (as an eligible student) can try out courses that suit your academic interest before you commit to a particular major and submit your application form for taking a replacement course(s) for SCNC1111 and/or SCNC1112 via the Science Online Application Submission System (OASS) during the courses add/drop periods in your second/third year of study. The replacement course must be the disciplinary elective in your declared Science major. If you wish to take double Science majors, you should take the disciplinary elective in one of your declared Science majors to replace the exempted SCNC course(s).

Under these circumstances, the following list shows the major-major combinations that have 24 credits (or more) of the same ‘disciplinary core’ courses that appear in both Science majors and is subject to the rule of double counting:

<table>
<thead>
<tr>
<th>Scenario #1</th>
<th>Admission Year (Year 1)</th>
<th>Exemption granted</th>
<th>No. of replacement courses (credits) to be taken in the 1st major (‘Major 1’)</th>
<th>No. of common ‘disciplinary core’ courses (credits) appear in both Science 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>(a) Major in Biochemistry, Major in Chemistry</td>
<td>2020 &amp; thereafter</td>
<td>SCNC1111 or SCNC1112</td>
<td>1 (6 credits)</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>OR (b) Major in Biochemistry, Major in Molecular Biology &amp; Biotechnology</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 or SCNC1112</td>
<td>1 (6 credits)</td>
<td>4 (24 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>OR (b) Major in Biological Sciences, Major in Ecology &amp; Biodiversity</td>
<td>2020 &amp; thereafter</td>
<td>SCNC1111 or SCNC1112</td>
<td>1 (6 credits)</td>
<td>7 (42 credits)</td>
<td>3 (18 credits)</td>
</tr>
<tr>
<td>OR (b) Major in Biological Sciences, Major in Food &amp; Nutritional Science</td>
<td>2020 &amp; thereafter</td>
<td>SCNC1111 or SCNC1112</td>
<td>1 (6 credits)</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>OR (b) Major in Biological Sciences, Major in Molecular Biology &amp; Biotechnology</td>
<td>2020 &amp; thereafter</td>
<td>SCNC1111 or SCNC1112</td>
<td>1 (6 credits)</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>OR (b) Major in Earth System Science, Major in Geology</td>
<td>2020 &amp; thereafter</td>
<td>SCNC1111 or SCNC1112</td>
<td>1 (6 credits)</td>
<td>4 (24 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>OR (b) Major in Ecology &amp; Biodiversity, Major in Food &amp; Nutritional Science</td>
<td>2020 &amp; thereafter</td>
<td>SCNC1111 or SCNC1112</td>
<td>1 (6 credits)</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>OR (b) Major in Ecology &amp; Biodiversity, Major in Molecular Biology &amp; Biotechnology</td>
<td>2020 &amp; thereafter</td>
<td>SCNC1111 or SCNC1112</td>
<td>1 (6 credits)</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>OR (b) Major in Food &amp; Nutritional Science, Major in Molecular Biology &amp; Biotechnology</td>
<td>2020 &amp; thereafter</td>
<td>SCNC1111 or SCNC1112</td>
<td>1 (6 credits)</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
</tbody>
</table>

Double Counting of Courses in Double Majors, Major-Minor or Double Minors
If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses (‘disciplinary core’) 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(s) in the second major (‘Major 2’) and have the same prefix and at the same or higher level as the double-counted course(s). For example, if a student takes a first major in Ecology & Biodiversity (‘Major 1’) and a second major in Molecular Biology & Biotechnology (‘Major 2’), SCNC1111, SCNC1112, BIOL1110, BIOL2102 and BIOL2103 are the common ‘disciplinary core’ courses that appear in both majors.

(a) In light of the exempted course SCNC1111, the double counted credits should count the following courses in this order: (1) SCNC1112, (2) introductory level (levels 1 and 2) courses, and (3) advanced level (level 3 or above) courses. The 4 courses (SCNC1112, BIOL1110, BIOL2102, and BIOL2103) would be counted for the major in Molecular Biology & Biotechnology. The student has to take a replacement ‘disciplinary elective’ course in the second major in Molecular Biology & Biotechnology to make up for SCNC1111.

(b) In light of the exempted course SCNC1112, the double counted credits should count the following courses in this order: (1) SCNC1111, (2) introductory level (levels 1 and 2) courses, and (3) advanced level (level 3 or above) courses. The 4 courses (SCNC1111, BIOL1110, BIOL2102, and BIOL2103) would be counted for the major in Molecular Biology & Biotechnology. The student has to take a replacement ‘disciplinary elective’ course in the second major in Molecular Biology & Biotechnology to make up for SCNC1112.

Scenario #2

(a) Admission Year (Year 1): 2021 & thereafter
Exemption granted: SCNC1111 & SCNC1112

<table>
<thead>
<tr>
<th>Major-Major combination</th>
<th>Admission Year (Year 1)</th>
<th>Exemption granted</th>
<th>No. of replacement courses (credits) to be taken in the 1st major (‘Major 1’)</th>
<th>No. of common ‘disciplinary core’ courses (credits) appear in both Science 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 Biochemistry</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 &amp; SCNC1112</td>
<td>2 (12 credits)</td>
<td>5 (30 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Chemistry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SCNC1111 &amp; SCNC1112</td>
</tr>
<tr>
<td>Major in Biochemistry</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 &amp; SCNC1112</td>
<td>2 (12 credits)</td>
<td>4 (24 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Molecular Biology &amp; Biotechnology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SCNC1111 &amp; SCNC1112</td>
</tr>
<tr>
<td>Major in Biological Sciences</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 &amp; SCNC1112</td>
<td>2 (12 credits)</td>
<td>7 (42 credits)</td>
<td>3 (18 credits)</td>
</tr>
<tr>
<td>Major in Ecology &amp; Biodiversity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SCNC1111 &amp; SCNC1112</td>
</tr>
<tr>
<td>Major in Biological Sciences</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 &amp; SCNC1112</td>
<td>2 (12 credits)</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Food &amp; Nutritional Science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SCNC1111 &amp; SCNC1112</td>
</tr>
<tr>
<td>Major in Biological Sciences</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 &amp; SCNC1112</td>
<td>2 (12 credits)</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Molecular Biology &amp; Biotechnology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SCNC1111 &amp; SCNC1112</td>
</tr>
<tr>
<td>Major in Earth System Science</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 &amp; SCNC1112</td>
<td>2 (12 credits)</td>
<td>4 (24 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Geology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SCNC1111 &amp; SCNC1112</td>
</tr>
<tr>
<td>Major in Ecology &amp; Biodiversity</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 &amp; SCNC1112</td>
<td>2 (12 credits)</td>
<td>5 (30 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Food &amp; Nutritional Science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SCNC1111 &amp; SCNC1112</td>
</tr>
<tr>
<td>Major in Molecular Biology &amp; Biotechnology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SCNC1111 &amp; SCNC1112</td>
</tr>
<tr>
<td>Major in Ecology &amp; Biodiversity</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 &amp; SCNC1112</td>
<td>2 (12 credits)</td>
<td>5 (30 credits)</td>
<td>2 (12 credits)</td>
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<tr>
<td>Major in Molecular Biology &amp; Biotechnology</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Major in Food &amp; Nutritional Science</td>
<td>2021 &amp; thereafter</td>
<td>SCNC1111 &amp; SCNC1112</td>
<td>2 (12 credits)</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 required courses (‘disciplinary core’) 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(s) in the second major (‘Major 2’) and have the same prefix and at the same or higher level as the double-counted course(s). In light of the exempted course SCNC1111 & SCNC1112, the double counted credits should count the following courses in this order: (1) introductory level (levels 1 and 2) courses, and (2) advanced level (level 3 or above) courses. For example, if a student takes a first major in Ecology & Biodiversity (‘Major 1’) and a second 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 3 courses (BIOL1110, BIOL2102, and BIOL2103) would be counted for the major in Molecular Biology & Biotechnology. The student has to take 2 replacement ‘disciplinary elective’ courses in the second major in Molecular Biology & Biotechnology to make up for SCNC1111 & SCNC1112.

4. 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.

5. 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 :</td>
<td>Select 6 credits from the following to replace MATH1013:</td>
</tr>
<tr>
<td></td>
<td>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 Programme / Major / Minor with Disciplinary Core Courses :</td>
<td>• MATH2012 Fundamental concepts of mathematics (6) (if not the disciplinary core course in the structure)</td>
</tr>
<tr>
<td></td>
<td>MATH1851 and MATH1853 (which are together deemed equivalent to MATH1013)</td>
<td>• MATH2241 Introduction to mathematical analysis (6) (if not the disciplinary core course in the structure)</td>
</tr>
<tr>
<td></td>
<td>For students taking Professional Core in Bachelor of Science in Actuarial Science with Disciplinary Core Course :</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH1821 (which is equivalent to MATH1013)</td>
<td></td>
</tr>
<tr>
<td>MATH2014 Multivariable calculus and linear algebra</td>
<td>For students taking Programme/Major with Disciplinary Core Course :</td>
<td>Select 6 credits from the following to replace MATH2014:</td>
</tr>
<tr>
<td></td>
<td>MATH2101 and MATH2211 (which are together deemed 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>For students taking Professional Core in Bachelor of Science in Actuarial Science with Disciplinary Core Course :</td>
<td>• MATH2012 Fundamental concepts of mathematics (6) (if not the disciplinary core course in the structure)</td>
</tr>
<tr>
<td></td>
<td>MATH2822 (which is equivalent to MATH2014)</td>
<td>• MATH2241 Introduction to mathematical analysis (6) (if not the disciplinary core course in the structure)</td>
</tr>
</tbody>
</table>

6. For the situations of 2, 3, 4 and 5 above, students have to complete and submit the online application form to the Faculty Office via the Science Online Application Submission System (OASS) by the deadline of course selection or add/drop periods. The application will then be forwarded to the relevant Course Selection Adviser (CSA) for endorsement and comment (if any).
BIOC1600  Perspectives in biochemistry (6 credits)  Academic Year  2022
Offering Department  Biomedical Sciences  Quota  ---
Course Co-ordinator  Prof J Tanner, Biomedical Sciences (jatanner@hku.hk)  
(Prof J Tanner, Biomedical Sciences)  
(Dr B H B Yuen, 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)  
(Prof J Tanner, Biomedical Sciences)  

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. 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-successes and failures.

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, using texts and diagrams, 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 communication skills and the ability to collaborate with colleagues in practicals and in presentation of scientific ideas via written and oral proficiencies

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

Not for students who have passed in BIOL1110, or have already enrolled in this course

Offer in 2022 - 2023  
Y 1st sem  Offer in 2023 - 2024 : Y

Examination Dec

Grade Descriptors (A+ to F)  
A  Exceptionally good performance demonstrating comprehensive understanding of the subject matter; critical insight into use of scientific data and the scientific literature; superior presentation and group collaboration skills.

B  Good performance demonstrating full understanding of the subject matter; coherent insight into use of scientific data and the scientific literature; good presentation and group collaboration skills.

C  Satisfactory performance demonstrating adequate understanding of the subject matter; some insight into use of scientific data and the scientific literature; some presentation and group collaboration skills.

D  Limited performance demonstrating some understanding of basic subject matter; some ability to use scientific data and the scientific literature; limited presentation and group collaboration skills.

Fail  Poor understanding of subject matter; with little to no insight into use of scientific data; no understanding of the scientific literature and unable to present or collaborate.

Communication-intensive Course  
Y

Course Type  
Lecture-based course

Course Teaching & Learning Activities  
Activities  Details  No. of Hours
Lectures or workshops  36
Group work Practical classess  12
Reading / Self study  50
Assessment Tasks and preparation  30

Assessment Methods and Weighting  
Methods  Details  Weighing in final course grade (%)  Assessment Methods to CLO Mapping
Assignments including practical writeups  20  CLO 1,2,3,4,5
Examination  50  CLO 1,2,3
Project reports group communication project  30  CLO 2,3,4,5

Required/recommended reading and online materials  
TBC

BIOC2600  Basic biochemistry (6 credits)  Academic Year  2022
Offering Department  Biomedical Sciences  Quota  300
Course Co-ordinator  Dr M Kotaka, Biomedical Sciences (masayo@hku.hk)
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 Objectives

On successful completion of this course, students should be able to:

- CLO 1 relate the structures to functions of major biomolecules including carbohydrates, amino acids and lipids
- CLO 2 explain the fundamentals and significance of bioenergetics, metabolism and intracellular signaling
- CLO 3 explain the fundamentals and importance of the flow of genetic information
- CLO 4 explain the molecular mechanisms of disorders related to metabolism of carbohydrates, amino acids and/or lipids
- CLO 5 demonstrate skills in working and collaborating together with colleagues in group assignments

Prerequisites and Co-requisites

Pass in BIOC1600 or BiOL1110 or ENGG1207 or BMED1207; and Not for students who have passed in BIOL2220 or MEDE2301 or BMED2301, or have already enrolled in these courses.

Assessment

Examination 50 CLO 1,2,3,4

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

- Assignments Assignments 20%; Quizzes 30% 50 CLO 1,2,3,4,5
- Examination 50 CLO 1,2,3,4

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.

Course Teaching & Learning Activities

Activities Details No. of Hours

- Lectures 36
- Tutorials 12
- Reading / Self study 100
- Tutorials 12
- 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.

Communication-intensive Course

N

Course Type

Lecture-based course

Offer in 2022 - 2023

Y 1st sem Offer in 2023 - 2024 : Y
Grade Descriptors (A+ to F)

A: 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.

B: 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 critically appraise data to draw appropriate conclusions.

C: Demonstrates general but incomplete knowledge and skills required for attaining most of the course learning outcomes. Shows evidence of some critical thinking and analytical skills. Conducts laboratory skills and techniques with a satisfactory level of competence and can sometimes correctly appraise data and draw appropriate conclusions.

D: 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.

Fail: 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.

Communication-intensive Course

N

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities
Lectures
biological pathways
Tutorials
Tutorials working on problems relating to the lecture topics
No. of Hours
36
12
100

Assessment Methods and Weighting

Methods
Assignments
Examination
2.5 hrs examination
50
50

Details
weighting in final course grade (%) to CLO Mapping

Assessment Methods
CLO 1,2,3
CLO 1,2,3

CLO 1 describe and explain the principles underlying various biochemical and molecular techniques
CLO 2 apply different techniques to isolate and characterize carbohydrates, lipids, proteins and nucleic acids in hands-on laboratory sessions
CLO 3 interpret and discuss scientific data using appropriate scientific language
CLO 4 collaborate effectively with team members in laboratory sessions

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOC2600 or BIOL2220 or BMED2301 or MEDE2301 or MED2301

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 describe and explain the principles underlying various biochemical and molecular techniques
CLO 2 apply different techniques to isolate and characterize carbohydrates, lipids, proteins and nucleic acids in hands-on laboratory sessions
CLO 3 interpret and discuss scientific data using appropriate scientific language
CLO 4 collaborate effectively with team members in laboratory sessions

Required/recommended reading and online materials


BIOC3604

Essential techniques in biochemistry and molecular biology (6 credits)

Academic Year
2022

Offering Department
Biomedical Sciences

Quota
70

Teachers Involved

Dr R C C Chang, Biomedical Sciences
Dr B C W Wong, Biomedical Sciences
Dr K M Yao, Biomedical Sciences
Dr N S Wong, Biomedical Sciences
Dr V W Ng, Biomedical Sciences
Prof D K Y Shum, Biomedical Sciences
Prof Z J Zhou, Biomedical Sciences

Course Points

Teaching

No. of Hours

Lectures
12
Laboratory
72
Tutorials
6
Reading / Self study
76

Activity details

Y
2nd sem
Offer in 2023 - 2024:

Examination
May

School of Biomedical Sciences
### BIOC3605

**Sequence bioinformatics (6 credits)**  
**Offering Department**: Biomedical Sciences  
**Quota**: 80

**Course Co-ordinator**: Dr B C W Wong, Biomedical Sciences  
**Teachers Involved**: (Dr. CP Chan, Biomedical Sciences)  
**Teaching and Learning Activities**:  
- Lecture-based course  
- Tutorials  
- Reading / Self study

**Course Contents & Topics**: This course will introduce and discuss the following topics:

- DNA and protein sequence database, protein family databases; information searching and retrieval; 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; analysis of next generation sequencing data

**Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in BIO2600 or BiOL2220 or BBMS2003 or BBMS2007 or MEDE2301 or BMED2301


**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- CLO 1 search and retrieve sequence data from biological databases  
- CLO 2 describe the algorithms of commonly used methods for pair-wise and multiple alignments, BLAST database search, phylogenetic trees construction, and gene prediction  
- CLO 3 apply the techniques of sequence analysis in various biological context  
- CLO 4 interpret results from sequence alignments, BLAST database searches, and phylogenetic trees construction  
- CLO 5 carry out basic analysis of next generation sequencing 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>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Written assignments (Lab reports and reading assignments) 25%; Lab skill and problem-solving exercises 25%</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### BIOC3606

**Molecular medicine (6 credits)**  
**Offering Department**: Biomedical Sciences  
**Quota**: 50

**Course Co-ordinator**: Prof D Y Jin, Biomedical Sciences  
**Teachers Involved**: (Dr. CP Chan, Biomedical Sciences)  
(Dr. ZW Ye, Biomedical Sciences)  
(Prof D Y Jin, Biomedical Sciences)  
(Prof K S E Cheah, Biomedical Sciences)

**Course Objectives**: 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.
## Course Contents & Topics

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 biology is assumed for students taking this course.

## Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1** explain the molecular mechanisms underlying selected human diseases including cancer and emerging infections.
- **CLO 2** illustrate the application of molecular biology in medicine with examples; apply biochemical, molecular and cell biological, genetic, immunological as well as microbiological principles and methods to solve new medical problems.
- **CLO 3** interpret and communicate new results about molecular aspects of medicine in the literature to a wider audience in the community.
- **CLO 4** integrate and translate knowledge in molecular biology to new approaches in disease prevention and intervention.

## Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOC2600 or BIOL2220 or MEDE2301 or BMED2301

## Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
<th>May</th>
</tr>
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<td>May</td>
</tr>
<tr>
<td>B</td>
<td>Y</td>
<td>Examination</td>
<td>May</td>
</tr>
<tr>
<td>C</td>
<td>Y</td>
<td>Examination</td>
<td>May</td>
</tr>
<tr>
<td>D</td>
<td>Y</td>
<td>Examination</td>
<td>May</td>
</tr>
<tr>
<td>E</td>
<td>Y</td>
<td>Examination</td>
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</tr>
<tr>
<td>F</td>
<td>Y</td>
<td>Examination</td>
<td>May</td>
</tr>
</tbody>
</table>

## Communication-intensive Course

N

## Course Type

Lecture-based course

## Course Teaching & Learning Activities

### Activities

- **Lectures**: 36 hours
- **Tutorials**: 12 hours
- **Reading / Self study**: 100 hours

## 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>
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<td>CLO 1,2,3,4</td>
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<tr>
<td>Test</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>

## Required/recommended reading and online materials


## BIOC3999

**Directed studies in biochemistry (6 credits)**

### Offering Department

Biomedical Sciences

### Course Co-ordinator

Dr B H B Yuen, Biomedical Sciences (yuenbbh@hku.hk)

### Teachers Involved

(All academic staff in Biochemistry Major,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.
- **CLO 4** interpret scientific data in original research articles and communicate using appropriate scientific language.

### 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 or BIOL2220 and BIOL3401.

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
<th>No Exam</th>
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<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>Examination</td>
<td>No Exam</td>
</tr>
<tr>
<td>B</td>
<td>Y</td>
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<tr>
<td>C</td>
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<tr>
<td>E</td>
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</tr>
<tr>
<td>F</td>
<td>Y</td>
<td>Examination</td>
<td>No Exam</td>
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</tbody>
</table>
This course aims at providing students 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-cellular matrix (ECM) junctions and their adhesion molecules; cadherins and integrins; collagens and proteoglycans; when cell meets the matrix; regulation of signaling molecules by ECM

**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**

### Course Learning Outcomes

**CLO 1** describe and explain the molecular and cellular signal transduction mechanisms that mediate cellular communication to achieve a plethora of cellular responses in multicellular organisms

**CLO 2** apply knowledge in molecular cell biology to analyze new findings and to design further experiments

**CLO 3** interpret data in research articles/problem-solving questions and communicate using appropriate scientific language

**CLO 4** work effectively with classmates in tutorial classes

### 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>Dissertation</td>
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<td>CLO 1,2,3,4</td>
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<tr>
<td>Oral presentation</td>
<td></td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Research report</td>
<td>Supervisor comments 15%; Mind map 10%</td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOC3601 or BIOL3401 or BIOL3402 or BIOL3404

### School of Biomedical Sciences

- Demonstrates 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.

- 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 critical thinking and analytical skills, and ability to apply knowledge to familiar and some unfamiliar situations.

- Demonstrates 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.

- Demonstrates 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.

- 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 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.

- 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.
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>
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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>
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**Assessment Methods and Weighting**

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<tbody>
<tr>
<td>Assignments</td>
<td>Problem-solving questions and quizzes</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

**BIOC4611**
Advanced biochemistry II (6 credits)

**Offering Department**
Biomedical Sciences

**Quota**
50

**Course Co-ordinator**
Prof D Chan, Biomedical Sciences (chand@hku.hk)

**Teachers Involved**
(Dr C M Qian, Biomedical Sciences)
(Dr M Kotaka, Physiology)
(Dr N S Wong, Biomedical Sciences)
(Prof D Chan, Biomedical Sciences)
(Prof J Tanner, Biomedical Sciences)

**Course Objectives**
This course is aimed at providing students with an up-to-date knowledge of protein biochemistry from sequence to structure and disease; realizing the importance of kinetics in cellular function and an appreciation of the technological advances in the characterization of macromolecules.

**Course Contents & Topics**
Topics including protein folding and misfolding in diseases; conformation of proteins and the role of conformational changes in protein function; catalytic mechanisms of enzymes and enzyme kinetics; biomolecular interactions; characterization of macromolecules using X-ray crystallography, nuclear magnetic resonance and other spectroscopy methods; protein engineering and therapeutic approaches targeting protein function.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1 describe how protein structures inform functions
- CLO 2 recognize the roles of enzyme kinetics in cellular functions
- CLO 3 derive structural information of macromolecules from experimental data
- CLO 4 apply their knowledge on protein engineering and therapeutics, and on experimental designs in basic and applied research

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in BIOC3601; and BIOL3404 or CHEM2441; and Pass in BIOC4610, or already enrolled in this course

**Offer in 2022 - 2023**
N

**Grade Descriptors (A+ to F)**
- **A**
  Clear and insightful description of how protein structure informs functions; clear evidence of ability to recognize mechanisms of enzyme function and interpretation of data; effectual demonstration of applying knowledge to the design of scientific methodologies and cohesive, systematic and creative organization of information for presentation and communication.
- **B**
  Clear description of how protein structure informs function; evidence of ability to recognize mechanisms of enzyme function and interpretation of data; capable demonstration of applying knowledge to the design of scientific methodologies; and cohesive and systematic organization of information for presentation and communication.
- **C**
  Awareness of how protein structure informs function; some evidence of ability to recognize mechanisms of enzyme function and interpretation of data; capable demonstration of applying knowledge to the design of scientific methodologies and systematic organization of information for presentation and communication.
- **D**
  Superficial awareness of how protein structure informs function; limited evidence of ability to recognize mechanisms of enzyme function and interpretation of data; superficial demonstration of applying knowledge to the design of scientific methodologies and limited organizational skill of information for presentation and communication.
- **F**
  Lack of awareness of how protein structure informs function; lack of ability to recognize mechanisms of enzyme function and interpretation of data; superficial demonstration of applying knowledge to the design of scientific methodologies; insufficient organizational skill of information for presentation and communication.

**Communication-intensive Course**
N

**Course Type**
Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Tutorials</td>
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<td>12</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>
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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Problem-solving questions and quizzes</td>
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<tr>
<td>Examination</td>
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<td>70</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
W.H. Freeman, New York.
To be given.

**BIOC4612**
Molecular biology of the gene (6 credits)

**Offering Department**
Biomedical Sciences

**Quota**
50

**Course Co-ordinator**
Prof K S E Cheah, Biomedical Sciences (hrmbdkc@hku.hk)

**Teachers Involved**
(Dr K M Yao, Biomedical Sciences)
(Prof K S E Cheah, Biomedical Sciences)
### BIOC4613 Advanced techniques in biochemistry & molecular biology (6 credits)

**Offering Department:** Biomedical Sciences  
**Course Co-ordinator:** Prof D Chan, Biomedical Sciences (chand@hku.hk)  
**Teachers Involved:**  
- Dr B C W Wong, Biomedical Sciences  
- Dr C Y S Chung, Biomedical Sciences  
- Dr M C H Cheung, Biomedical Sciences  
- Dr A B Kinghorn, Biomedical Sciences  
- Prof D Chan, Biomedical Sciences  
**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 and design alternative approaches to test or validate hypotheses  
- CLO 4 collaborate with team members to complete laboratory experiments  
- CLO 5 document laboratory work and data using a laboratory notebook following standard practices in research laboratories  
**Pre-requisites:** Pass in BIOC3601 or BIOC3402 or BIOC3404 or BBMS2007  
**Offer in 2022 - 2023:** Y  
**Grade Descriptors (A+ to F):**  
- A: Demonstrates a deep and comprehensive understanding of the regulation of eukaryotic gene expression and its relevance to disease and effectively relates the knowledge to developmental processes. Uses skill and insight to analyse and interpret experimental data from gene regulation studies.  
- B: Demonstrates a competent grasp of the key concepts in the regulation of eukaryotic gene expression and its relevance to disease and is able to link the knowledge to developmental processes. Correctly analyses and interprets experimental data from gene regulation studies.  
- C: Demonstrates a basic understanding of the regulation of eukaryotic gene expression and its relevance to disease and is sometimes able to relate the knowledge to developmental processes. Displays a limited capacity to analyse and interpret experimental data from gene regulation studies.  
- D: Demonstrates a simplistic knowledge of the regulation of eukaryotic gene expression and rarely relates the information to developmental processes. Displays weak analytical skills and is rarely able to interpret experimental data from gene regulation studies.  
- E: Demonstrates incomplete or incorrect knowledge of the regulation of gene expression and is unable to relate the ideas to developmental processes. Unable to analyse or interpret experimental data from gene regulation studies.  

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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>
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<tr>
<td>Tutorials</td>
<td>12</td>
<td></td>
</tr>
<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>Problem-solving questions and data analysis</td>
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<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
<td></td>
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</table>

**Required/recommended reading and online materials:**  
### BIOC4966
**Biochemistry internship (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biomedical Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr B H B Yuen, Biomedical Sciences (<a href="mailto:yuennbh@hku.hk">yuennbh@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(All academic staff in Biochemistry Major, Biomedical Sciences) (Dr B H B Yuen, Biomedical Sciences)</td>
</tr>
</tbody>
</table>

#### 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 School/Departments.

#### Course Contents & Topics
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 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).

#### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 recognize the strengths and limitations of their area of training or expertise
- CLO 2 acquire problem-solving skills to solve novel and ill-defined problems
- CLO 3 work effectively with colleagues in laboratories or other real world environments
- CLO 4 examine the role of science in society

#### 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 BIOC3604.

This capstone course is for Biochemistry Major students only.

The earliest that a student can take this capstone course is their year 3 study.

#### Offer in 2022 - 2023
- Y 1st sem 2nd sem Summer Offer in 2023 - 2024: Y
- Examination: No Exam

#### Communication-intensive Course
- N

#### Course Type
- Internship

#### Course Teaching & Learning Activities
**Activities**
- Internship work

**Details**
- 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**
- Oral presentation
- Supervisor’s feedback
- Written report

**Details**
- 30
- 30
- 40

**Weighting in final course grade (%)**
- CLO 1, 2, 3, 4

**Assessment Methods to CLO Mapping**
- CLO 1, 2, 3, 4

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### Grade Descriptors

<table>
<thead>
<tr>
<th>Distinction</th>
<th>Pass</th>
<th>Fail</th>
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<tbody>
<tr>
<td>B Comprehensive understanding of the principles and applications of advance technologies in biochemistry; clear ability to identify problems and generate solutions relating to applications in a laboratory setting; some awareness of ability to evaluate experimental data; systematic planning and organization of experimental design and presentation of experimental data.</td>
<td>C Sound understanding of the principles and applications of advance technologies in biochemistry; sound ability to identify problems and generate solutions relating to applications in a laboratory setting; some awareness of ability to evaluate experimental data; satisfactory planning and organization of experimental design and presentation of experimental data.</td>
<td>D Superficial understanding of the principles and applications of advance technologies in biochemistry; limited ability to identify problems and generate solutions relating to applications in a laboratory setting; lack of awareness of ability to evaluate experimental data; some evidence of planning and organization of experimental design and presentation of experimental data.</td>
</tr>
</tbody>
</table>

### Assessment

- **Written Report (40)**
  - CLO 1, 2, 3, 4

- **Supervisor’s Feedback (30)**
  - CLO 1, 2, 3, 4

- **Examination One (50)**
  - CLO 1, 2, 3, 4

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### Course Description

In handling and carrying out the work required in the job or assigned by supervisor(s), demonstrates excellent performance in application of knowledge to solve problems in the workplace. Demonstrates excellent performance in handling and carrying 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, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.

**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.

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### Quota

- 20

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### University Press, Cambridge

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 only opened to students who are in year 3 or above in the Biochemistry Major program.
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.

BIOC4999 Biochemistry project (12 credits) Academic Year 2022
Offering Department Biomedical Sciences Quota 25
Course Co-ordinator Dr B H B Yuen; Prof J D Huang, Biomedical Sciences
Teachers Involved (All academic staff in Biochemistry Major, Biomedical Sciences) (Dr B H B Yuen, Biomedical Sciences) (Prof J D Huang, Biomedical Sciences)
Course Objectives
To enable students to acquire the basic skills in scientific research emphasizing on critical and analytical reasoning, free and creative thinking, scholarly communication (both orally and in writing), research integrity, teamwork and time management. The course is particularly useful for those students who intend to pursue a career in life science either in research or industry.
Course Contents & Topics
Project-related topics in biochemistry, cell, molecular and developmental biology.
Experimental methods in protein and nucleic acid biochemistry; bioinformatics and cell biology.
Critical appraisal of current science literature
Formulation of research questions
Design of experiments.
Data analysis and interpretation.
Scientific writing

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 describe recent research development in a defined area of biochemistry and molecular biology
CLO 2 formulate research questions and design experiments to address these questions
CLO 3 apply appropriate experimental techniques to solve research problems
CLO 4 manage and interpret experimental results
CLO 5 develop scientific writing skills and logically report their research findings

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 4 of the following 5 courses: BIL3401, BIOC3601, BIOC3604, BIOC4610 and BIOC4613. BIOC4610 and BIOC4613 can be taken concurrently with this course. This capstone course is only opened to students who are in year 3 or above in the Biochemistry Major program.

Offer in 2022 - 2023 Y Year long Offer in 2023 - 2024: Y Examination No Exam
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. Communicates the findings to a broader audience with reasonable clarity and responds to most questions. Acceptable time-management skills.
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.
Communication-intensive Course None
Course Type Project-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
Dissertation CLO 1, 2, 3, 4, 5 50 CLO 1, 2, 3, 4, 5
Oral presentation 35 CLO 1, 2, 3, 4, 5
Research report 15 CLO 1, 2, 3, 4, 5
Required/recommended reading and online materials None prescribed

BIOL3404 Protein structure and function (6 credits) Academic Year 2022
Offering Department Biomedical Sciences Quota 70
Course Co-ordinator Dr C M Qian, Biomedical Sciences (cmqian@hku.hk)
Teachers Involved (Dr C M Qian, Biomedical Sciences) (Prof 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, nuclear magnetic resonance and cryo electron microscopy;
How protein works: protein flexibility and dynamics, protein interaction, protein complex, and control of protein function;
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.

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>CLO 1</th>
<th>fundamental understanding of principles of protein structure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLO 2</td>
<td>demonstrate a basic understanding of the relationship between protein structure and function</td>
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<tr>
<td></td>
<td>CLO 3</td>
<td>have a basic understanding of major methods for macromolecular structure determination</td>
</tr>
<tr>
<td></td>
<td>CLO 4</td>
<td>understand the principles regulating protein function in vivo</td>
</tr>
<tr>
<td></td>
<td>CLO 5</td>
<td>learn about the ways to purify protein and the many industrial uses of proteins</td>
</tr>
</tbody>
</table>

Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in BIOC2600 or BIOL2220 or MEDE2301 or BMED2301

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Y 2nd sem Offer in 2023 - 2024 : Y</th>
<th>Examination</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td>A 1. Exceptionally good performance demonstrating comprehensive understanding of the subject matter. 2. Critical insight into the scientific literature. 3. Superior writing and group communication skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B 1. Good performance demonstrating full understanding of the subject matter. 2. Coherent insight into the scientific literature. 3. Good writing and group collaboration skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C 1. Satisfactory performance demonstrating adequate understanding of the subject matter. 2. Some insight into the scientific literature. 3. Adequate writing and group collaboration skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D 1. Limited performance demonstrating some understanding of basic subject matter. 2. Some ability to use the scientific literature. 3. Limited writing and group collaboration skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fail 1. Poor understanding of subject matter. 2. Little to no insight into use of the scientific literature. 3. Unable to write or collaborate.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Communication-intensive Course N

Course Type | Lecture-based course
Course Teaching & Learning Activities | Activities | Details | No. of Hours
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
<td></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>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>35</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>15</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials | None prescribed
| To be announced. |

Additional Course Information | This course will be offered subject to a minimum enrollment number and availability of teachers.
BIOL1110  From molecules to cells (6 credits)  Academic Year  2022
Offering Department  Biological Sciences  Quota  382
Course Co-ordinator  Dr G Y W Chan, Biological Sciences (gywchan@hku.hk)
Teachers Involved  (Dr C S C Lo, School of Biological Sciences)
  (Dr G Y W Chan, School of Biological Sciences)
  (Dr K W Y Yuen, School of Biological Sciences)
Course Objectives  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.
Course Contents & Topics  An issue-based approach will be adopted to enable students to integrate basic concepts in molecules and cells and to inspire further exploration 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:
1. 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?
2. 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?
3. 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?
4. 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?
Course Learning Outcomes  On successful completion of this course, students should be able to:
1. Understand the relationships between genes in a genome and the inherited phenotypes expressed in a living organism
2. Learn the underlying principle on how mutation of a gene can lead to the development of a genetic disease
3. Understand the importance of dietary intake of biomolecules in relationship to health
4. Explain various stages in a cell division and that disturbance of this process may result in cancer development
5. Describe concepts used in genetic engineering
6. Know some applications of genetic engineering in gene therapy and production of genetically modified food
Pre-requisites (and Co-requisites and Impermissible combinations)  Not for students who have passed in BIOL1600, or have already enrolled in this course.
Offer in 2022 - 2023  Y
Grade Descriptors (A+ to F)  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.
For students having taken any level 2 (or above) Biomedical Sciences (BBMS) or Biochemistry (BIOC) or Bachelor of Medicine and Bachelor of Surgery (MBBS) course. Students having taken level 2 BBMS/BIOC/MBBS course should take the replacement course for BIOL1110 in any regular major offered by the School of Biological Sciences.

Communication-intensive Course  N
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, 4, 5, 6
Test  50  CLO 1, 2, 3, 4, 5, 6
Course Website  http://moodle.hku.hk/
Additional Course Information  Quota in 1st Semester: 210
  Quota in 2nd Semester: 172

BIOL1111  Introductory microbiology (6 credits)  Academic Year  2022
Offering Department  Biological Sciences  Quota  80
Course Co-ordinator  ---, Biological Sciences ()
School of Biological Sciences

Course Objectives

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.

Course Contents & Topics

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.

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 describe the key features of the major microbial phyla and place them in an evolutionary context
- CLO 2 explain the major physiological and genetic processes in prokaryotes and eukaryotic microorganisms and compare the similarities and differences between these two domains
- CLO 3 identify the microorganisms involved and their role in ecological processes, human disease and medicine, food production and spoilage, and biotechnology

Pre-requisites (and Co-requisites and Impermissible combinations)

NIL

Grade Descriptors (A+ to F)

A (85-100%) Meets the standard of excellence. All criteria are addressed. Organization of ideas and clarity are excellent. Additional reading or research is evident. Ideas show an exceptional understanding of concepts. Arguments are highly persuasive and show excellent judgment and prioritization of issues. Presentation is highly creative and appealing.

B (70-84%) Approaches the standard of excellence. All criteria are addressed. Organization of ideas and clarity are very good. Ideas show a complete understanding of concepts. Arguments are persuasive and prioritize major issues. Presentation is creative and appealing.

C (55-69%) Meets an acceptable standard. All criteria are addressed. Organization of ideas and clarity are sufficient. Ideas show an effective understanding of concepts. Arguments identify major issues. Presentation is appealing but may lack clarity.

D (45-54%) Below acceptable standard. Most criteria are addressed. Organization of ideas and clarity are weak. Ideas show an incomplete understanding of concepts. Arguments are not persuasive. Presentation lacks creativity or is not appealing.

F (<45%) Unacceptable. Inability to identify major criteria. Very weak organization of ideas and clarity. Ideas show a lack of understanding of concepts. No coherent argument. Presentation lacks creativity or is unappealing.

Communication-intensive Course

N

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>

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>Examination</td>
<td>70</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>30</td>
<td>CLO 3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk/

BIOL1201 Introduction to food and nutrition (6 credits)

Offering Department

Biological Sciences

Course Co-ordinator

Dr L Zhang, Biological Sciences (lzhang17@hku.hk)

Teachers Involved

(Dr J C Y Lee, School of Biological Sciences)

(Dr L Zhang, School of Biological Sciences)

Course Objectives

To enable students to appreciate the multidisciplinary nature in the study of Food and Nutrition. From the farmer's field to the dinner table, a basic understanding of the general properties of food in production, processing, storage and safety, as well as food security will be covered. Basic macro- and micronutrients from these food and their absorption, distribution, metabolism, and excretion will allow students to understand the function of these nutrients in the human body.

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 include food composition and functional properties of major nutrients; food additives; food hygiene, safety and regulation; food security; 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 associate with malnutrition

Pre-requisites (and Co-requisites and Impermissible combinations)

NIL

Offer in 2022 - 2023

Y 1st sem Offer in 2023 - 2024 : Y

Grade Descriptors (A+ to F)

A Demonstrate thorough grasp of the subject matter covered. Show exceptional ability to articulate concepts and integrate knowledge. Demonstrate highly effective organization / writing skills.

B Demonstrate substantial grasp of the subject matter covered. Show full capacity to use the appropriate concepts and assimilate the materials to solve problems. Demonstrate effective organization / writing skills.

C Demonstrate general but incomplete grasp of the subject matter covered. Show ability to apply concepts to solve simple problems. 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. Ability to apply concepts and solve simple problems is limited. Demonstrate
BIOL1309  Evolutionary diversity (6 credits) Academic Year 2022

Offering Department Biological Sciences Quota 250
Course Co-ordinator Dr B Guenard, Biological Sciences (bguenard@hku.hk)
Teachers Involved (Dr B Guenard,School of Biological Sciences)
(Dr C S C Lo,School of Biological Sciences)
Course Objectives To provide students with an introduction to the diversity of plant and animal life. Recent research has resulted in fundamental changes in our understanding of evolutionary history (phylogeny). Current evolutionary trees will be used as the basis for a survey of different groups in phylogenetic sequence, and for understanding how structures, processes and behaviours have changed through time.
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, Anthocerotophyta and Bryophyta); seedless vascular plants (Lycophyta, Psilophyta, Sphenophyta and Pterophyta); seed plants (Cycadophyta, Ginkgophyta, Coniferophyta, Gnetophyta and Anthophyta); invertebrates (Cnidaria, Platyhelminthes, Annelida, Mollusca, Nematomad, Arthropoda and Echinodermata); fish (Chondrichthyes and Actinopterygii); amphibians (Batrachomorpha); 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 (and Co-requisites and Impermissible combinations) NIL
Offer in 2022 - 2023 Y 2nd sem Offer in 2023 - 2024 : Y Examination May
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. Presentational skills are minimally effective or ineffective.
Communication-intensive Course N
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
Course Website http://moodle.hku.hk
## Bioethics (6 credits)

### Course Objectives
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

<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 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.</td>
<td>36</td>
</tr>
<tr>
<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 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.</td>
<td>12</td>
</tr>
<tr>
<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 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.</td>
<td>100</td>
</tr>
<tr>
<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 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.</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 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.</td>
<td></td>
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</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Activities</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></td>
<td>40</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

## The gene (6 credits)

### 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

<table>
<thead>
<tr>
<th>Content/topics include:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction and review of basic cell biology</td>
</tr>
<tr>
<td>Basic genetic - The gene</td>
</tr>
<tr>
<td>Basic Molecular Biology and Biotechnology</td>
</tr>
<tr>
<td>Recombinant DNA and cloning</td>
</tr>
<tr>
<td>Bacterial Genes - Gene and Environment</td>
</tr>
<tr>
<td>Human Genes/Human genome - history and its Impacts!</td>
</tr>
<tr>
<td>Human Genetics - The Amazing discovery!</td>
</tr>
<tr>
<td>Genes and Biotechnology</td>
</tr>
<tr>
<td>Genes and Disease</td>
</tr>
<tr>
<td>Genes and Cancer</td>
</tr>
</tbody>
</table>
School of Biological Sciences

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

Offer in 2022 - 2023

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 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 generally appropriate conclusions to real-world problems. Demonstrate moderate 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.
- F: 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 inadequately, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness individual as well as collaborative-based organizational and presentational skills.

Communication-intensive Course

- N

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)

Offering Department

- Biological Sciences

Course Co-ordinator

- Dr J C Y Lee, Biological Sciences (jetylee@hku.hk)

Teachers Involved

- (Dr J C Y Lee, 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 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.

Offer in 2022 - 2023

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 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

507
### Course Description

This course aims to introduce students to the core ideas and concepts of statistical analysis with special attention to the modeling approaches used in biological sciences. The course will give students the skills and knowledge to understand how to apply these concepts using the R statistical programming language for data analysis. Although the course covers some basic concepts (experimental design, distributions, hypothesis testing), the main emphasis of the course is on model building and selection, linear models (regression and analysis of variance), basic random effects and mixed effects models, and multivariate statistics (PCA, MANOVA).

### Course Objectives

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 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** apply different statistical modeling methods

### Course Contents & Topics

- Introduction to Statistics and Probability; Descriptive Statistics and Estimation; Statistical Inference; Statistical Explanation and Diagnosis; Likelihood and Model Selection; Categorical predictors (ANCOVA and ANOVA); Factorial design, Multiple Comparisons and Block Design; Correlation and Regression Analyses; Multiple Regression Analysis; Introduction to Multivariate Analyses. Students will learn how to use R to conduct the statistical analyses, and correctly interpret the results.

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOC1600 or BIOL1110 or BIOL2306 or ENVS1301 or ENVS2002 or SCNC1111

### 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>
</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 Laboratory</td>
<td>30</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>40</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>30</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>No Exam</td>
</tr>
</tbody>
</table>

### 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 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 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.
- **Fail** 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 misuse of data and statistical results and/or unable to draw appropriate conclusions. Apply minimally effective or ineffective organizational and presentational skills.
School of Biological Sciences

**BIOL2103** Biological sciences laboratory course (6 credits)  
**Academic Year**: 2022  
**Quota**: 210  
**Offering Department**: Biological Sciences  
**Course Website**: http://moodle.hku.hk/  
**Course Co-ordinator**: Dr W Y Lui, Biological Sciences (wylui@hku.hk)  
**Teachers Involved**:  
- Dr W Y Lui, School of Biological Sciences  
- Prof A Yan, School of Biological Sciences  
- Prof B K C Chow, School of Biological Sciences  
**Offer in 2022 - 2023**: Y  
**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 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**:  
Pass in BIOL1110.  
Not for students having taken any level 3 (or above) Biochemistry (BIOC) course or BBMS2001.

**Offer in 2023 - 2024**: Y  
**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. Apply highly effective lab skills and techniques. Critical use of data of 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. Evidence of analytical and critical abilities and logical thinking. Apply moderately effective lab skills and techniques. Critical use of data of results to draw appropriate conclusions. Apply moderately effective organizational and presentational 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. Apply partially 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. 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.  
- **Fail**: 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.

**Communication-intensive Course**: N

**Course Type**: Laboratory and workshop course

**Course Teaching & Learning Activities**:  
- **Activities**: Details  
  - Laboratory: 11 laboratory sessions (4 hours each)  
  - Tutorials: lecture/tutorials  
  - Reading / Self study: 2 x 15% each  
- **Assessment Methods and Weighting**:  
  - **Methods**: Details  
    - Laboratory reports: plus lab performance  
    - Test: 1 hour final examination  
  - **Weighting in final course grade (%)**:  
    - Laboratory reports: 50  
    - Test: 50  
  - **Assessment Methods to CLO Mapping**:  
    - Laboratory reports: CLO 1,2,3,4  
    - Test: CLO 1,2

**Course Website**: http://moodle.hku.hk/

**Additional Course Information**:  
Quota 100 - 1st Semester  
Lab A on Wed. with 30 students and Lab. B on Thurs. with 70 students
BIOL2220  
**Principles of biochemistry (6 credits)**

**Offering Department:** Biological Sciences  
**Course Co-ordinator:** Dr C S C Lo, Biological Sciences (clivelo@hku.hk)  
**Teachers Involved:** (Dr C S C Lo, School of 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 Contents & Topics:** 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 2022 - 2023:** Y 1st sem  
**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. Integration of the full range of appropriate theories, principles, evidence and techniques
- **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. General integration of theories, principles, evidence and techniques
- **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. Some partial integration of theories, principles, evidence and techniques
- **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 integration of theories, principles, evidence and techniques
- **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. Little or no or inapt integration of theories, principles, evidence and techniques

**Communication-intensive Course:** N

**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>Tutorial</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</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>35</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>


**Course Website:** http://moodle.hku.hk/

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BIOL2306  
**Ecology and evolution (6 credits)**

**Offering Department:** Biological Sciences  
**Course Co-ordinator:** Dr C Schunter, Biological Sciences (schunter@hku.hk)  
**Teachers Involved:** (Dr A C Hughes, School of Biological Sciences)  
(Prof G A Williams, Field course coordinator, School of 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.

**Outcomes:** Lectures are complemented by a 5-day field course during the Reading Week when students visit a variety of Hong Kong wetlands and national parks. Students will participate in a series of activities designed to enhance understanding of the principles of ecology and evolution in a real-world context.
Kong habitats to study their biodiversity, community composition and the relationship between organisms and their environment.

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>understand how scientific methods (hypotheses, experiments, comparisons) are used to investigate ecological and evolutionary processes</td>
<td>20</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>CLO 2</td>
<td>understand the basic mechanism of natural selection, and how interactions with the environment lead to adaptation and generate biodiversity</td>
<td>50</td>
<td>CLO 1, 5</td>
</tr>
<tr>
<td>CLO 3</td>
<td>understand that ecology and behaviour can be interpreted in the light of selective pressures from the environment upon individual organisms</td>
<td>30</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>CLO 4</td>
<td>understand the ecological factors influencing evolution, using the human evolutionary tree as an example</td>
<td>30</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>CLO 5</td>
<td>understand the community ecology and biodiversity of selected Hong Kong habitats, and typical adaptations of organisms found there</td>
<td>30</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

Pre-requisites (and Co-requisites and Impermissible combinations)

- Pass in BIOL1110 or BIOL1309 or ENVS1301 or ENVS1401

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning 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>

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>Field course assessment</td>
<td>30</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Examination</td>
<td>In-lecture quizzes</td>
<td>50</td>
<td>CLO 1, 5</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


Course Website

http://moodle.hku.hk

Additional Course Information

- A compulsory 5-day field component during the reading week.
- Details of the location and cost of the field course, which will be held in the Reading week of semester 1, will be made available at the start of the semester. Priority will be given to students majoring in BS, BS intensive, E&B and E&B intensive.

BIOL2408

<table>
<thead>
<tr>
<th>Green earth-plants and mankind (6 credits)</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Sciences</td>
<td>2022</td>
<td>30</td>
</tr>
</tbody>
</table>

Course Co-ordinator

- Prof. M L Chye, Biological Sciences (mlchye@hku.hk)
- (Dr C Lo, School of Biological Sciences)
- (Prof M L Chye, School of Biological Sciences)

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 plants with the living and non-living environment
  - CLO 5 Appreciate the contribution of plants to humans

Pre-requisites (and Co-requisites and Impermissible combinations)

- Pass in BIOL1110 and BIOL2103
Offer in 2022 - 2023  N  Offer in 2023 - 2024 : 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. 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. Technical use of data and results to draw appropriate conclusions. Apply highly effective organizational and presentational skills.
B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining all but 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 presentational 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 partly 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 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 presentational skills are minimally effective or ineffective.

Communication-intensive Course
N

Course Type  Lecture with laboratory component course

Course Teaching & Learning Activities
Activities  Details  No. of Hours
Lectures  24
Laboratory  24
Field work  Field trip  6
Reading / Self study  100

Assessment Methods and Weighting
Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
Assignments  Lab sessions / reports  30  CLO 1,2,3,4,5
Examination  50  CLO 1,2,3,4,5
Test  20  CLO 1,2,3,4,5

Required/recommended reading and online materials
Core Textbooks
2. Teaching Tools in Plant Biology (American Society of Plant Biologists)

Course Website
http://moodle.hku.hk

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL2409 Biotechnology industry and entrepreneurship (6 credits)  Academic Year 2022
Offering Department  Biological Sciences  Quota 40
Course Co-ordinator  Dr W B L Lim, Biological Sciences (bllim@hku.hk)

Teachers Involved
(Dr R Law, Faculty of Science)
(Dr W B Lim, School of Biological Sciences)
(Guest Lecturer, School of Biological Sciences)

Course Objectives
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.

Course Contents & Topics
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 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)
Pass in 1110
NOT for students who have passed in BIOL3409.
**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>
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<tr>
<td>Field work</td>
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<tr>
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<td>Reading / Self study</td>
<td>60</td>
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<tr>
<td>Assessment</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>50</td>
<td>CLO 1, 2, 3, 4, 5</td>
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<tr>
<td>Presentation</td>
<td>30</td>
<td>CLO 1, 2, 3, 4, 5</td>
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<tr>
<td>Test</td>
<td>20</td>
<td>CLO 1, 2, 3, 4, 5</td>
<td></td>
</tr>
</tbody>
</table>

**Course Contents & Topics**

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 Learning 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 2022 - 2023**

<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>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.</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>
Examination

Required/recommended reading and online materials

Course Website

Additional Course Information

Course Learning Outcomes

Pre-requisites (and Co-requisites & Impermissible combinations)

Offer in 2022 - 2023

Grade Descriptors (A+ to F)

Communication-intensive Course

Course Type

Course Teaching & Learning Activities

Assessment Methods and Weighting

BIOL3105 Animal physiology and environmental adaptation (6 credits)

Offering Department

Course Co-ordinator

Teachers Involved

Course Objectives

Course Contents & Topics

Course Type

Course Teaching & Learning Activities

Assessment Methods and Weighting
**Biology 3107**

**Course Title:** Plant physiology (6 credits)

**Offering Department:** Biological Sciences

**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.
- 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 Contents & Topics:**
- 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:**
- Pass in BIOL2103
- NOT for students who have passed in ENVS3202

**Offer in 2022 - 2023:**
- N: Offer in 2023 - 2024: N

**Grading System:**
- A: Exceptionally good organization and presentation, the discussion would be very clearly written and show evidence of originality. In practical sessions: excellent insight in to the practical aims; submit good reports.
- B: In written examination: coherent organization and clear presentation, the discussion would be a complete and critical response to questions. In practical sessions: full understanding of the practical aims; submit accurate reports.
- C: In written examination and practical sessions: Good in parts, but important points omitted. Might also have defects in presentation or be not very well written. Reasonably competent, but might show misunderstanding of the material: significant inaccuracies or errors.
- D: In written examination and practical sessions: Some knowledge of the material is evident, but there are serious deficiencies in understanding, organization, clarity or accuracy. Write-ups that are unduly brief would fall into this category.
- Fail: In written examination and practical sessions: Poor knowledge and understanding of the subject, a lack of coherent and organization, and answers are largely irrelevant.

**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>Examination</td>
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<td>Laboratory reports</td>
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<td>CLO 3</td>
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</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
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**Required/recommended reading and online materials:**
- Lecturing materials and journal articles will be posted on HKU Moodle.

**Course Website:** http://moodle.hku.hk/

**Additional Course Information:**
This course will be offered subject to a minimum enrolment number and availability of teachers.

**School of Biological Sciences**

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**Biology 3108**

**Course Title:** Microbial physiology (6 credits)

**Offering Department:** Biological Sciences

**Course Co-ordinator:** Dr A Yan, Biological Sciences

**Course Objectives:**
- 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 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 Adaptation'. 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 '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-based learning experiences.

**Course Learning Outcomes:**
- 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

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515
| Pre-requisites (and Co-requisites and Impermissible combinations) | Grade Descriptors |
|---------------------------------------------------------------|
| Pass in BIOL2600 or BIOL2103 or BIOL3604                      |

<table>
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<tr>
<th>Offer in 2022 - 2023</th>
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<tbody>
<tr>
<td>N</td>
<td>Examination ---</td>
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<table>
<thead>
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<th>Grade</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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<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, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills.</td>
<td>100</td>
<td>CLO 1,2,3,4</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. 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.</td>
<td>70</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>C</td>
<td>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.</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
<td>30</td>
<td>CLO 1,2,3</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. Organizational skills are minimally effective or ineffective.</td>
<td>0</td>
<td>CLO 1,2,3</td>
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<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
<th>Details</th>
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<tr>
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<table>
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<table>
<thead>
<tr>
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<td>Activities</td>
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<td>Reading / Self study</td>
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<th>Details</th>
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<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Examination</td>
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<td>CLO 1,2,3</td>
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<td></td>
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<tr>
<td>Test</td>
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<td>CLO 1,2,3</td>
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<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
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<tbody>
<tr>
<td>Supplementary Reading: On-line textbook of Bacteriology; Kenneth Tobar, U. of Wisconsin-Madison, Department of Bacteriology. URL (<a href="http://www.textbookofbacteriology.net/">http://www.textbookofbacteriology.net/</a>)</td>
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<table>
<thead>
<tr>
<th>Course Website</th>
<th>Details</th>
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<tbody>
<tr>
<td><a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
<td>This course will be offered subject to a minimum enrollment number and availability of teachers.</td>
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<th>BIOL3109 Environmental and molecular ecology (6 credits)</th>
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<tr>
<td>Biological Sciences</td>
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<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>Dr Mathew Seymour, Biological Sciences (<a href="mailto:matsey@hku.hk">matsey@hku.hk</a>)</td>
<td>Dr Mathew Seymour, School of Biological Sciences</td>
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<table>
<thead>
<tr>
<th>Teachers Involved</th>
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<tr>
<td>(Dr Mathew Seymour, School of Biological Sciences)</td>
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<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>Details</th>
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<tbody>
<tr>
<td>To provide an overview of impacts of biological community processes on our environments and ecosystems, such as biogeochemical cycles, trophic interactions and spatio-temporal dynamics. An introduction to modern molecular methods used to assess biological communities and relevant approaches to study design and applications.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Contents &amp; Topics</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>1. Environmental biology overview</td>
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<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>Details</th>
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<tbody>
<tr>
<td>On successful completion of this course, students should be able to:</td>
<td></td>
</tr>
<tr>
<td>CLO 1 understand the environmental process that influence the abundances and distributions of organisms</td>
<td></td>
</tr>
<tr>
<td>CLO 2 connect aspects of microbial abundance, diversity, and metabolic potential to processes in natural and modified ecosystems</td>
<td></td>
</tr>
<tr>
<td>CLO 3 demonstrate a basic understanding of the diversity and application of modern molecular methods for ecological and environmental studies</td>
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<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Details</th>
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<tr>
<td>Pass in BIOL2103 or ENV2002</td>
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<table>
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<tbody>
<tr>
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<tr>
<th>Grade Descriptors (A+ to F)</th>
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<tbody>
<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. Show very little or no ability to apply knowledge to solve problems. Organizational skills are minimally effective or ineffective.</td>
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</table>
School of Biological Sciences

**BIOI3110**  
*Environmental toxicology (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>TBC, Biological Sciences</td>
</tr>
</tbody>
</table>

**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

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 mineralization
- CLO 5 understand appropriate techniques in environmental cleaning up

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOI2103 or CHEM3141 or ENVS3042

**Offer in 2022 - 2023**

N  

**Grade Descriptors (A* to F)**

- **A**  
  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.

- **B**  
  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.

- **C**  
  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.

- **D**  
  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.

- **Fail**  
  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.

**Communication-intensive Course**

N

<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>Lecture with laboratory component course</td>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td>laboratory, assignment; and seminar</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
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</table>

**Communication- intensive Course**

N

**Assessment Methods and Weighting**

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<tr>
<td>Assignments</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>30</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**

- Freeland, Joanna R. Molecular ecology. John Wiley & Sons, 2020

**Course Website**

http://moodle.hku.hk/

**Additional Course Information**

This course will be offered subject to a minimum enrollment number and availability of teachers.
<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
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<tbody>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>student-based assessment includes laboratory report, assignment, presentations or other forms</td>
<td>40</td>
<td>CLO 1,2,3,4,5</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.

<table>
<thead>
<tr>
<th>BIOL3201</th>
<th>Food chemistry (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Offering Department</strong></td>
<td>Biological Sciences</td>
<td><strong>Quota</strong></td>
<td>60</td>
</tr>
<tr>
<td><strong>Course Co-ordinator</strong></td>
<td>Dr J C Y Lee, Biological Sciences (<a href="mailto:jettylee@hku.hk">jettylee@hku.hk</a>)</td>
<td><strong>Course Co-ordinator</strong></td>
<td>Dr T C S Lam, School of Biological Sciences</td>
</tr>
<tr>
<td><strong>Course Objectives</strong></td>
<td>To provide a basic understanding of chemistry in food systems, and to provide practical training in chemistry related to food science and nutrition.</td>
<td><strong>Course Learning Outcomes</strong></td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td><strong>Course Contents &amp; Topics</strong></td>
<td>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. A series of laboratory sessions will cover analysis of food components, protein chemistry, lipid oxidation, properties of sugars and starches, enzymatic and non-enzymatic browning reactions, and sensory analysis of foods.</td>
<td><strong>CLO 1</strong></td>
<td>understand the functions and properties of major and minor food components</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>CLO 2</strong></td>
<td>understand the basic chemistry behind food processing</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>CLO 3</strong></td>
<td>have integrated their knowledge of biological and chemical principles into a food science and nutrition context</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Pre-requisites</strong></td>
<td>Pass in BIOC2600 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>
</tr>
<tr>
<td><strong>Offer in 2022 - 2023</strong></td>
<td>N Offer in 2023 - 2024 : N</td>
<td><strong>Examination</strong></td>
<td>---</td>
</tr>
<tr>
<td><strong>Grade Descriptors (A+ to F)</strong></td>
<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>
</tr>
<tr>
<td></td>
<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>
</tr>
<tr>
<td></td>
<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>
</tr>
<tr>
<td></td>
<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 moderately appropriate conclusions.</td>
<td></td>
</tr>
<tr>
<td></td>
<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>
<td></td>
</tr>
<tr>
<td><strong>Communication-intensive Course</strong></td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Course Type</strong></td>
<td>Lecture with laboratory component course</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Course Teaching &amp; Learning Activities</strong></td>
<td>Activities</td>
<td>Details</td>
<td>No. of Hours</td>
</tr>
<tr>
<td></td>
<td>Lectures</td>
<td>24</td>
<td></td>
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<tr>
<td></td>
<td>Laboratory</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tutorials</td>
<td>6</td>
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</tr>
<tr>
<td></td>
<td>Reading / Self study</td>
<td>100</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>Assignments</td>
<td>Laboratory</td>
<td>30</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

- Belitz HD, Grosch W, Schieberle, P, Food Chemistry (Springer 4th Ed, 2009)
- Fennema OR, Food Chemistry (Marcel Dekker 4th Ed, 2008)

**Course Website**

http://moodle.hku.hk/

**Additional Course Information**

This course will be offered subject to a minimum enrollment number and availability of teachers.

**Lab. A (Quota: 30): 14:30 pm - 18:50 pm (Monday)**

**Lab. B (Quota 30): 13:30 pm - 17.50 pm (Wednesday)**

<table>
<thead>
<tr>
<th>BIOL3202</th>
<th>Nutritional biochemistry (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
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<tbody>
<tr>
<td><strong>Offering Department</strong></td>
<td>Biological Sciences</td>
<td><strong>Quota</strong></td>
<td>100</td>
</tr>
</tbody>
</table>
School of Biological Sciences

Course Co-ordinator
Dr C B Chan, Biological Sciences (chancb@hku.hk)

Teachers Involved
(De 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 BIQC2600 or BIQL2220 or MEDE2301

Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : Y Examination Dec

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 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.</td>
</tr>
<tr>
<td>B</td>
<td>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.</td>
</tr>
<tr>
<td>C</td>
<td>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.</td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
</tr>
<tr>
<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 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.</td>
</tr>
</tbody>
</table>

Communication-intensive Course
N

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 34
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>Assignments</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>30</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
M.H. Stipanuk & M.A. Caudill 'Biochemical, physiological, and molecular aspects of human nutrition' (3rd edition) Elsevier
K. N. Frayn 'Metabolic Regulation

Course Website
http://moodle.hku.hk/

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers

BIOC3203
Food microbiology (6 credits)

Offering Department
Biological Sciences

Quota
140

Course Co-ordinator
Dr H S El-Nezami, Biological Sciences (elnezami@hku.hk)

Teachers Involved
(De 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
- 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 (and Co-requisites and Impermissible combinations)
Pass in BIOC2600 or BIQL2220 or MEDE2301

Offer in 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : Y Examination No Exam

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 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>
</tr>
</tbody>
</table>

519
## BIOL3204 Nutrition and the life cycle (6 credits)

### Course Description
Nutritional needs vary throughout 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 Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1: be able to critically assess and identify the specific needs at different stages of the life cycle
- CLO 2: relate the concept of requirement to physiological needs
- CLO 3: understand the impact of socio-cultural factors on nutritional status

### Course Details
- **Format**: Lecture-based course
- **Course Website**: [http://moodle.hku.hk/](http://moodle.hku.hk/)
- **Pre-requisites and Co-requisites**: Pass in BIOL2220 or BIOC2600 or BIOL3202
- **Offer in 2022 - 2023**: Y 2nd sem
- **Examination**: No Exam

### Assessment

<table>
<thead>
<tr>
<th>Activities</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>Seminars</td>
<td>30</td>
<td>CLO 2.4</td>
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<tr>
<td>Laboratory reports</td>
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<td>CLO 1.3</td>
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<tr>
<td>Test</td>
<td>50</td>
<td>CLO 2.4</td>
<td></td>
</tr>
</tbody>
</table>

### Communication-intensive Course
- **Course Type**: Lecture with laboratory component course
- **No. of Hours**: 24 for Lectures, 24 for Laboratory, 12 for Tutorials / Self study

### Additional Course Information
- **Course Co-ordinator**: Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)
- **Quota**: 70 in sub class A; 70 in sub class B

### Course Outcomes
On successful completion of this course, students should be able to:
- **CLO 1**: be able to critically assess and identify the specific needs at different stages of the life cycle.
- **CLO 2**: relate the concept of requirement to physiological needs.
- **CLO 3**: understand the impact of socio-cultural factors on nutritional status.

### Course 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>student-centered learning</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### Communication-intensive Course
- **Course Type**: Lecture-based course
- **No. of Hours**: 100

### Offer in 2022 - 2023: Y 2nd sem

### Examination: No Exam

### Grade Descriptors

- **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 team-based organization and presentation 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.
- **C**: Demonstrate effective team-based organization and presentation skills.
- **D**: Demonstrate general but incomplete grasp of the subject matter covered. Might show misunderstanding of the materials. Demonstrate satisfactory team-based organization and presentation skills.
- **Fail**: 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.

### Communication-intensive Course
- **Course Type**: Lecture-based course
- **No. of Hours**: 100
<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>Research-Based Assignment (Individual)</td>
<td>20</td>
<td>CLO 1,2,3</td>
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</tr>
<tr>
<td>Presentation</td>
<td>Oral presentation</td>
<td>30</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td>Group project</td>
<td>20</td>
<td>CLO 1,2</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>30</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. sub class A - 25 Quota; sub class B - 25 Quota.

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**BIOL3205**

**Human physiology (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr W Y Lui, Biological Sciences (wylui@hku.hk)

**Teachers Involved**

- (Dr C B Chan, School of Biological Sciences)
- (Dr W Y Lui, School of Biological Sciences)
- (Prof A O L Wong, School of 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 2022 - 2023**

Y 1st sem Offer in 2023 - 2024 : Y

**Examination**

**Weighting in final course grade (%)**

**Assessment Methods to CLO Mapping**

<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</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

N

**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>
</table>

**Required/recommended reading and online materials**

- Mulroney S.E. & Myers A.K. Netter's Essential Physiology (Saunders, 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.

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**BIOL3206**

**Clinical nutrition (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr J M F Wan, Biological Sciences (jmfwan@hku.hk)

**Teachers Involved**

- (Dr J M F Wan, Biological Sciences)
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

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

Pass in BIOL3202 or BIOL3203 or BIOL3204 or BIOL3205

Offer in 2022 - 2023

N Offer in 2023 - 2024 : 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. 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 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 / 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 some of the course learning outcomes. Partial but limited 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 partially 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.

Communication-intensive Course

N

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></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></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>
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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1.2</td>
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<tr>
<td>Examination</td>
<td></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>
</tbody>
</table>

Required/recommended reading and online materials

Selected readings will also be available on the class website. S. Rodwell Williams: Nutrition and Diet Therapy (7th ed.) Sullor & Hunter: Nutrition: Principles and Application in Health Promotion Wardlaw Gordon: Perspectives in Nutrition (2nd ed.)

Course Website

http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3207

Principles of toxicology (6 credits)

Academic Year 2022

Offering Department

Biological Sciences

Quota 80

Teachers Involved

Dr H S El-Nezami, Biological Sciences (einezami@hku.hk)

Course Objectives

To introduce students to methods used in assessing the toxicity of food contaminants, and to develop their confidence in the handling and in the presentation 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 nondietary 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
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.
- CLO 2: Demonstrate an understanding of the various effects induced after exposure to toxicants.
- CLO 3: Demonstrate an understanding of the factors which underlie species differences in response to potential toxicants.
- CLO 4: Demonstrate the ability to work in a team to investigate and solve toxicological problems of importance in human health.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2600 or BIOL2220 or BIOL3205 or MEDE2301

Offer in 2022 - 2023

Y 2nd sem Offer in 2023 - 2024: 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>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>
</tr>
<tr>
<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>
</tr>
<tr>
<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>
</tr>
<tr>
<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 ineffectiveness team-based organizational and presentational skills.</td>
</tr>
</tbody>
</table>

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Methods</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>seminars (30%) &amp; opinion paper (30%)</td>
<td>60</td>
<td>CLO 2,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>Test</td>
<td>Mid-term</td>
<td>20 CLO 2.4</td>
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<td></td>
<td></td>
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</tbody>
</table>

Assessment

Methods

Example: CLO 1,2,4

Assignments (30%) 60 CLO 2,4

Laboratory reports 20 CLO 2

Test 20 CLO 2.4

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

This course will be offered subject to a minimum enrollment number and availability of teachers.

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.
- The regulatory, social and business imperative for food safety.
- Basic concepts in TQM
- 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)

Pass in BIOL3201 or BIOL3203

Credit: 523
Offering Department: Biological Sciences

Course Co-ordinator:
Dr J C Y Lee, Biological Sciences (jlettylee@hku.hk)

Teachers Involved:
(Chair, Biological Sciences)
(Deputy, School of 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 basic and analytical instruments used in food analysis. To train students to analyze major and minor food components as well as some toxic compounds developed during processing.

Course Contents & Topics:
The key concepts in professional food analysis in an industry context will be introduced. Basic and advanced analytical techniques for macro nutrients (e.g. protein, carbohydrate and fats), micronutrients (vitamins and minerals) and toxic compounds. A variety of classical and instrumental techniques used in food analysis will be discussed: rheology and texture measurement, color, mass spectrometry and chromatography, and sensory properties.

Course Learning Outcomes:
On successful completion of this course, students should be able to:

- CLO 1 understand the basic principles of food and nutrient analysis
- 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 apply their knowledge and laboratory skills in novel situations to measure and analyze the macronutrient and micronutrient of food products
- CLO 5 select and justify an appropriate analytical technique to solve practical food analysis problems

Pre-requisites:
Pass in BIOL2101

Not for students who have passed in CHEM3242

Offer in 2022 - 2023

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 quality management skills and techniques and analysis of data and results to draw moderately appropriate 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 moderately effective 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 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.

Assessment Methods and Weighting:

Methods | Details | No. of Hours | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | --- | ---
Assignments | | 10 | CLO 2 | 10%
Examination | | 60 | CLO 1,2,3 | 60%
Project reports | including presentation | 30 | CLO 2,3 | 50%
Reading / Self study | | 100 | | |

Required/recommended reading and online materials:


Course Website:
http://moodle.hku.hk/
Course Type: Lecture with laboratory component course

Assessment Methods and Weighting:
- Assignments: Laboratory 10 CLO 1,2,3,4
- Presentation: 20 CLO 1,2,3,4,5
- Project report: 30 CLO 1,2,3,4,5
- Test: 40 CLO 1,2,4,5

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.

BIO3210 Grain production and utilization (6 credits)

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 production, 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 2022 - 2023: 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.

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.

Communication-intensive Course: N

Course Type: Lecture-based course

Course Teaching & Learning Activities:
- Lectures: 36
- Tutorials: 12
- Reading / Self study: 100

School of Biological Sciences
<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>70</td>
<td>CLO 1, 2, 3, 4, 5</td>
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<tr>
<td>Project reports</td>
<td></td>
<td>including presentation</td>
<td>30</td>
<td>CLO 2.3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

- Other readings to be provided

**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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**BIOL3211 Nutrigenomics (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr Ibis K C Cheng, Biological Sciences (ibisckc@hku.hk)

**Teachers Involved** (Dr Ibis K C Cheng, School of 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 underpinning 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 BIOC2600 or BIOL2220 or MEDE2301

**Offer in 2022 - 2023**

- Academic Year: 2022
- Grade Descriptors (A+ to F)
  - A: Demonstrate thorough grasp of the subject matter covered. Show extensive ability of knowledge integration and problem solving skills. Show excellent ability to critically analyze and interpret complex scientific data and draw appropriate conclusions. Demonstrate highly effective organization and writing skills.
  - B: Demonstrate substantial grasp of the subject matter covered. Show substantial ability of knowledge integration and problem solving skills. Show substantial ability to critically analyze and interpret scientific data and draw appropriate conclusions. Demonstrate effective organization and writing skills.
  - C: Demonstrate general and acceptable grasp of the subject matter covered. Show acceptable ability of knowledge integration and problem solving skills. Show moderate ability to analyze and interpret scientific data and draw proper conclusions. Demonstrate moderate organization and writing skills.
  - D: Demonstrate marginal grasp of the subject matter covered. Show limited ability on knowledge integration and problem solving skills. Show limited ability to analyze and interpret scientific data and draw conclusions. Demonstrate basic organization and writing skills.
  - Fail: Demonstrate little or no grasp, with little retention of information of the subject matter covered. Show lack of coherent and logical thinking, and minimal evidence in problem solving. Fail to integrate information and identify problems. Show little or minimal ability to analyze and interpret scientific data and draw conclusions. Demonstrate poor organization and writing skills.

**Communication-intensive Course**

- N

**Course Type** Lecture-based course

**Course Teaching & Learning Activities**

- Activities Details No. of Hours
  - Lectures
  - Tutorials student-centered learning 12
  - Reading / Self study 100

**Assessment Methods and Weighting**

- Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
  - Assignments presentation 30 CLO 1, 2, 3, 4, 5
  - Examination 40 CLO 1, 2, 3, 4, 5
  - Test 30 CLO 1

**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.

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**BIOL3215 Principles of dietary assessment (6 credits)**

**Offering Department** Biological Sciences

**Academic Year** 2022

**Quota** 30
Course Co-ordinator: Dr J C Y Louie, Biological Sciences (jimmy@hku.hk)

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 nutrient 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 2022 - 2023: 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 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 practical 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 practical 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 practical 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 practical skills and techniques and analysis of data and results and lead to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Communication-intensive Course: N

Course Type: Laboratory and workshop course

Course Teaching & Learning Activities: Activities | Details | No. of Hours
--- | --- | ---
Workshops | 48
Tutorials | 12
Reading / Self study | 90

Assessment Methods and Weighting: Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Laboratory reports | 40 | CLO 1,2,3
Presentation | Group presentation | 10 | CLO 1,2,3
Project reports | 30 | CLO 1,2,3,4
Test | 20 | CLO 1,2,3,4

Required/recommended reading and online materials: Required: Lee RD and Nieman DC, Nutritional Assessment 6th Ed. McGraw Hill
Gibson RS, Principles of Nutritional Assessment 2nd Ed. Oxford University Press
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

BIOL3216 Food waste management (6 credits) Academic Year: 2022
Offering Department: Biological Sciences
Course Co-ordinator: TBC, Biological Sciences
Teachers Involved: (TBC,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.

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 outline:
- Background, Definitions, Social & Environmental implications of food waste
- Facts and figures related to food Waste
- Basic Waste Management concepts (3 R’s)
- Case studies: Agricultural waste
- Case studies: Food Industrial waste
- Case studies: Food consumer waste
- Waste Management in Hong Kong vs other countries in Asia
- Individual waste footprint: from awareness to legislation in Hong Kong

Current Technological applications & limitations in food waste treatment

Course Objectives

- The environment, human well-being and the functioning of society are highly influenced by food production and consumption. The food-environment-health nexus (FEHN) interrelates the agri-food system (AFS) and community health. Students will learn the agri-food system which is categorized into crops, livestock, forestry, fisheries, and aquaculture that focus on resource shortage and degradation, climate change, disease, exacerbating resource pressures and human suffering. The impact of current agricultural technology on plant health and animal feeds, sustainable and alternative food production, environment on food systems will also be explored. Notwithstanding xenobiotic effect on animal and human health, environmental influence on sensory decision, the aftermath of climate change and nutritional security of a community will be discussed. Evidence-based case examples through the navigation of alternative solutions to sustain the healthy development and Problem Based Learning (PBL) approach will be used with emphasis on 'real-life' cases connecting human nutrition, well-being and environmental health.

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 policies 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

Offer in 2022 - 2023

- N Offer in 2022 - 2023 : Y

Grade Descriptors

- 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 presenntational 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 limited understanding of team-based organizational and presenntational skills.
- E 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 to draw sometimes inappropriate and ultimately erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Communication-intensive Course

- N

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>including presentation</td>
<td>12</td>
</tr>
<tr>
<td>Group work</td>
<td></td>
<td>30</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>Assignments</td>
<td></td>
<td>10</td>
<td>CLO 1.2,3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Project reports</td>
<td>including presentation</td>
<td>30</td>
<td>CLO 2,3,4</td>
</tr>
</tbody>
</table>

Course Website

- http://moodle.hku.hk

Additional Course Information

- This course will be offered subject to a minimum enrolment number and availability of teachers.

BIOL3217

Food, environment and health (6 credits)

Offering Department

- Biological Sciences

Course Co-ordinator

- Dr K S Leung, Biological Sciences (lks612@hku.hk)

Teachers Involved

- Dr J C Y Lee, School of Biological Sciences

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. The food-environment-health nexus (FEHN) interrelates the agri-food system (AFS) and community health. Students will learn the agri-food system which is categorized into crops, livestock, forestry, fisheries, and aquaculture that focus on resource shortage and degradation, climate change, disease, exacerbating resource pressures and human suffering. The impact of current agricultural technology on plant health and animal feeds, sustainable and alternative food production, environment on food systems will also be explored. Notwithstanding xenobiotic effect on animal and human health, environmental influence on sensory decision, the aftermath of climate change and nutritional security of a community will be discussed. Evidence-based case examples through the navigation of alternative solutions to sustain the healthy development and Problem Based Learning (PBL) approach will be used with emphasis on 'real-life' cases connecting human nutrition, well-being and environmental health.
Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand multifactorial and interdisciplinary relations in sustainable environment and nutrition
- CLO 2 understand different agri-food systems in Asia and worldwide
- CLO 3 address today's national and global challenges in the environmental and food sectors
- CLO 4 critically analyze global food-system issues
- CLO 5 construct a personal philosophy and framework for alternative solutions to maintain food-environment-health nexus

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL2101 or ENVS2001 or ENVS2002

Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : 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.
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 moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately 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 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 inefﬁciently, 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 quality management skills and techniques and analysis of data and results inefﬁciently, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Communication-intensive Course
N

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>20</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>50</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>Flipped lecture 30%, Poster 20%</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Presentation</td>
<td>Case study</td>
<td>20</td>
<td>CLO 3,4,5</td>
</tr>
<tr>
<td>Project reports</td>
<td>Group work</td>
<td>30</td>
<td>CLO 1,2,4,5</td>
</tr>
</tbody>
</table>

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

BIOL3218 Food hygiene and quality control (6 credits)
Academic Year 2022

Offering Department Biological Sciences
Quota 30

Course Co-ordinator Dr Zhang Lu, Biological Sciences (lzhang17@hku.hk)

Teachers Involved (Dr Zhang Lu, School of Biological Sciences)

Course Objectives
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.

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
- 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

Course Learning Outcomes
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

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL2101 or BIOL3203
Not for students who have passed in BIOL3208

Offer in 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : 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.
# BIOL3301 Marine biology (6 credits)

**Offering Department**: Biological Sciences  
**Quota**: 60  
**Academic Year**: 2022  
**Pre-requisites**: Pass in BIOL2306 or ENV2002  

## 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

## 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</td>
<td></td>
<td></td>
<td>20</td>
<td>CLO 2</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td>50</td>
<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td></td>
<td>30</td>
<td>CLO 2, 3</td>
</tr>
</tbody>
</table>

## Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture-based course</td>
<td>Lectures</td>
<td>24 hours lecture &amp; 12 hours tutorial for project</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Group work</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Project work</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Reading / Self study</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

## Additional Course Information
The course will be offered subject to a minimum enrollment number and availability of teachers.

## Communication-intensive Course
N

## 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. Apply limited or barely effective 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 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.

## Communication-intensive Course
N

## Course Type
Lecture with laboratory component 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>
<td>Lectures</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>
### Grade Descriptors

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Fail</strong></td>
<td>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. Presentation 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.</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>24</td>
</tr>
<tr>
<td>Group work</td>
<td>Group work</td>
<td>24</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</td>
<td>CLO 1,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>20</td>
<td>CLO 1,3</td>
</tr>
<tr>
<td>Project report</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

### Course Website
- [http://moodle.hku.hk](http://moodle.hku.hk)

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**BIOL3302**

### Systematics and phylogenetics (6 credits)

- **Offering Department**: Biological Sciences
- **Course Co-ordinator**: Dr Alice Hughes, Biological Sciences (echughes@hku.hk)
- **Pre-requisites (and Co-requisites)**: Any level 2 BIOL course
- **Quota**: 60
- **Year**: 2022

### 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).

### Course Contents & Topics

Current classification 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, biogeography and ethology. Causes of taxonomic complexity: environmental factors; hybridization; breeding systems. Principles of nomenclature. Practical 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 the basic principles of nomenclature and show how multivariate statistical methods can be applied below the species level
- **CLO 2**: describe the principles behind maximum parsimony methods of phylogenetic reconstruction (including sister-group relationships, out-group comparison, homoplasy and the assessment of clade stability)
- **CLO 3**: evaluate the diversity of sources of taxonomic data, and explain the importance of specific data sources
- **CLO 4**: recognise the main causes of taxonomic complexity, and identify appropriate solutions
- **CLO 5**: understand the processes and patterns in species biogeography, and important biogeographic factors to consider when understanding species current ranges

### Assessment Methods Details

- **Weighting in final course grade (%)**
  - Examination: 80
  - Assignments: 20

### Assessment

- **Examination 80 CLO 1,2,3
 Assignments 20 CLO 1,2,3,4,5
 Laboratory reports 20 CLO 1,3,4,5
 Project report Project reports and Presentation 20 CLO 1,2,3,4,5

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**School of Biological Sciences**

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531
### 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 professional conservation practitioners. 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

<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Pass in BIOL2306</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Offer in 2022 - 2023</strong></td>
<td>Y 2nd sem Offer in 2023 - 2024 : Y</td>
</tr>
<tr>
<td><strong>Grade Descriptors (A+ to F)</strong></td>
<td>Examination May</td>
</tr>
<tr>
<td><strong>A</strong></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, 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.</td>
</tr>
<tr>
<td><strong>B</strong></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, 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.</td>
</tr>
<tr>
<td><strong>C</strong></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 presentational skills. Little evidence of clear attention to thoughtful and reflective thinking.</td>
</tr>
<tr>
<td><strong>D</strong></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 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.</td>
</tr>
<tr>
<td><strong>Fail</strong></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 Website
http://moodle.hku.hk
### BIOL3305

**Tropical and temperate marine ecology field course (6 credits)**

**Offering Department:** Biological Sciences  
**Quota:** 20

**Course Co-ordinator:** Dr B Russell, Biological Sciences (brussell@hku.hk)  
**Teachers Involved:** (Dr B Russell,Biological Sciences)  
(Prof. G A Williams,Biological Sciences)

**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.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

1. **CLO 1** demonstrate an understanding of the complexity and function of marine ecosystems.
2. **CLO 2** explain the role of physical and biological processes in shaping the similarities and differences among marine ecosystems tropical and temperate regions.
3. **CLO 3** demonstrate skills for field sampling in marine and estuarine habitats.
4. **CLO 4** demonstrate knowledge in hypothesis testing and experimental design.
5. **CLO 5** identify a range of marine species and their role in ecosystems.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in "C" or above in BIOL2306 or BIOL3301 or BIOL3303 or ENVS2001

**Offer in 2022 - 2023 Grade Descriptors (A+ to F)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</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. 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 conceptual perspective to draw insightful and logical conclusions. Shown 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>100</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>B</td>
<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. Work more than sufficient for what is required at degree level.</td>
<td>80</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>C</td>
<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 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>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>D</td>
<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>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>F</td>
<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>0</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

No

**Field camps**

### 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>Presentation</td>
<td>100</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Course Teaching & Learning Activities**

- **Activities**
  - Lectures: Pre-course lectures and field trips  
  - Field work: 80 hours + travel time
  - Reading / Self study: 80

**Communication-intensive Course**

No

- **Field camps**

**Assessment Methods and Weighting**

- **Methods**
  - Assignments: Presentation

**Course Website**

http://moodle.hku.hk

**Required/recommended reading and online materials**

- V. D. Fred: Conservation biology [electronic resource]: foundations, concepts, applications (Springer, 2008)
- NIL
### BIOL3313 Freshwater ecology (6 credits)

**Offering Department:** Biological Sciences  
**Academic Year:** 2022  
**Quota:** 30

| Course Co-ordinator | TBC, Biological Sciences ()  
| Teachers Involved | (TBC, School of Biological Sciences) |

**Course Objective:** 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 introduced. 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 | 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 | 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 | 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 2022 - 2023 | N Offer in 2023 - 2024 : N |

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Evidence of original logical (or coherent) thought, strong analytical (or critical) abilities and a thorough grasp of the subject as 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>
</tr>
<tr>
<td>B</td>
<td>Evidence of analytical (or critical) abilities and logical (or coherent) - but not necessarily original - thinking, a good 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>
</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 sufficient for what is required for degree level.</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 presentational skills. Shows insufficent 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>
</tr>
<tr>
<td>Fall</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>
</tr>
</tbody>
</table>

**Communication-intensive Course:** N

**Course Type:** Lecture with laboratory component 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>Lecutres</td>
<td></td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>project and laboratory work; field trips to local streams and wetlands</td>
<td>40</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
Students will be directed to relevant scientific literature and websites

**Course Website & Information:** http://moodle.hku.hk

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 (mosquitoes 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.
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 2</td>
</tr>
<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 3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


An online training tool developed by an international team (including the course coordinator) that contains information on the physical and biological features of rivers, and shows how human livelihoods depend on river health.

A list of references available in HKU library will be provided for each lecture on the course website.

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.

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BIOL3314

Plant structure and evolution (6 credits)

Offering Department

Biological Sciences

Course Co-ordinator

TBC, Biological Sciences (TBC, Biological Sciences)

Course Objectives

To survey the form and function of the vascular plant body, with particular emphasis on the evolutionary significance of structures. This course forms a basis for understanding plant physiology, ecology, systematics and phylogenetics.

Course Contents & Topics

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 BIOL1309; and Any level 2 BIOL course

Offer in 2022 - 2023

N: Offer in 2023 - 2024 : N

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 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.

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.

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.

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.

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.

Communication-intensive Course

N

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>
</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>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


A list of additional reading material will be provided during the course.

Course Website

http://moodle.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  
**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 2022 - 2023** Y 2nd sem Offer in 2023 - 2024 : Y

**Grade Descriptors (A+ to F)**

- **A** Evidence of original, logical (or coherent) thought, strong analytical and critical abilities and a thorough grasp of the subject as demonstrated by background reading and excellent use of named (organism) examples. Show excellent presentational, analytical skills and/or lab/field skills, and demonstrate substantial knowledge of general intertidal ecology and excellent experimental design and analysis skills.
- **B** Evidence of analytical (or critical) abilities and logical (or coherent), but not necessarily original, thinking, a good 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 demonstrate knowledge of general intertidal ecology and good experimental design and analysis skills.
- **C** 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, limited background reading and use of named (organism) examples. Show fair presentational, analytical and/or lab/field skills, and demonstrates some knowledge of general intertidal ecology and adequate abilities of experimental design and analysis.
- **D** Evidence of retention of a minimum of relevant information of the subject (i.e. knowledge is very incomplete), with limited organizational, analytical or presentational skills. Show insufficient evidence of background reading, or familiarity with lab/field techniques. Poor knowledge of general intertidal ecology and misunderstanding of experimental design and analysis.
- **Fail** Evidence of poor or inadequate knowledge and understanding of the subject, and a lack of coherence, poor organization and/or excessive irrelevancy. Limited or no evidence of familiarity with relevant reading material and lab/field techniques, or knowledge of general intertidal ecology, and misuse of experimental design and analysis skills.

**Communication-intensive Course** N

**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>16</td>
</tr>
<tr>
<td>Field work</td>
<td>field trip/project work</td>
<td>28</td>
</tr>
<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>
</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 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

- TBC

**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 enrolment number and availability of teachers.

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**BIOL3319 Tropical terrestrial ecology (6 credits)**

**Offering Department** Biological Sciences  
**Course Co-ordinator** Dr B Guenard, Biological Sciences  
**Teachers Involved** (Dr B Guenard,School of Biological Sciences)  
**Course Objectives** To enable motivated students to acquire the knowledge and skills needed to solve real problems in terrestrial ecology.

**Course Contents & Topics** 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.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand evolution of biodiversity patterns and shaping processes within terrestrial ecosystems at
different geographic and time scales

CLO 2 understand the current patterns that sustain biodiversity in their pristine form and disturbed state

CLO 3 understand the various threats to terrestrial ecosystems and some of the methods to evaluate and reduce
the impacts of those threats

CLO 4 plan and conduct baseline study of terrestrial biodiversity

CLO 5 develop the skill to be an active learner through the problem-based learning exercises

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL1309 and BIOL2306

Offer in 2022 - 2023

Y 2nd sem Offer in 2023 - 2024 : Y

Examination May

Course Type

Course Teaching & Learning Activities

Lecture with laboratory component course

Communication-intensive Course

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 40 CLO 1,2,3,4,5

Presentation 25 CLO 1,2,3,4,5

Project report 25 CLO 1,2,3,4,5

Required/recommended reading and online materials


Dudgeon D. and Corlett R. T.: Ecology and Biodiversity of Hong Kong (Friends of the Country Parks, Hong Kong)

To be provided in classes

Course Website

http://moodle@hku.hk

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3320 The biology of marine mammals (6 credits)

Offering Department Biological Sciences

Quota 2022 30

Course Objectives

Few other groups of animals have captured the public's imagination the way marine mammals, especially whales
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
(sireniens) 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

537
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 environmental influences on 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 an independent literature-searches and will discuss the project 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 (and Co-requisites and Impermissible combinations)**

Pass in BIOL2306

N Offer in 2023 - 2024 : N

**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>including field trips, research site visits, 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>
</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>including participation/continuous assessment/presentation</td>
<td>55</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>45</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


Reynolds JE & Rommel SA (eds). Biology of marine mammals (Smithsonian Institution Press 1999)


Course Website

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.

**Biology of Marine Invertebrates (6 credits)**

**Offering Department**

Biological Sciences

**Quota**

30

**Course Co-ordinator**

TBC, Biological Sciences / (TBC, 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 marine invertebrates to appreciate the diversity of body plans and ecological roles these animals play in coastal, benthic and pelagic ecosystems. The course will particularly focus on the South East Asian seas, which are the most diverse marine systems in the world.

**Course Contents & Topics**

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), Polychaeta (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 with the commonest Hong Kong taxa and species in field trips and laboratory sessions.

Course Learning Outcomes
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

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL2306

Offer in 2022 - 2023
Offer in 2023 - 2024 : N

Grade 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. Excellent 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.

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.

Communication-intensive Course
N

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities  Details  No. of Hours
Lectures  26
Laboratory  24
Field work  12
Project work  12
Reading / Self study  100

Assessment Methods and Weighting
Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
Assignments  30  CLO 2.4
Examination  50  CLO 1,2,4
Laboratory reports  20  CLO 1.3

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 2017-2018
This course will be offered subject to a minimum enrollment number and availability of teachers

BIOL3328 Nearshore marine and estuarine ecology (6 credits)
Academic Year 2022
Quota 10

Offering Department
Biological Sciences

Course Co-ordinator
Prof. G.A. Williams, Biological Sciences (hrswbgs@hku.hk)

Teachers Involved
(Prof. G.A. Williams, School of Biological sciences)

Course Objectives
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 mould 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.

Course Contents & Topics
Students will learn the abiotic and biotic factors that structure intertidal communities in Hong Kong and, during a residential fieldcamp, 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
**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**

<table>
<thead>
<tr>
<th>CLO</th>
<th>Describe knowledge and understanding of the underlying concepts associated with recently developed techniques including PCR, site-directed mutagenesis, DNA sequencing</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>know the basic structures of DNA, RNA and protein, and how DNA is package in the nucleus of eukaryotic cells</td>
</tr>
<tr>
<td>CLO 2</td>
<td>understand the biochemical processes involved in DNA replication, transcription, translation and post-translational modifications in prokaryotes and eukaryotes</td>
</tr>
<tr>
<td>CLO 3</td>
<td>explain and describe the regulation of gene transcription in prokaryotes and eukaryotes</td>
</tr>
<tr>
<td>CLO 4</td>
<td>identify a range of species and their roles and relationships in the intertidal zone</td>
</tr>
<tr>
<td>CLO 5</td>
<td>develop an understanding of the regulation of gene expression in prokaryotes and eukaryotes</td>
</tr>
<tr>
<td>CLO 6</td>
<td>analyze and interpret the distribution of species over relevant environmental gradients</td>
</tr>
<tr>
<td>CLO 7</td>
<td>design, execute and analyze experiments to investigate species interactions</td>
</tr>
<tr>
<td>CLO 8</td>
<td>integrate abiotic and biotic interactions to determine patterns of connectivity between intertidal habitats</td>
</tr>
</tbody>
</table>

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in BIOL2306 or BIOL3301

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Examination</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>C</td>
<td>130</td>
</tr>
<tr>
<td>Medium</td>
<td>B</td>
<td>50</td>
</tr>
<tr>
<td>High</td>
<td>A</td>
<td>10</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>Group presentation</td>
<td>30</td>
<td>CLO 3, 4, 5, 6</td>
</tr>
<tr>
<td>Report</td>
<td>60</td>
<td></td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Test</td>
<td>Pre-course</td>
<td>10</td>
<td>CLO 1, 2, 6</td>
</tr>
</tbody>
</table>

**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>Pre-course modules</td>
<td>8</td>
</tr>
<tr>
<td>Field work</td>
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</tr>
<tr>
<td>Tutorials</td>
<td>Pre-course assignments</td>
<td>10</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Course Information**
Students who have taken BIOL3318 will be at an advantage.

**Course Website**
http://moodle.hku.hk

**Additional Course Information**

- Students will work in groups with students from the University of Johannesburg and North West 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.

- Students will join undergraduate students from the University of Johannesburg and North Western University, South Africa.

- 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.

- BIOL3401 Molecular biology (6 credits)

**Offering Department**
Biological Sciences

**Course Co-ordinator & Teachers Involved**
Dr K W Y Yuen, Biological Sciences (kwuyuen@hku.hk)
(Dr K W Y Yuen, School of Biological Sciences)
Dr Y L Zhai, School of Biological Sciences

**Course Learning Outcomes**

<table>
<thead>
<tr>
<th>CLO</th>
<th>Describe knowledge and understanding of the underlying concepts associated with recently developed techniques including PCR, site-directed mutagenesis, DNA sequencing</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>know the basic structures of DNA, RNA and protein, and how DNA is package in the nucleus of eukaryotic cells</td>
</tr>
<tr>
<td>CLO 2</td>
<td>understand the biochemical processes involved in DNA replication, transcription, translation and post-translational modifications in prokaryotes and eukaryotes</td>
</tr>
<tr>
<td>CLO 3</td>
<td>explain and describe the regulation of gene transcription in prokaryotes and eukaryotes</td>
</tr>
<tr>
<td>CLO 4</td>
<td>demonstrate knowledge and understanding of the underlying concepts associated with recently developed techniques including PCR, site-directed mutagenesis, DNA sequencing</td>
</tr>
</tbody>
</table>
## BIOL3402 Cell biology and cell technology (6 credits)

### Offering Department
Biological Sciences

### Course Co-ordinator
Dr. Johnson Heath, Biological Sciences (hjohnson@hku.hk)

### Teachers Involved
- Dr. Johnson Heath, School of Biological Sciences
- Dr. Peng Wang, School of Biological Sciences
- Dr. W.Y. Lui, School of 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**
- Cell membranes. Organelles.
- Cellular transport: ions transport and channels. Protein and RNA transport.
- Membrane potentials, Action potentials.

**II. Techniques in animal cell culture**
- Mammalian cells in culture. Primary and continuous cell lines. Cell types and cell growth parameters.
- Media formulation, growth factors and design of serum-free media. Culture lab facilities and sterilization. Mechanism of cryopreservation.

**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 BIQC2600 or BIOL2103 or BIOL2220 or MEDE2301 or BMED2301

### Offer in 2022 - 2023
- **Y** 1st sem
- **Offer in 2023 - 2024**: 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 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. Consistently demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.</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. 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. Consistently demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge 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. Apply moderately effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.</td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
</tr>
<tr>
<td>E</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>
<tr>
<td>Fail</td>
<td>Demonstrate minimal understanding of the course learning outcomes. Lack of evidence of analytical and critical abilities, logical and coherent thinking. Show 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>

### Assessment Methods and Weighing

<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>2 quizzes</td>
<td>30</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</td>
<td></td>
<td>20</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 Bartlett, 2008)
- Selected journal articles and web learning materials.
- TBC

### Course Website
http://moodle.hku.hk/
## Course Type

Lecture with laboratory component course

## Offered Department

Biological Sciences

## Course Co-ordinator

Dr Chaogu Zheng, Biological Sciences (cgzheng@hku.hk)

## Teachers Involved

Dr Chaogu Zheng, School of Biological Sciences

## Pre-requisites and Co-requisites

Pass in BIOC2600 or BIOL2103 or BIOL2220 or MEDE2301 or BMED2301

## Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Year</th>
<th>Offer</th>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022</td>
<td>Y</td>
<td>A 1. Exceptionally good performance demonstrating comprehensive understanding of the subject matter. 2. Critical insight and analysis into the scientific literatures. 3. Superior writing, presentation and group communication skills.</td>
<td>Y</td>
<td>Examination</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B 1. Good performance demonstrating full understanding of the subject matter. 2. Coherent insight and analysis into the scientific literatures. 3. Good writing, presentation and group communication skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C 1. Satisfactory performance demonstrating adequate understanding of the subject matter. 2. Some insight into the scientific literatures. 3. Adequate writing and communication skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D 1. Limited performance demonstrating some understanding of basic subject matter. 2. Some ability to use the scientific literatures. 3. Limited writing and communication skills.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Examination

<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 1.3</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>30</td>
<td>CLO 2.3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>20</td>
<td>CLO 1</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>Laboratory reports</td>
<td>24</td>
<td>CLO 1.3</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td>12</td>
<td>CLO 2.3</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td>CLO 1</td>
<td></td>
</tr>
</tbody>
</table>

## Course Contents & Topics


## Course Objectives

To provide a broad understanding of the animal immune system with a focus on the cells and molecules involved in immune reactions against pathogens. Topics will also include the application of a variety of immunological methods to research and disease diagnosis.

## 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 immunoassays

## Assessment to CLO Mapping

<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 1.3, 2.3, 4.5</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>20</td>
<td>CLO 1.2, 3.4, 5</td>
<td></td>
</tr>
</tbody>
</table>

## Required/recommended reading and online materials

Textbooks:

Course Website:
http://moodle.hku.hk/
### Required/recommended reading and online materials

<table>
<thead>
<tr>
<th>Course</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3405</td>
<td><a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
</tr>
</tbody>
</table>

### Course Website

This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3405

**Molecular microbiology (6 credits)**

**Offering Department**

Biological Sciences

**Course Co-ordinator**

---, Biological Sciences (/)

---, Biological Sciences

**Course Objectives**

This course is intended for biology, biotechnology and biochemistry students who would like to understand the combinations and Impermissible online materials.

**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 genetic 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.
- The molecular biology of plasmids and transposable elements in the survival of the microbes
- Appreciate the development of modern techniques in studying microorganisms

**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

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>N</th>
<th>Offer in 2023 - 2024 : N</th>
</tr>
</thead>
</table>

**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. 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.
- **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 presentational 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 presentational skills.
- **F**
  - 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 presentational skills are minimally effective or ineffective.

### Communication-intensive Course

N

### 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>20</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>

### 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 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>20</td>
<td>CLO 3,4,5</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>10</td>
<td>CLO 1,2,5</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

- Willey, Sherwood & Woolvertor: Prescott’s Principles of Microbiology (McGraw Hill 2009)
- Madigan, Martinko, Dunlap & Clark: Brock Biology of Microorganisms (Pearson 2009, 12th ed.)

### Course Website

http://moodle.hku.hk/

### Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3406

**Reproduction and reproductive biotechnology (6 credits)**

**Offering Department**

Biological Sciences

**Course Co-ordinator**

Prof A O L Wong, Biological Sciences (olwong@hku.hk)

**Teachers Involved**

Prof A O L Wong, School of Biological Sciences

**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:

CLO 1. Have a broad understanding of reproductive biology ranging from evolution of sex, different reproductive strategies & sexual behaviors in animals to the regulatory mechanisms for sex determination & development of reproductive systems.

CLO 2. Have an appreciation of the recent advances on neuroendocrine control of reproductive functions & reproductive cycle, sexual behavior, parental care, and pregnancy & parturition in human & mammalian models.

CLO 3. Have a basic understanding on the adverse effects of environmental endocrine disruptors on reproduction, possible causes of human infertility & treatment with assisted reproduction.

CLO 4. Comprehend a wide range of modern technologies for genome editing, animal cloning & primordial germ cell transplantation and the applications of embryonic stem cells/induced pluripotent stem cells in regenerative medicine/therapeutic cloning.

Pre-requisites (and Co-requisites & Impermissible combinations)
Pass in BIOL2103 or BIOL2220 or BIOC2600 or MEDE2301

Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : 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 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 some 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.

Communication-intensive Course
N

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>

Assessment Methods and Weighting
<table>
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<tr>
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<th>Details</th>
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<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Test</td>
<td>Continuous Assessment</td>
<td>50</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
Refer to the Website of School of Biological Sciences

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3408
Genetics (6 credits)
Academic Year 2022

Offering Department
Biological Sciences

Quota 50

Course Co-ordinator
Dr G Y W Chan, Biological Sciences (gywchan@hku.hk)

Teachers Involved
Dr C Schunter,School of Biological Sciences (Dr G Y W Chan,School of Biological Sciences)

Course Objectives
This course aims to provide students with fundamental knowledge on various topics in genetics (classical, molecular and population genetics) and genomics (genomics, transcriptomics, proteomics, epigenomics, and bioinformatics)

Course Contents & Topics
Topics will include 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, genome editing, epigenetics, genomics, transcriptomics, proteomics, as well as population genetics. Basic knowledge and applications of bioinformatics will also be included.
Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand and present basic principles of heredity, genetic variations and mechanisms of DNA repair
CLO 2 understand both concepts and applications of genomics, transcriptomics and proteomics
CLO 3 apply qualitative and quantitative experimental methodologies for genetic analysis at individual and population level
CLO 4 acquire bioinformatics skills including use of genome browser and analysing gene expression data, and write reports to discuss the results

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL1110 or BIOL 1600; and BIOL2102 or BIOL2103.

Offer in 2022 - 2023

Y 1st sem Offer in 2023 - 2024 : 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. Integration of the full range of appropriate theories, principles, evidence and techniques

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 unfamiliar situations. Some partial integration of theories, principles, evidence and techniques

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. Some partial integration of theories, principles, evidence and techniques

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 integration of theories, principles, evidence and techniques

Fail Demonstrate little or no evidence of 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. Little or no or inapt integration of theories, principles, evidence and techniques

Communication-intensive Course

Y

Course Type

Lecture with laboratory component course

Course Teaching & Learning Activities

Activities Details No. of Hours

Lectures 24

Laboratory 24

Tutorials tutorials & laboratories 6

Reading / Self study 100

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments Written report - Bioinformatics assignment 20 CLO 2.4

Examination Report of data collected in lab sessions 40 CLO 1,2,3

Laboratory reports Report of data collected in lab sessions 20 CLO 1,2,3,4

Presentation Presentation of special topics 20 CLO 1.3

Course Website

http://moodle.hku.hk/

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIO3409 Business aspects of biotechnology (6 credits)

Academic Year 2022

Offering Department Biological Sciences

Quota 40

Course Co-ordinator Dr W B L Lim, Biological Sciences (bllim@hku.hk)

Teachers Involved (Dr K W Y Yuen, School of Biological Sciences) (Dr Ng, Guest Lecture) (Dr W B L Lim, Biological Science)

Course Objectives

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.

The course will 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 (BDI, 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
BIOL3419 Insect ecology: the little things that run the world (6 credits)  Academic Year 2022
Offering Department Biological Sciences
Offering Year 2022
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 Learning Outcomes 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 2022 - 2023 N Offer in 2023 - 2024 : N Examination ---
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.

Communication-intensive Course N
Course Type Lecture-based course
Course Teaching & Learning Activities Activities Details No. of Hours
Lectures
Field work
Group work Presentation
Reading / Self study
Assessment Assignment
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
Assessment Methods
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

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Test 20 CLO 1,2,3,4,5
Presentation 20 CLO 1,2,3,4,5
Assignments 60 CLO 1,2,3,4,5
Assessment Methods
Methods to CLO Mapping
Assessment

---

A Demonstration of an excellent understanding of the biological concepts and theories developed during the course. Master the identification skills and use of taxonomic keys of the different groups of arthropods. Present an active and participative attitude in class. Curation and identification of the collection reaching international scientific standard as presented during the course.
B Demonstration of a good understanding of the biological concepts and theories developed during the course. Master most of the identification skills and use of taxonomic keys of the different groups of arthropods. Participation in class more limited. Curation and identification of the collection satisfactory for the course.
C Demonstration of a general but incomplete understanding of the biological concepts and theories developed during the course. Identification skills and use of taxonomic keys of the different groups of arthropods insufficient to provide reliable identification. Participation in class very limited or irrelevant. Curation and identification of the collection not reaching academic level.
**School of Biological Sciences**

**Communication-intensive Course**

| N  | Lecture with laboratory component course |

**Course Type**

Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities &amp; Learning 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>This part includes 4 hours of lectures about identification and curation of arthropod collection.</td>
<td>28</td>
</tr>
<tr>
<td>Project work</td>
<td>Students will collect independently their own insect collection, curate and identify the specimen collected</td>
<td>48</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>50</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>30</td>
<td>CLO 1,2,3,5,6</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>40</td>
<td>CLO 1,2,3,4,5,6</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>30</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**

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)**

**Offering Department**

Biological Sciences

**Quota**

50

**Course Co-ordinator**

Dr M Sun, Biological Sciences (meisun@hku.hk)

**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.
- Natural selection, sexual selection, and adaptation.
- Migration
- Evolution and Biodiversity
- Species
- Specification
- Evolution and development
- The history of life
- Estimating Evolutionary Trees

**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 2022 - 2023**

N Offer in 2023 - 2024 : N

**Grade Descriptors (A+ to F)**

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Details</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 skillful 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>
</tbody>
</table>
| 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.

Communication-intensive Course

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>
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<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Project work</td>
<td></td>
<td>12</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>Assignments</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Essay</td>
<td></td>
<td>5</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>10</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Project reports</td>
<td>including computer lab</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>
</tr>
</tbody>
</table>

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)

Offering Department Biological Sciences

Course Co-ordinator Dr M Sun, Biological Sciences (meisun@hku.hk)

Teachers Involved

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:
- resolving taxonomic uncertainties and defining management units;
- genetic management of wild populations;
- genetic issues in introduced and invasive species;
- genetic management of captive populations;
- genetic management for reintroduction;
- use of molecular genetics in forensics and understanding species biology.

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 2022 - 2023 N

Grade Descriptors (A+ to F)

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.
Course Co-ordinators

Dr C B Chan, Biological Sciences
(Dr C B Chan, School of Biological Sciences)
(Dr Y L Zhai, School of Biological Sciences)

Offering Department

BIOL3503

Academic Year

2022

Quota

60

Course Contents & Topics


The hypothalamic pituitary axis


The gastrointestinal system

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


Osmoregulation

Posterior pituitary hormone, ADH. Aldosterone and sodium balance. Angiotensin's effect on blood pressure. Atrial natriuretic peptide and its function in water and sodium balance.

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 2022 - 2023

Y

Offer in 2023 - 2024

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 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.
## BIOL3505

**Oyster aquaculture and restoration (6 credits)**

**Offering Department**

Biological Sciences

**Course Co-ordinator**

Dr T Vengatesen, 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 populations. 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 (and Co-requisites and Impermissible combinations)**

Pass in BIOL2103 or BIOL2306 or BIOL3301 or BIOL3303

**Offer in 2022 - 2023**

N Offer in 2023 - 2024 : N

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>CLOs Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>80</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>lab performance &amp; report</td>
<td>20</td>
<td>CLO 1,3,4</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.
classroom 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.

<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Type</strong></td>
<td>Field camps</td>
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<tr>
<td><strong>Course Teaching &amp; Learning Activities</strong></td>
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<tr>
<td><strong>Activities</strong></td>
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<tr>
<td>Lectures</td>
<td>25</td>
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<tr>
<td>Field work</td>
<td>25</td>
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<tr>
<td>Laboratory work</td>
<td>25</td>
</tr>
<tr>
<td>Tutorials</td>
<td>10</td>
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<tr>
<td>Presentation</td>
<td>5</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>20</td>
</tr>
<tr>
<td>Assessment</td>
<td>10</td>
</tr>
</tbody>
</table>

| **Assessment Methods and Weighting** |   |
| **Methods**                        |  |
| Assignments                        | 25 |
| Report                             | 50 |
| Test                               | 25 |

| **Assessment Methods to CLO Mapping** |   |
| **Methods**                         |  |
| Assignments                        | CLO 3,4 |
| Report                             | CLO 4 |
| Test                               | CLO 1,2 |

| 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) |

| Course Website | http://www.biosch.hku.hk/ecology/lsc/ |

| 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, 2016; 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 subject to a minimum enrollment number and availability of teachers. This course will be offered in alternative year. |

<table>
<thead>
<tr>
<th>BIOL3506</th>
<th>Evolutionary biology (6 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Biological Sciences</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr J D Gaitan-Espitia, Biological Sciences (<a href="mailto:jdgaitan@hku.hk">jdgaitan@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr C Schunter,School of Biological Sciences)</td>
</tr>
<tr>
<td>(Dr J D Gaitan-Espitia,School of Biological Sciences)</td>
<td></td>
</tr>
<tr>
<td><strong>Course Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
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</tr>
<tr>
<td>2. The course emphasizes the interplay between theory and empirical tests of hypotheses, thus acquainting students with the process of science.</td>
<td></td>
</tr>
</tbody>
</table>

| **Course Contents & Topics** |   |
| Introduction to Evolutionary Biology Theory |
| Mechanisms of evolution |
| Genetics Drift |
| Gene Flow |
| Natural Selection |
| Sexual Selection |
| Speciation |
| Species concept |
| Phenotypic evolution |
| Evolution of genes and genomes |
| Evolutionary Development (Evo-Devo) |
| Co-Evolution |

| **Course Learning Outcomes** |   |
| On successful completion of this course, students should be able to: |
| CLO 1 identify the facts on 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 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 |

| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in BIOL2306 |
|                                                                | Not for students who have passed in BIOL3501 |
| **Offer in 2022 - 2023** | Y 1st sem Offer in 2023 - 2024 : Y |
| **Graduate Descriptors (A+ to F)** |   |
| 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 uncertainties 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. |
Microbes are amazing and important entities on earth. Knowledge of microbes is widely applied in food, pharmaceuticals, biotechnologies, and medicine. This course will be offered subject to a minimum enrolment number and availability of teachers.

<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Type</td>
<td>Lecture with laboratory component course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Lectures</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>24</td>
</tr>
<tr>
<td>Project work</td>
<td>12</td>
</tr>
<tr>
<td>Tutorials</td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
</tr>
<tr>
<td>Assignments</td>
<td>60</td>
</tr>
<tr>
<td>Examination</td>
<td>40</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>J.C. Herron and S. Freeman: Evolutionary Analysis (5th ed. Pearson, 2013)</td>
</tr>
<tr>
<td>eBooks available</td>
<td></td>
</tr>
<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></td>
</tr>
<tr>
<td>Additional Course Information</td>
<td>This course will be offered subject to a minimum enrolment number and availability of teachers.</td>
</tr>
</tbody>
</table>

**BIOL3508 Microbial physiology and biotechnology (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Prof A Yan, Biological Sciences (ayan@hku.hk)

**Teachers Involved** (Prof A Yan, School of Biological Sciences)

**Course Objectives**

Microbes are amazing and important entities on earth. Knowledge of microbes is widely applied in food, pharmaceauticals, 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.

**Course Contents & Topics**

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.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** appreciate the diversity of microbial metabolisms and applications in biotechnology
- **CLO 2** comprehend the principles underlying the dynamic nature of microbial physiology
- **CLO 3** gain laboratory skills on methodologies for microbial studies
- **CLO 4** relate knowledge to practical application of microbes in industry and medicine

**Pre-requisites (and Co-requisites and Impermissible combinations)**

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.

**Offer in 2022 - 2023** Y 2nd sem Offer in 2023 - 2024 : 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 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 limited 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 limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills.
- **F** 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.

<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
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</tr>
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<tbody>
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</tr>
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<td>Laboratory</td>
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</tr>
<tr>
<td>Project work</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
</tr>
<tr>
<td>Examination</td>
<td>60</td>
</tr>
<tr>
<td>Assignments</td>
<td>40</td>
</tr>
</tbody>
</table>
### Grade Descriptors

<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. 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 presentation skills with scientific oral literacy. Apply highly effective laboratory/fieldwork 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 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 presentation skills with scientific oral literacy. Apply effective laboratory/fieldwork 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. 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 presentation skills with scientific oral literacy. Apply moderately effective laboratory/fieldwork 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. Partial but limited 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 presentation skills with scientific oral literacy. Apply partially effective laboratory/fieldwork skills and techniques. Limited ability to use data and results to draw appropriate conclusions.</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. 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 presentation skills with scientific oral literacy 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.</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighing

<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>Assignment &amp; Presentation (Individual)</td>
<td>40</td>
<td>CLO 1.2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>30</td>
<td>CLO 1.3</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>30</td>
<td>CLO 1.2,3,4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
- **Supplementary Reading:** Brock Biology of Microorganisms, by Michael Madigan, John Martinko, 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/
Required/recommended reading and online materials
Selected readings will also be available on the class website.

Course Website
http://moodle.hku.hk/

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

**BIOL3608 Food Commodities (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr L Zhang, Biological Sciences (lzhang@hku.hk)

**Teachers Involved**
- Dr. J.C.Y. Lee, School of Biological Sciences
- Dr. L Zhang, 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; slaughtered 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 BIOL2101
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 2022 - 2023** Y 2nd sem Offer in 2023 - 2024: Y

**Examination**

**Communication-intensive Course**
N

**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>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</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>40</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>30</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**
The course will be offered subject to a minimum enrollment number and availability of teachers.

**BIOL3951 Ecology & Biodiversity Field Course (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr L Karczmarski, Biological Sciences (lkeszek@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 students contact the course coordinator for further information on the courses available.

**Course Learning Outcomes**
- CLO 1 understand of the biodiversity and primary habitats in the ecosystem studied
CLO 4 understand the basic ecology of target species and how biotic and abiotic factors shape focal communities

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.

The earliest that a student is allowed to take this capstone course is their year 3 study.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Field camps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Content</td>
<td>Students will be directed to relevant scientific literature and websites</td>
</tr>
<tr>
<td>Additional Course Information</td>
<td><a href="http://www.bioesch.hku.hk/ecology/lsc/">http://www.bioesch.hku.hk/ecology/lsc/</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>N</th>
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<tbody>
<tr>
<td>Offer in 2023 - 2024</td>
<td>N</td>
</tr>
<tr>
<td>Examination</td>
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</tbody>
</table>

<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>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. Impressive 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>
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<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. Work more than sufficient for what is required at degree level.</td>
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</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>
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<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>
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</tbody>
</table>

| 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. |

| Communication- intensive Course | N |
| Offer in 2022 - 2023 | N |
| Examination           | --- |

| 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 predetermined 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. |

<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>Identify a relevant scientific question or knowledge gap</td>
</tr>
<tr>
<td>CLO 2</td>
<td>Establish a desk-top literature approach to test the question posed / address the knowledge gap</td>
</tr>
<tr>
<td>CLO 3</td>
<td>Undertake the appropriate research to test the question / address the knowledge gap using sound scientific principles, including statistical analyses where appropriate</td>
</tr>
</tbody>
</table>
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 Content & 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 consent 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** acquire knowledge about the process of scientific inquiry
- **CLO 2** have a better understanding of the nature of food & nutritional science
- **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 (BIOLO3XXX or BIOLO4XXX) 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 2022 - 2023
Y 1st sem 2nd sem Offer in 2023 - 2024 : Y Examination No Exam

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>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 scientific approach to test research hypothesis. Show excellent organizational and/or analytical skills. Demonstrate comprehensive, critical, assessment of findings and professional 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. Adequately designed scientific approach to test research hypothesis. Show good organizational and/or analytical skills. Demonstrate effective, critical, assessment of findings 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 scientific approach to test research hypothesis. Show fair organizational and/or analytical skills. Demonstrate adequate but not necessarily critical, assessment of findings and 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 scientific approach to test research hypothesis. Show fair organizational and/or analytical skills. Demonstrate confused and poorly organized assessment of findings and limited presentation of research work.</td>
</tr>
<tr>
<td>F</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 scientific approach to test research hypothesis. Show little evidence of appropriate organizational and/or analytical skills. Demonstrate incorrect interpretation and assessment of findings and poor presentation of research work.</td>
</tr>
</tbody>
</table>

Communication-intensive Course

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Course Teaching &amp; Assessment Methods and Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project-based course</td>
<td>Preparation</td>
</tr>
</tbody>
</table>

Activities
- Reading / Self study
- At least 120 hours on the dissertation or project

Methods
- Oral presentation
- Research report

Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
--- | --- |
30 | CLO 1, 2, 3, 4 |
70 | CLO 1, 2, 3, 4, 5 |

Activities Details | No. of Hours |
--- | --- |
Preparation | 120 |

Preparation
- 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.

Students should complete the registration form by clicking (http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.

Additional Course Information

Course Website
http://moodle.hku.hk

BIOLO3992
Directed studies in food & nutritional science (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Teachers Involved</th>
<th>Course Objectives</th>
<th>Course Content &amp; Topics</th>
<th>Course Learning Outcomes</th>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Offer in 2022 - 2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Sciences</td>
<td>Dr J CY LEE, Biological Sciences (<a href="mailto:jettylee@hku.hk">jettylee@hku.hk</a>)</td>
<td>This course aims to provide a stimulating capstone experience for all Food &amp; Nutritional Science Major undergraduates to integrate and apply their knowledge and skills obtained from the Major.</td>
<td>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 &amp; nutritional science. The student should obtain the consent of a supervisor in the area of the dissertation topic before submitting the registration form for the course.</td>
<td>On successful completion of this course, students should be able to:</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective courses (BIOLO3XXX or BIOLO4XXX) in the Food &amp; Nutritional Science Major. This capstone course is for Food &amp; Nutritional Science Major students only.</td>
<td>Y 1st sem 2nd sem Offer in 2023 - 2024 : Y Examination No Exam</td>
</tr>
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Grade Descriptors (A+ to F)

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<tbody>
<tr>
<td>A</td>
<td>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 and 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 satisfies the specified requirements. All other aspects of the dissertation conform to a high academic standard.</td>
</tr>
<tr>
<td>B</td>
<td>Work showing some evidence of originality and insight in identifying, generating and communicating competing arguments; demonstrating substantive 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 review of appropriate 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.</td>
</tr>
<tr>
<td>C</td>
<td>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 treatment 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; 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.</td>
</tr>
<tr>
<td>D</td>
<td>Evidence of limited coherence and a good grasp of the topic 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 scientific approach to test research hypothesis. Show fair organizational and/or analytical skills. Demonstrate confused and poorly organized assessment of findings and limited presentation of research work.</td>
</tr>
<tr>
<td>F</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 scientific approach to test research hypothesis. Show little evidence of appropriate organizational and/or analytical skills. Demonstrate incorrect interpretation and assessment of findings and poor presentation of research work.</td>
</tr>
</tbody>
</table>
Course Teaching and Learning Activities

- **Activities**
  - Reading / Self study
  - Notes on the course topics provided by the Course Co-ordinator.

- **Assessment Methods and Weighting**
  - **Course Learning Outcomes**
    - 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**
    - Passed 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 2022 - 2023**
    - Y
  - **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 understanding 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. All other aspects of the dissertation 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 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 critical thinking; arguments undeveloped or inapplicable 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; oversuse quotations with little explanation; insufficient support from literature; reading not well incorporated into the text; limited acknowledgements and light bibliography; some major points missed. Minimum conform to an acceptable academic standard.
This capstone course is for Biological Sciences Major students only. BIOL 4XXX in the Biological Sciences Major.

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

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.

Students should complete the registration form by clicking (http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.

BIOL 3994
Directed studies in biological sciences (6 credits)

Offering Department: Biological Sciences
Course Co-ordinator: Dr J Wu, Biological Sciences (jinwu@hku.hk)

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.

Pre-requisites
(And Co-requisites and Impermissible combinations)
Offer in 2022 - 2023

Grade Descriptors
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 meets 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 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; some major points missed; 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 light bibliography; some major points missed. Minimum 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; student has adequate grasp of the topic from background reading and analysis; 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.

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 light 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; unreflective; incoherent argument; complete misinterpretation 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.
### 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>15 minutes (Plus 5 minutes for questions and answers).</td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Research report</td>
<td>Written report 6000-8000 words (excluding figures and references).</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### 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.

Students should complete the registration form by clicking (http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.

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### BIOL4201

**Public health nutrition (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr D M Y Wu, Biological Sciences (wudaphne@hku.hk)

**Teachers Involved** (Dr D M Y Wu,School of Biological Sciences)

**Course Contents & Topics**

- Public health nutrition unites social sciences and biomedical sciences in preventing disease and improving human health through programs aimed at enhancing good nutritional practices. This course presents a broad overview of the professional practice and essential skills required of a public health nutritionist.

**Course Objectives**

- CLO 1: have a broad knowledge of the scope and methodologies of public health nutrition
- CLO 2: critically review and interpret public health nutrition studies in the literature
- CLO 3: plan public health nutrition programs according to the program planning cycle's framework
- CLO 4: explain the meaning and uses of Dietary Reference Intakes and dietary guidelines
- CLO 5: understand the principles of dietary assessment methods, and the strengths of limitations of these methods
- CLO 6: evaluate the validity and reliability of dietary assessment tools, and choose the most appropriate nutrition assessment methods for different purposes
- CLO 7: understand the local and international food regulations

**Course Learning Outcomes**

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. 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.
- 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.
- Demonstrate partial but limited 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.
- 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 to draw inappropriate conclusions. Apply moderately effective organizational and presentational skills.
- 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.
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- Demonstrate partial but limited 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.
- 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 to draw inappropriate conclusions. Apply moderately effective organizational and presentational skills.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

PASS in BIOL3202

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Y</th>
<th>2nd sem</th>
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</thead>
<tbody>
<tr>
<td>Y</td>
<td>Offer in 2023 - 2024 : Y</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. Thorough grasp of the subject. Show evidence of some 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. 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.
- C: 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 / 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 some of the course learning outcomes. Partial but limited 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 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.
- 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.

**Communication-intensive Course**

- **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>36</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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<td>CLO 1,2,3,4</td>
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<tr>
<td>Research report</td>
<td>Written report 6000-8000 words (excluding figures and references).</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Course Website**

http://moodle.hku.hk/
BIOL4202 Nutrition and sports performance (6 credits)

Offering Department
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 2023 - 2024: 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.

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 ineffective 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 quality management skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Communication-intensive Course N

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 CLO 1, 2, 4, 6, 7
Presentation CLO 1, 3, 4, 5
Project reports CLO 1, 4, 5

Required/recommended reading and online materials

Course Website http://moodle.hku.hk/
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.

BIOL4204 Diet, brain function and behavior (6 credits) Academic Year 2022
Offering Department Biological Sciences Quota 30
Course Co-ordinator Dr E T S Li, Biological Sciences (etsli@hku.hk)
(Dr J C Y Lee, Biological Sciences)
Teachers Involved
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
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
Pass in BIOL3204, or already enrolled in this course

Offer in 2022 - 2023
N Offer in 2023 - 2024 : 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. Might show misunderstanding of the materials. 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.

Communication-intensive Course
N

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials tutorials/group discussions/seminars 12
Project work oral presentation 12
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 20 CLO 1,2,4
Examination 60 CLO 1,2,3,4
Presentation 20 CLO 2,4

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 2022
Offering Department Biological Sciences Quota 30
Course Co-ordinator Dr K S Leung, Biological Sciences (kks612@hku.hk)
(Dr L Zhang, School of Biological Sciences)
Teachers Involved
Course Objectives
To provide students with basic principles and methodologies of food processing and preservation technology for product development. To cover key technological principles relevant to the food industry. Students will gain hands-on experience with selected food processing and preservation techniques for product development.
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 will discuss the basic technological principles and applications of methods in food processing and preservation. Techniques discussed will include those for high and low temperature processing, fermentation, and general preservation. Marketing aspect of food products will be discussed.

### Course Learning Outcomes

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 with the inclusion of marketing prospects
- **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 BIOL3209

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Grade</th>
</tr>
</thead>
<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>
</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>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete grasp of the subject matter covered. Show adequate evidence of analytical and critical abilities and logical thinking of the changes that take place in variety of food during preparation, processing and storage. Identifies and uses appropriate techniques and equipment for a variety of food-specific purposes. Demonstrates adequate skills in designing, producing and evaluating solutions of sound quality for specific food purposes. Use lab skills and techniques and analysis of data and results to draw moderately appropriate conclusions.</td>
</tr>
<tr>
<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 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 generally appropriate conclusions.</td>
</tr>
<tr>
<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 of the changes that take place in variety of food during preparation, processing and storage. Identifies with guidance factors and uses some appropriate techniques and equipment for a limited range of food-specific purposes. Use lab skills and techniques and analysis of data and results to draw inappropriate conclusions occasionally.</td>
</tr>
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</table>

### Communication-intensive Course

N

### Course Type

Lecture with laboratory component course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>laboratory/field trip/seminar</td>
<td>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
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<tr>
<td>Reading / Self study</td>
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<td>100</td>
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### Assessment Methods and Weighting

<table>
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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></td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>40</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

Food Processing Technology-Principles & Practice 3rd Ed P.J. Fellows

Unit Operations in Food Processing - 2nd ed. R.L. Earle

### Course Website

http://moodle.hku.hk/

### Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL4207

**Meat and dairy sciences (6 credits)**

**Offering Department**

Biological Sciences

**Academic Year**

2022

**Course Co-ordinator**

Prof N P Shah, Biological Sciences (npshah@hku.hk)

**Teachers Involved**

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

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL3201

**Offer in 2022 - 2023**

N Offer in 2023 - 2024 : N

**Examination**

---
**BIOL4208**  
**Meat, dairy and grain sciences (6 credits)**  

**Offering Department**  
Biological Sciences

**Course Co-ordinator**  
Prof N P Shah, Biological Sciences (npshah@hku.hk)

**Teachers Involved**  
(Prof N P Shah, School of Biological Science)

**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**  
Pass in BIOL3201 or BIOL2101 and any level 3 BIOL course; and
Not for students who have passed in BIOL3210; and
Not for students who have passed in BIOL4207

**Offer in 2022 - 2023**  
N Offer in 2023 - 2024 : N

**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 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>
</tr>
<tr>
<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>
</tr>
<tr>
<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 inappropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based 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 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 moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate team-based organizational and presentational skills of limited effectiveness.</td>
</tr>
<tr>
<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>
</tr>
</tbody>
</table>

**Communication-intensive Course**  
N

**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 |
--- | --- | --- | --- | --- |
Examination |  |  | 70 | CLO 1,2,3,4 |
Laboratory reports |  |  | 30 | CLO 1,2,3 |

Required/recommended reading and online materials | Lawrie’s Meat Science. RA Lawrie (CRC Press, 2006) |

Course Website | http://moodle.hku.hk |

Additional Course Information | The course will be offered subject to a minimum enrollment number and availability of teachers. |

### BIOL4209 Functional foods (6 credits) Academic Year 2022

**Offering Department** | Biological Sciences |
**Course Co-ordinator** | Dr L Zhang, Biological Sciences (lzhang17@hku.hk) |
**Teachers Involved** | (Dr K S Leung, School of Biological Sciences) |
**Course Co-ordinator** | 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, phytoestrogens 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 BIOL3202

**Offer in 2022 - 2023**
- Offer in 2023 - 2024 : 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 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 knowledge to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.</td>
</tr>
<tr>
<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 knowledge to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.</td>
</tr>
<tr>
<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 knowledge to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based 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 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.</td>
</tr>
<tr>
<td>F</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 knowledge ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**
N

**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/seminars</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 2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>40</td>
<td>CLO 2,3,4,5</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/

**Additional Course Information**
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4210 Food product development (6 credits) Academic Year 2022

<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>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>70</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
Lawrie’s Meat Science. RA Lawrie (CRC Press, 2006)

**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)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr M F Wang, Biological Sciences (<a href="mailto:mfwang@hku.hk">mfwang@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr M F Wang, Biological Sciences)</td>
</tr>
</tbody>
</table>

#### Course Objectives
- To introduce the key concepts and techniques used in fish product development. To provide small group experience in the design, development and production of a new fish 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 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 BIOL3203 or BIOL4205

#### Offer in 2022 - 2023
- N Offer in 2023 - 2024 : 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 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>
</tr>
<tr>
<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>
</tr>
<tr>
<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>
</tr>
<tr>
<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>
</tr>
<tr>
<td>F</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>
</tr>
</tbody>
</table>

#### Communication-intensive Course
- N

#### 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></td>
</tr>
<tr>
<td>Group work</td>
<td>80-100 hours group project work</td>
<td>100</td>
</tr>
<tr>
<td>Tutorials</td>
<td>10 lectures + 12 tutorials</td>
<td>22</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>assessment of group product development project including in-class presentation</td>
<td>80</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4,5</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.
Environmental impact assessment (6 credits)

Offering Department: Biological Sciences
Quota: 30

Course Objectives: To introduce the general principles, processes, techniques, current practices and problems of environmental impact assessment (EIA).


Course Learning Outcomes: On successful completion of this course, students should be able to:

- CLO 1 understand the EIA procedures and requirements in different places, especially Hong Kong
- CLO 2 appreciate the multidisciplinary nature of EIA
- CLO 3 realise the difficulties and challenges of public involvement in EIA processes
- CLO 4 conduct an appraisal of EIA reports in the HK EIA system

Pre-requisites and Co-requisites: Pass in (BIOL2103 or BIOL2306); and (ENVS3004 or any BIOL3XXX course)

Offer in 2022 - 2023: Y
Grade Descriptors: 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 presentialtal 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 presentialtal 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 presentialtal 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 presentialtal skills. Lack of attention to thoughtful and reflective thinking.

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 presentialtal skills are minimally effective or ineffective.
This course teaches students the ways and means of exploring and understanding animal behaviour; it provides insights into a field of science that investigates everything animals do, including the underlying mechanisms and functions of specific behaviours; the ways in which animals interact with each other, with their physical environment and other organisms; how animals find and defend resources, avoid predators, choose mates, reproduce, and care for their young; how complex animal societies are formed and how behaviour of an individual affects the structure of a population.

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 Learning Outcomes
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 (and Co-requisites and Impermissible combinations)
- Pass in BIOL2306; and
- Pass in one of the following courses: BIOL3301, BIOL3313, BIOL3319, BIOL3320 or BIOL3419
- Not for students who have passed in BIOL3101

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>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.</td>
</tr>
<tr>
<td>B</td>
<td>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.</td>
</tr>
<tr>
<td>C</td>
<td>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.</td>
</tr>
<tr>
<td>D</td>
<td>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</td>
</tr>
</tbody>
</table>

School of Biological Sciences

BIOL4303 Animal behaviour (6 credits)
Offering Department Biological Sciences
Course Co-ordinator Dr L Karczmarski, Biological Sciences (leszek@hku.hk)
Teachers Involved

Course Objectives
This course teaches students the ways and means of exploring and understanding animal behaviour; it provides insights into a field of science that investigates everything animals do, including the underlying mechanisms and functions of specific behaviours; the ways in which animals interact with each other, with their physical environment and other organisms; how animals find and defend resources, avoid predators, choose mates, reproduce, and care for their young; how complex animal societies are formed and how behaviour of an individual affects the structure of a population.

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 Learning Outcomes
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 (and Co-requisites and Impermissible combinations)
- Pass in BIOL2306; and
- Pass in one of the following courses: BIOL3301, BIOL3313, BIOL3319, BIOL3320 or BIOL3419
- Not for students who have passed in BIOL3101

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>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.</td>
</tr>
<tr>
<td>B</td>
<td>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.</td>
</tr>
<tr>
<td>C</td>
<td>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.</td>
</tr>
<tr>
<td>D</td>
<td>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</td>
</tr>
</tbody>
</table>
BIOL4304 Ecosystem functioning and services (6 credits)

Offering Department
Biological Sciences

Course Co-ordinator
Dr B D Russell, Biological Sciences (brussell@hku.hk)

Teachers Involved
(Or B Guennard, School of Biological Sciences)
(Or C Dingle, School of Biological Sciences)
(Guest Lecturer, School of Biological Sciences)
(TBC, School of Biological Sciences)

Course Objectives
This course will introduce the functioning of terrestrial, fresh water and marine ecosystems and the services which they provide to 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.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 Demonstrate an understanding of the complexity and function of ecosystems
CLO 2 Explain how ecosystems provide services which humans use
CLO 3 Demonstrate knowledge on methods used to calculate the value of ecosystem services
CLO 4 Demonstrate knowledge on the limits to the methods used to calculate the value of ecosystems and the dangers of placing a value on nature
CLO 5 Demonstrate an understanding of how human activities reduce the function of ecosystems and reduces ecosystem services

Pre-requisites
Pass in one of the following courses: BIOL3301 or BIOL3303 or BIOL3319 or ENVS3019 or ENVS3004 or ENVS3020

Offer in 2022 - 2023
N Offer in 2023 - 2024 : Y

Grade 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 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.
**Course Objectives**
The objective is to provide students the knowledge on the practical applications of immunology and microbiology in clinical laboratory analysis in haematology, chemical pathology, and clinical microbiology. The application of these principles of flow cytometry and its application.

**Course Contents & Topics**
- Application of antigen-antibody interaction in advanced research such as chromatin, immunoprecipitation and dual immunofluorescence analysis.
- Principles of flow cytometry and its application.
- Tumor immunology and immunotherapy such as FDA-approved checkpoint inhibitor immunotherapy and chimeric antigen receptor (CAR) T-cell therapy.
- Microbial pathogens and associated diseases, host immune response, antimicrobial agents and multidrug resistance, epidemiology and prevention of microbial infections.
- Clinical laboratory analysis in haematology, chemical pathology, and clinical microbiology. The application of these techniques in the diagnosis of disease associated with major systems of the human body and the diagnosis of infectious diseases.

**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 (and Co-requisites and Impermissible combinations)**
Pass in BIOL3401

**Offer in 2022 - 2023**
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 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 presentional 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 solving 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. Mixture of data and results and/or unable to draw appropriate conclusions. Organization and presenational skills are minimally effective or ineffective.

**Communication-intensive Course**
N

**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>
<td>Lectures</td>
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<td>24</td>
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<tr>
<td>Laboratory</td>
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<tr>
<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
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**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.

**BIOL4401**
Medical microbiology and applied immunology (6 credits)

**Offering Department**
Biological Sciences

**Course Co-ordinator**
Dr W Y Lui, Biological Sciences (wylui@hku.hk)

**Teachers Involved**
- Dr A Yan, School of Biological Sciences
- Dr C G Zheng, School of Biological Sciences
- Dr W Y Lui, School of Biological Sciences

**Course Website**
hp://moodle.hku.hk

**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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<tbody>
<tr>
<td>Assignments</td>
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<td>40</td>
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<tr>
<td>Examination</td>
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<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Presentation</td>
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<td>CLO 1,2,4,5</td>
</tr>
</tbody>
</table>

**Grade Descriptors**

- **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.

- **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 presentional 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 solving 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. Mixture of data and results and/or unable to draw appropriate conclusions. Organization and presenational skills are minimally effective or ineffective.

**Communication-intensive Course**
N

**Course Type**
Lecture-based course

**Required/recommended reading and online materials**
Students will be directed to relevant scientific literature and websites

**Academic Year**
2022

**Quota**
40
### BIOL4402 Microbial biotechnology (6 credits)

**Offering Department:** Biological Sciences  
**Course Co-ordinator:** Dr W B L Lim, Biological Sciences  
**Course Website:** [http://moodle.hku.hk/](http://moodle.hku.hk/)

#### 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 discussed 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 biopesticides 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.

#### Assessment Methods and Weighting
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<tbody>
<tr>
<td>Examination</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>Laboratory reports</td>
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<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3</td>
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#### Required/recommended reading and online materials
To be announced in class

#### Course Website
[http://moodle.hku.hk/](http://moodle.hku.hk/)

### BIOL4409 General virology (6 credits)

**Offering Department:** Biological Sciences  
**Course Co-ordinator:** Dr W B L Lim, Biological Sciences  
**Teachers Involved:** Dr W B L Lim, School of Biological Sciences  
**Course Website:** [http://moodle.hku.hk/](http://moodle.hku.hk/)

#### Course Objectives
This Course provides the fundamental principles of virology so that students can understand the pathogenesis of major viral diseases that affect animal health. The course will prepare students for profession or graduate work in intensive Course Communication.

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<td>Assignments</td>
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<tr>
<td>Examination</td>
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<td>70</td>
<td>CLO 1,2,3</td>
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#### Required/recommended reading and online materials
Course Contents & Topics
Fundamental Virology
1. Classification and Nomenclature of Viruses
2. Virus structure: Capsid symmetry, icosahedral symmetry
3. Virus structure: Genetic Materials, Nucleocapsid, Envelope
4. Virus entry: Receptors, uncoating and fusion
5. Virus-Cell Interaction
6. RNA viruses: Genome replication and mRNA production
7. Baltimore Class IV (+) s.s. RNA viruses: Picornaviruses
8. Baltimore Class V (-) s.s. RNA viruses: Myxoviruses
9. Ambisense RNA viruses: Bunyaviruses and Arenaviruses
10. Baltimore Class VI (+) s.s. RNA viruses: Retroviruses
11. Baltimore Class III d.s. RNA viruses: Reoviruses
12. Baltimore Class I d.s. DNA viruses: Adenoviruses, Herpesviruses
13. Baltimore Class II s.s. (+) DNA viruses: Paroviruses
14. Mechanisms of Viral Oncogenesis
15. Anti-viral treatments
16. 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

Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : N

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of knowledge required for attaining all the course learning outcomes. Show strong analytical skills and competent ability to acquire knowledge on new development of the subject. Apply highly effective lab skills and techniques. 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 skills and adequate ability to acquire knowledge on new development of the subject. Apply effective lab skills and techniques. 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 skills and certain ability to acquire knowledge on new development of the subject. Apply moderately effective lab skills and techniques. 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 limited analytical skills and ability to acquire knowledge on new development of the subject. Apply partially effective lab skills and techniques. Apply partially 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 skills and ability to acquire knowledge on new development of the subject. Apply minimally effective or ineffective lab skills and techniques. Organization and presentational skills are minimally effective or ineffective.

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<tr>
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<td>Laboratory reports</td>
<td>20</td>
<td>CLO 1,2,3</td>
<td></td>
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Communication-intensive Course
N

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities
No. of Hours
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
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
Quota 50

Course Co-ordinator Prof M L Chye, Biological Sciences (mlchye@hku.hk)

Teachers Involved (mlchye@hku.hk,School of Biological Sciences)

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.
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 2022 - 2023

Y 1st sem Offer in 2023 - 2024 : 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 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 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 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.

Communication-intensive Course

N

Course Type

Lecture with laboratory component course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures
Laboratory practical/laboratory/project 30
Reading / Self study
Reading notes on Moodle

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 50 CLO 1,2,3
Lab reports 10 CLO 1,2,3
Presentation 20 CLO 1,2,3
Test 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

BIOL4415 Healthcare biotechnology (6 credits)

Academic Year 2022

Offering Department Biological Sciences

Quota 70

Course Co-ordinator Dr G Y W Chan, Biological Sciences (gywchan@hku.hk)

Teachers Involved

(Dr G Y W Chan, School of Biological Sciences)

(Dr K W Y Yuen, School of 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 or BIOL3408

### Offer in 2022 - 2023
<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Grade Descriptors</th>
<th>Offer in 2023 - 2024</th>
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<td>Y</td>
</tr>
<tr>
<td>2023</td>
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### Examination
May

### Communication-intensive Course
N

### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities
**Activities**

- **Lectures**
  - Details: No. of Hours
  - 24

- **Laboratory**
  - Details: 24

- **Tutorials**
  - tutorials/assignments/computer sessions: 6

- **Reading / Self study**
  - Details: 100

**Assessment Methods and Weighting**

<table>
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<tr>
<td>Assignments</td>
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<tr>
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</tr>
<tr>
<td>Test</td>
<td></td>
<td>15</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 Chaogu Zheng, Biological Sciences
- 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
**School of Biological Sciences**

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in BIOC3601 or BIOC3604 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408

**Offer in 2022 - 2023**  
Y 2nd sem  Offer in 2023 - 2024 : N  Examination  May

**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 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. 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. 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. 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.

**Communication-intensive Course**  
N

**Course Type**  
Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
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<tr>
<td>Laboratory</td>
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<td>Tutorials</td>
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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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**Required/recommended reading and online materials**

- Essentials of stem cell biology edited by Robert Paul Lanza 2009
- Science in medicine: the JCI textbook of molecular medicine
- By Andrew R. Marks, American Society for Clinical Investigation, Ushma S. Neill
- Molecular biology of aging, Issue 51
- By Leonard Guarente, Linda Partridge, Douglas C. Wallace - 2008

**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.

**BIOL4417**

'Oomics' and systems biology (6 credits)

**Offering Department**  
Biological Sciences

**Course Co-ordinator**  
Dr J W Zhang, Biological Sciences (jzhang1@hku.hk)

**Teachers Involved**  
(Dr J W Zhang, School of Biological Sciences)

**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.

Synthetic biology is set to be the heart of future economy, promising to create new drugs, industrial materials and energy sources similar to chemical synthesis. The significance of this field has been promoted by the worldwide synthetic biology competition organized by MIT, i.e., iGEM competition. In this course, we will introduce some innovative ideas in synthetic biology and practice the skills needed for iGEM competition.

**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 experiment methodologies involved in: 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; Synthetic biology- the design and building of synthetic protocells using basic biochemical building blocks from scratch.

**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 iGEM and Synthetic biology
- 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 Synthetic Biology studies

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
Pass in BIOC3601 or BIOC3604 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408

**Offer in 2022 - 2023**  
Y 2nd sem  Offer in 2023 - 2024 : Y  Examination  May
| 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 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. 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. 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. 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. |
| 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. |

### Communication-intensive Course
N

#### Course Type
Lecture with laboratory component 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>Laboratory</td>
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<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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<td>Assignments</td>
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<tr>
<td>Examination</td>
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</table>

#### Required/recommended reading and online materials
TBA

#### Course Website
http://moodle.hku.hk/

#### Additional Course Information
Offer in alternate year from 2017-2018

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### BIOL4451
Cetacean behaviour, ecology and conservation: field research experience (6 credits)

#### Offering Department
Biological Sciences

#### Course Co-ordinator
, Biological Sciences ()

#### Teachers Involved

#### Course Objectives
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 how individual projects can contribute to advancing science and benefiting broader conservation management efforts. The course includes lectures, informal discussions of current research and recent discoveries, review of innovative research techniques, and extensive field component 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 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 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 year 3 study; and because it is conducted in early June, this course is best suited for year 3 students.

#### Offer in 2022 - 2023
N Offer in 2023 - 2024 : N

#### Grade Descriptors
<table>
<thead>
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<th>(A+ to F)</th>
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<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
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### BIOL4501

**Molecular phylogenetics and evolution (6 credits)**

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<th>Offering Department</th>
<th>Academic Year</th>
<th>Quota</th>
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<tr>
<td>Biological Sciences</td>
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<td>25</td>
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<td>Course Co-ordinator</td>
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<td>TBC, Biological Sciences</td>
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**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**

- 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 2022 - 2023**

- N Offer in 2023 - 2024 : N

**Course Descriptors (A+ to F)**

- A 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.

- B Demonstrate good knowledge and good level of skills sufficient for accomplishing most 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.

- C 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,
School of Biological Sciences

BIOL4505 Oyster aquaculture: business and technology (6 credits)  Academic Year 2022  Quota 20

Offering Department Biological Sciences

Course Co-ordinator Dr T Vengatesen, 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 academic knowledge to oyster growers and aquaculture industry for sustainable, healthy and safe sea-food production;

Course Contents

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 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.

Not for students who have passed in BIOL3505

Grade Descriptors

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.
**Course Website**: http://moodle.hku.hk

**Additional Course Information**
Offer in alternate year from 2017–2018

Offered in after 2nd Sem. during May to June

The course date may be slightly change depending on the situation and there will Not be any overseas or mainland field trips, the field course will be conducted in HK.

The course results of BIOL4505 will be released as usually longer than the other 2nd Semester courses by the Faculty of Science.

For more course details, please email to Dr Rajan rajan@hku.hk or Ms. Jessie Lai hylaia@hku.hk

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**BIOL4861**

**Ecology & biodiversity internship (6 credits)**

**Offering Department**: Biological Sciences

**Course Co-ordinator**: Dr T Vengatesen, Biological Sciences (rajan@hku.hk)

**Teachers Involved**: All academic staff in Ecology & Biodiversity Major, School of Biological Sciences

**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.

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.

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 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 Ecology and Biodiversity Major.

This course is for Ecology & Biodiversity Major / Ecology & Biodiversity (Intensive) Major students only.

The earliest that a student is allowed to take this course is their Year 3.

**Offer in 2022 - 2023 Grade Descriptors Distinction/Pass/Fail**

**Distinction**
- Demonstrates excellent ability in applying knowledge to solve problems in the workplace.
- Demonstrates excellent performance in handling and carrying out the work required in the job or assigned by supervisor(s).

**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.

**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.

**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 workplace
- CLO 3 acquire an understanding and appreciation of the real work environment
- CLO 4 extend their network in their field of study

**Examination**

No Exam

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**Communication-intensive Course**

**Course Type**: Internship

**Course Teaching & Learning Activities**

**Activities**
- Internship work
  - No. of Hours: at least 160 hours

**Assessment Methods and Weighting**

**Methods**
- Written report
  - Weighting in final course grade (%): 100
  - Assessment Methods to CLO Mapping: CLO 1,2,3,4

**Course Website**: http://moodle.hku.hk

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**Communication-intensive Course**

**Course Type**: Field camps

**Course Teaching & Learning Activities**

**Activities**
- Lectures including tutorial
  - No. of Hours: 40
- Field work
  - No. of Hours: 50
- Laboratory work hands on training
  - No. of Hours: 30

**Assessment Methods and Weighting**

**Methods**
- Assignments Practical
  - Weighting in final course grade (%): 25
  - Assessment Methods to CLO Mapping: CLO 3,4
- Report Presentation: developing innovative ideas for sustainable and economically viable aquaculture in Hong Kong
  - Weighting in final course grade (%): 50
  - Assessment Methods to CLO Mapping: CLO 4,5
- Test Written exam.
  - Weighting in final course grade (%): 25
  - Assessment Methods to CLO Mapping: 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)
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.

Offering Department
Conservation science in practice (6 credits) Academic Year 2022

Course Co-ordinator
Biological Sciences Quota 9

Teachers Involved
TBC, Biological Sciences ()

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
CLO 5 be able to competently present the case study and convincingly argue their case

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 Ecology & Biodiversity Major / Ecology & Biodiversity (Intensive) Major including BIOL3303. This capstone course is for Ecology & Biodiversity Major / Ecology & Biodiversity (Intensive) Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

Grade Descriptors

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 practical and political dimensions for addressing conservation challenges. Apply highly effective presentialational skills. Strong evidence of attention to thoughtful and reflective thinking and consideration of the wider issues of biodiversity conservation for Society. Apply moderately effective presentational skills. Some evidence of clear attention to thoughtful and reflective thinking and attention to detail. Consideration of practical components in conservation management must be demonstrated including the importance of biodiversity conservation in Society.

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 management must be demonstrated including the importance of biodiversity conservation in Society.

C

- Demonstrate partial 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, ability to apply knowledge to most familiar situations and of relevance of biodiversity conservation for Society. Apply moderately effective presentialational 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 solving problems. Organization and presentational skills are minimally effective or ineffective.

Communication-intensive Course

Course Type
Project-based course

Assessment Methods and Weighting

<table>
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<th>Methods</th>
<th>Details</th>
<th>Weighing in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Oral presentation</td>
<td>40</td>
<td>CLO 1,2,4,5</td>
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<tr>
<td>Research report</td>
<td>project report</td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Details</td>
<td>Supervised practical work of at least 80 hours followed by written &amp; oral reports. Tutorials provided by course coordinator</td>
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Course Website
http://www.biosch.hku.edu.hk/ecology/lab
This course will be offered in alternate year from 2017-2018
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4912
Sensory evaluation of food (6 credits) Academic Year 2022

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Offering Department: Biological Sciences

Course Co-ordinator: Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)

Teachers Involved:

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 July in a 2-week intensive workshop format at a collaborating facility in mainland China, to enable close study of food products in the Chinese marketplace. Preliminary lectures will take place at the University of Hong Kong. Physiology and psychology of sensory perception. Objectives, planning and conduct of sensory testing, Discrimination testing, thresholds, descriptive analysis, affective testing. Instrument-sensory relationships, texture and aroma profiles, food oral processing, shelf-life studies, expert panels. Case studies of sensory applications in product development, quality management, and consumer research.

Course Learning Outcomes:
On successful completion of this course, students should be able to:

- CLO 1 understand the psychophysiological basis for human sensory perception of food
- CLO 2 understand the major techniques used in sensory testing
- CLO 3 interpret sensory evaluation reports, and to design and conduct sensory evaluation projects using appropriately chosen methods

Pre-requisites (and Co-requisites and Impermissible combinations):
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.

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 2022 - 2023:
N

Grade Descriptors:
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.

Communication-intensive Course:
N

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.

BIOL4913
Advanced practicum on food and nutrient analysis (6 credits)

Offering Department: Biological Sciences

Course Co-ordinator: Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)

Teachers Involved:

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 the 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 and 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.

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
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) included BIOL3207 and/or BIOL3209 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 2022 - 2023
No

N        Offer in 2023 - 2024 : N

Grade Descriptors
(A+ to F)

Examination
---

A       Demonstrate a 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 inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Communication-intensive Course
N

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities          Details          No. of Hours
Lectures                24
Laboratory              48
Reading / Self study    100

Assessment Methods and Weighting
Methods          Details          Weighting in final course grade (%)          Assessment Methods to CLO Mapping
Project report                50          CLO 1,2,3,4
Test                     50          CLO 1,2,3,4,5

Required/recommended reading and online materials
Y. Pico, Chemical Analysis of Food Techniques and Applications (2012, Knovel, Science Direct on-line)

Course Website
http://moodle.hku.hk

Additional Course Information
The course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4921 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

Academic Year
2022

Quota
15
BIOL4922

Food product development and evaluation (6 credits)

Offering Department
Biological Sciences

Course Co-ordinator
TBC, Biological Sciences

Teachers Involved
(TBC,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)
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 & Nutritional Science Major.

Communication-intensive Course
Field camps

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>lectures and tutorials</td>
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<tr>
<td>Field work</td>
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<td>72</td>
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<tr>
<td>Presentation</td>
<td>interactive debates</td>
<td>10</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></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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</table>

Required/recommended reading and online materials
Required/recommended reading and online materials (at most 400 characters)

Course Website
http://www.biosch.hku.hk/ecology/lsc/

School of Biological Sciences
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.

### 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 limited team-based organizational and presentational skills.

- **F**: 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 ineffective, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

### Communication-intensive Course

- **N**

### Course Type

- Laboratory and workshop course

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Details</th>
<th>No. of Hours</th>
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<td>CLO 1, 2, 3, 4, 5</td>
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<table>
<thead>
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<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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</thead>
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<td>Group work</td>
<td>80-100 hours group project work</td>
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<td>Tutorials</td>
<td>6 lectures + 6 tutorials</td>
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<tr>
<td>Assignments</td>
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<td></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.

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### BIOL4962 Food & nutritional science internship (6 credits)

#### Academic Year

- 2022

#### Quota

- N

#### Offer in 2022 - 2023

- N

#### Course Co-ordinator

- Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)

#### Teachers Involved

- (All academic staff in Food & Nutritional Science Major, School of 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 & 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 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 work place
  - 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.

The earliest that a student is allowed to take this capstone course is their year 3 study.

#### Offer in 2022 - 2023

- Y

#### Grade Descriptors Distinction/Pass/Fail

- **Distinction**: Demonstrates excellent ability in applying knowledge to solve problems in the workplace. Demonstrates excellent performance in handling and carrying out the work required in the job or assigned by supervisor(s). Establishes highly 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, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.

- **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.

#### Communication-intensive Course

- N
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
- Methods: Oral presentation, Supervisor's feedback, Written report
- Details: 25%, 50%, 25%
- Weighting in final course grade (%): 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.
- 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.

BIOL4963
- Molecular biology & biotechnology internship (6 credits)
- Offering Department: Biological Sciences
- Course Coordinator: Dr J C Y Lee, Biological Sciences (jetylee@hku.hk)
- Teachers Involved: All academic staff in Molecular Biology & Biotechnology Major, School of 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.
  - Students taking this course will work as an intern 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 Contents & Topics
- 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 / Molecular Biological & Biotechnology (Intensive) Major students only.
- The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2022 - 2023
- Y: 1st sem, 2nd sem, Summer
- Offer in 2023 - 2024: Y
- Examination: No Exam

Communication-intensive Course: N

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
- 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

Grade Descriptors
- Distinction: Demonstrates excellent ability in applying knowledge to solve problems in the workplace. Demonstrates excellent performance in handling and carrying out the work required in the job or assigned by supervisor(s). Establishes highly 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, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.

- 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
- Details: at least 160 hours (lunch hour excluded) in at least 20 working days
- 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.
- 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.
BIOL4964 Biological sciences internship (6 credits) Academic Year 2022
Offering Department Biological Sciences Quota ---
Course Co-ordinator Dr Y W Chan, Biological Sciences (gywchan@hku.hk)
Teachers Involved (All academic staff in Biological Sciences Major, School of Biological Sciences)
Course Objectives To provide a stimulating experience for all Biological Sciences major undergraduates to integrate and apply their 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 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 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 work place
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 Biological Sciences Major.
This capstone course is for Biological Sciences Major / Biological Sciences (Intensive) Major students only.
The earliest that a student is allowed to take this capstone course is their year 3 study.
Offer in 2022 - 2023 All academic staff in Biological Sciences Major, School of Biological Sciences
Grade Descriptors
Distinction Demonstrates excellent ability in applying knowledge to solve problems in the workplace. Demonstrates excellent performance in handling and carrying out the work required in the job or assigned by supervisor(s). Establishes highly 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, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.
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".
Fall 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.
Communication-intensive Course N
Course Type Internship
Course Teaching & Learning Activities Activities Details No. of Hours
Internship work at least 160 hours (lunch hour excluded) in at least 20 working days 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 1,2,3,4
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.
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.

BIOL4991 Ecology & biodiversity project (12 credits) Academic Year 2022
Offering Department Biological Sciences Quota ---
Course Co-ordinator Dr S W Y Sin, Biological Sciences (sinyw@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 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.
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.
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
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 critically discuss their research findings and place them into a holistic scientific context
CLO 8 submit their work following a specified journal format, present their work as a scientific conference talk
### School of Biological Sciences

#### Pre-requisites (and Co-requisites and Impermissible combinations)

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.

#### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
<th>Year</th>
<th>Offer in 2022 - 2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No Exam</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

#### 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. Well 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.

- **C**
  - Evidence of adequate understanding and grasp of the subject matter 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 confused and poorly organized assessment of results and limited 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 incorrect interpretation and assessment of results and poor 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.

#### Communication-intensive Course

- **N**

#### Course Type

- Project-based course

#### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods</td>
<td>Details</td>
<td>Weighting in final course grade (%)</td>
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<tr>
<td>Dissertations</td>
<td>Written report (&lt;12000 words)</td>
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<td>Oral presentation</td>
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#### Course Website

- http://moodle.hku.hk

#### Additional Course Information

- Students should complete the registration form by clicking [http://www.biosch.hku.hk/course/capstone/capstone.html](http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.

#### BIOL4992

**Food & nutritional science project (12 credits)**

- **Offering Department**: Biological Sciences
- **Course Co-ordinator**: Dr C B Chan, Biological Sciences (cbchan@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 carrying out a research project 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 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
  - CLO 8 submit their work following a specified journal format, present their work as a scientific conference talk
- **Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX and 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.
- **Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
<th>Year</th>
<th>Offer in 2022 - 2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No Exam</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

#### 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. Well 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.

- **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 adequate but not necessarily critical, assessment of results and presentation of research work.

#### BIOL4992

**Food & nutritional science project (12 credits)**

- **Offering Department**: Biological Sciences
- **Course Co-ordinator**: Dr C B Chan, Biological Sciences (cbchan@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 carrying out a research project 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 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
  - CLO 8 submit their work following a specified journal format, present their work as a scientific conference talk
- **Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX and 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.
- **Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
<th>Year</th>
<th>Offer in 2022 - 2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No Exam</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

#### 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. Well 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.

- **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 adequate but not necessarily critical, assessment of results and presentation of research work.
### Course Objectives
To provide a stimulating capstone experience for all Molecular Biology & Biotechnology Major / Molecular Biology & Biotechnology Major (Intensive) undergraduates to integrate and apply their knowledge and skills obtained from the Molecular Biology & Biotechnology Major / Molecular Biology & Biotechnology Major (Intensive) through planning and carrying out a research project under the supervision of a member of staff.

### Teachers Involved
Dr Chaogu Zheng, Biological Sciences (cgzheng@hku.hk)

### Teachers Involved
(All academic staff in MBB Major / MBB Intensive Major: Biological Sciences)

### Course Contests & 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:

<table>
<thead>
<tr>
<th>CLO</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>critique and review appropriate scientific literature</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>use this information to generate a scientifically relevant research question</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>develop and formulate scientific hypotheses to test this question</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>design and undertake practical research work to formally test the hypotheses proposed</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>analyse and evaluate the data collected to test the hypotheses proposed</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>present data in a professional manner to illustrate the outcomes</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>draw an objective series of conclusions based on the experimental work</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>highlight and discuss their research findings and place them into a holistic scientific context</td>
<td></td>
</tr>
</tbody>
</table>

### 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); and Cumulative GPA of 3.0 or above.

This capstone course is for 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 2022 - 2023 Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Project-based course</td>
<td>144</td>
</tr>
</tbody>
</table>

---

### Communication-intensive Course N

### Course Website
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 B.IOL4992 "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.

Students should complete the registration form by clicking (http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.

### Additional Course Information

<table>
<thead>
<tr>
<th>Quota</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2022</td>
</tr>
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</table>

---

### B.IOL4993
Molecular biology & biotechnology project (12 credits)

### Academic Year
2022

---

### Communication-intensive Course N

### Course Type
Project-based course

### Course Teaching & Learning Activities
Activities | Details | No. of Hours
--- | --- | ---
Reading / Self study | formal lectures, seminars & practical work | 144

---

### School of Biological Sciences

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587
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.

**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.

**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 Contents & Topics**

**BIOL4994 Biological sciences project (12 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr C Schunter, Biological Sciences (schunter@hku.hk)

**Course Website** [http://moodle.hku.hk/](http://moodle.hku.hk/)

**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>research seminar</td>
<td>20</td>
<td>CLO 1,6,7,8</td>
</tr>
</tbody>
</table>

**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.

**Course Type** Project-based course

**Communication-intensive Course** N

**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>

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<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>research seminar</td>
<td>20</td>
<td>CLO 1,6,7,8</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). Students should complete the registration form by clicking [http://www.biosch.hku.hk/course/capstone/capstone.html](http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.

**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). Students should complete the registration form by clicking [http://www.biosch.hku.hk/course/capstone/capstone.html](http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.

**ENVS1301 Environmental life science (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr T Vengatesen, Biological Sciences (rajan@hku.hk)

**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>research seminar</td>
<td>20</td>
<td>CLO 1,6,7,8</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). Students should complete the registration form by clicking [http://www.biosch.hku.hk/course/capstone/capstone.html](http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.

**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). Students should complete the registration form by clicking [http://www.biosch.hku.hk/course/capstone/capstone.html](http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.

**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). Students should complete the registration form by clicking [http://www.biosch.hku.hk/course/capstone/capstone.html](http://www.biosch.hku.hk/course/capstone/capstone.html) before or after they add this course during the course selection period.
### Teachers Involved

**Course Objectives**

This course is intended for students who wish to understand the fundamentals of environmental biology/life science and importantly the relationship (connection) between environment and life. Here you will learn about the various biological/ecological principles and concepts of environmental science which are needed for critical discussion and evaluation of current global environmental issues including human ecology, urbanization, ecological economics, and climate change.

### Course Contents & Topics

This course is a combination of lectures, group discussion/debate and field trips cum tutorials. We first explore the fundamental interactions between organisms and their environment. We then explore environmental constraints on life at various ecosystems (like marine, freshwater, and terrestrial). Students will also learn how factors such as urbanization, climate change, and anthropogenic impacts affect life at population and ecosystem levels. 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, students will be stimulated to think about current life science issues such as biodiversity loss, organisms adaptation 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 (and Co-requisites and Impermissible combinations)

Pre-requisites: NIL

### Offer in 2022 - 2023

<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>Activities</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of Hours</th>
<th>24</th>
<th>12</th>
<th>12</th>
<th>100</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>3-12 hours field work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td></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>Assignments</td>
<td>10</td>
<td>CLO 2.3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>70</td>
<td>CLO 1.3</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>group presentation</td>
<td>CLO 3.4</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>10</td>
<td>CLO 1</td>
<td></td>
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</tbody>
</table>

### Communication-intensive Course

N

### 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></td>
</tr>
<tr>
<td>Field work</td>
<td>3-12 hours field work</td>
<td>24</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

Methods: Assignments, Examination, Presentation, Test

### Required/recommended reading and online materials

Appropriate reading materials/handouts will be provided during the course.

### 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 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 (and Co-requisites and Impermissible combinations)

Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401

## Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Y 1st sem</td>
<td>Offer in 2023 - 2024 : Y</td>
</tr>
</tbody>
</table>

## Course Website

http://moodle.hku.hk

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## ENVS2002

**Environmental data analysis (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof T C Bonebrake, Biological Sciences (<a href="mailto:tbone@hku.hk">tbone@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof T C Bonebrake, School of Biological Sciences</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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 and QGIS.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td><strong>CLO 1</strong></td>
<td>accurately interpret methods and approaches in the scientific literature</td>
</tr>
<tr>
<td><strong>CLO 2</strong></td>
<td>evaluate critically data analyses in the environmental sciences</td>
</tr>
<tr>
<td><strong>CLO 3</strong></td>
<td>perform standard and appropriate statistical analyses on a variety of data sources</td>
</tr>
<tr>
<td><strong>CLO 4</strong></td>
<td>work comfortably with large datasets using applied software (e.g. R)</td>
</tr>
<tr>
<td><strong>CLO 5</strong></td>
<td>present results of data analyses in a clear and transparent manner</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401</td>
</tr>
<tr>
<td>Offer in 2022 - 2023</td>
<td>Y 2nd sem</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td></td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>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 and presentation skills.</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Apply effective computational and presentation skills.</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective computational and presentation skills.</td>
</tr>
</tbody>
</table>

## Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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<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>

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## Communication-intensive Course

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>

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## Grade Descriptors

- **A**: Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly effective computational and presentation skills.
- **B**: Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Apply effective computational and presentation skills.
- **C**: Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective computational and presentation 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 computational and presentation 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 computational and presentation skills.

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## Course Website

http://moodle.hku.hk
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. Examples will be taken globally but special emphasis will be given to the effects of 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 Objectives

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

### Course Learning Outcomes

**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 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.

**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 moderately effective presentational skills. Little evidence of clear attention to thoughtful and reflective thinking.

**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.

### 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>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>problem-based learning/computer laboratory</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>

<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>Examination</td>
<td>25</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Project report</td>
<td>25</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td>50</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 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 natural variation, increasing the magnitude and speed with which environmental change occurs. This course will focus primarily 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 synergistic 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
- CLO 5 understand the differences between climate change on a geologic time scale and recent climate change
- CLO 6 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 2022 - 2023

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 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.</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, 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.</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 presentational skills. Little evidence of clear attention to thoughtful and reflective 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 some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective presentational skills. Lack of evidence of clear attention to thoughtful and reflective 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. 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>

Communication-intensive Course
N

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>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>

References:

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
ENVS3022 Environmental science field course (6 credits)  Academic Year 2022

Offering Department Biological Sciences  Quota 10
Course Co-ordinator Dr M Yasuhara, Biological Sciences (yasuhara@hku.hk)
Teachers Involved (Dr M Yasuhara, School of Biological Sciences) (TBC, School of Biological Sciences)

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, palaeoecology and environmental problems, environmental geology/paleontology excursion, 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 (and Co-requisites and Impermissible combinations) Pass in ENVS2001 or Either pass in ENVS2002 or concurrently enrolled in ENVS2002

Offer in 2022 - 2023 : Y  Examination ---

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 presentational 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. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply partially 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. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately 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 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.

Communication-intensive Course N

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>Field work</td>
<td>Students will take part in at least 66 hours of field trips and other learning 66 hours</td>
<td>66</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>Laboratory reports</td>
<td>field reports</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Presentation</td>
<td>group presentations</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Project reports</td>
<td>individual report</td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Course Website http://www.biosch.hku.hk/ecology/lsc/

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 max.) and CV via e-mail to Dr M Yasuhara (yasuhara@hku.hk) and Ms. Maria Lo (gylo@hku.hk) not later than 1st August (Note: this is 2nd semester course, but we need applications well in advance, by this date). Late applications will not be accepted.

The proposal should include the following: (1) 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 & academic details; (2) ID photograph; (4) GPA; (5) Pre-requisite courses taken & 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 trip (please contact us for details & financial difficulty).
<table>
<thead>
<tr>
<th>ENVS3028</th>
<th>Coastal Sustainability (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Biological Sciences</td>
<td>Quota</td>
<td>8</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr T Vengatesen, Biological Sciences (<a href="mailto:rajan@hku.hk">rajan@hku.hk</a>)</td>
<td>(Dr T Vengatesen, School of Biological Sciences)</td>
<td>(Prof G A Williams, School of Biological Sciences)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr T Vengatesen, School of Biological Sciences)</td>
<td>(Prof G A Williams, School of Biological Sciences)</td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>- Understand the primary drivers of biodiversity and ecosystem function in rocky intertidal, mangrove and coral reef ecosystems in USA and SE Asia.</td>
<td>- Gain an appreciation for how urban ecosystems in this region are being affected by climate change, development and stress from pollution.</td>
<td>- Better understand how history and governance structures of Hong Kong, Malaysia and New England constrain and/or facilitate coastal adaptation strategies.</td>
</tr>
<tr>
<td></td>
<td>- Appreciate how cultural practices such as seafood preferences and traditional medicine affect harvesting of marine species, and how this impacts coastal biodiversity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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.</td>
<td></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>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>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</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>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</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLO 4 Becoming comfortable collaborating with peers from U.S.A. and gain a greater understanding of the culture of the region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in BIOL2306 or BIOL3301 or BIOL3305 or BIOL3318 or ENVS2001 or ENVS2002 or EASC3020</td>
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<td></td>
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<tr>
<td>Offer in 2022 - 2023</td>
<td>N</td>
<td>Offer in 2023 - 2024 : Y</td>
<td>Examination ---</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</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 complex issue of sustainable coastal management in economically and socially developed and developing places.</td>
<td></td>
</tr>
<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 a complex issue of sustainable coastal management in economically and socially developed and developing places</td>
<td></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 a complex issue of sustainable coastal management in economically and socially developed and developing places</td>
<td></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.</td>
<td></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 coastal problems.</td>
<td></td>
</tr>
<tr>
<td>Communication-intensive Course</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Type</td>
<td>Field camps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
<td>Details</td>
<td>No. of Hours</td>
</tr>
<tr>
<td></td>
<td>Lectures</td>
<td></td>
<td>40</td>
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<tr>
<td></td>
<td>Field work</td>
<td></td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Laboratory work including hands on training</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
<td>Weighting in final course grade (%)</td>
</tr>
<tr>
<td></td>
<td>Assignments</td>
<td>Write up forms the field trips</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Report</td>
<td>Final lab notebook and associated materials (video diaries and photos)</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Test</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Course Website Additional Course Information</td>
<td><a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Duration: around Early July to Early August in each year</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- All field trips, including the overseas trip to Malaysia and USA, are compulsory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Course fee - please contact the course coordinator</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1st week: Lectures, practicals and field trips in the University of Hong Kong. Hong Kong</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2nd week: Lectures and field trips in University Sains Malaysia, Penang (Malaysia)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3rd and 4th weeks: Lectures and field trips in Northeastern University, New England (Boston, USA)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It will be good to take this course before taking the final year project to have relevant hands-on experience. This course will be offered subject to a minimum enrollment no. and availability of teachers.
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."

### ENVS3202

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Plant ecophysiology and climate change (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Biological Sciences</td>
<td>Quota</td>
<td>50</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr J Wu, Biological Sciences (<a href="mailto:jinwu@hku.hk">jinwu@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr J Wu, School of Biological Sciences)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>In this course students will learn different quantitative methods for measuring and evaluating climate change impacts on terrestrial ecosystems. This interdisciplinary course draws on aspects of plant physiology ecology and ecosystem ecology to describe impacts and patterns of global change. We will explore how the &quot;breathing&quot; of the biosphere impacts and is impacted by climate change by scaling plant physiology from leaf to canopy, and ultimately to global scales. Students will examine the biophysical processes that affect the exchange of material (e.g. CO2 flux and water vapor) and energy between terrestrial biosphere and the atmosphere. In addition, students will learn cutting-edge techniques to help monitor, model and diagnose these processes.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Course Contents & Topics | 1. Overview of plant ecophysiology, with particular focus on the interactions between plants and climate.  
2. Fundamental biophysical principles that regulate the strengths of ecosystem metabolism (i.e. photosynthesis, transpiration and etc).  
3. Introduction to various remote sensing and modelling approaches to quantify the impacts of climate variability on plant metabolism (e.g. proximate and satellite remote sensing, ecosystem modelling, biological scaling processes, etc).  
4. Case studies introducing practical applications of cutting edge technology to current ecological and environmental issues. |
| Course Learning Outcomes | On successful completion of this course, students should be able to:  
CLO 1 understand the fundamental principles that regulate terrestrial ecosystem metabolism  
CLO 2 understand the basic of remote sensing data and how to analyze remote sensing data for plant ecophysiology  
CLO 3 understand how to use scientific understanding of plant physiology and remote sensing data to help explain several pressing environmental problems associated with global climate change |
| Pre-requisites | Pass in BIOL2306 or ENVS2001 or ENVS2002 or EASC2404.  
Priority will be given to students majoring in Environmental Science, Biological Science, and Earth System Science. |
| Offer in 2022 - 2023 | Y 1st sem侦察 Offer in 2023 - 2024 : Y | Examination | Dec |
| Grade Descriptors | 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 presentational skills. |
| | C | 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 presentational skills. |
| | D | 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 presentational skills. |
| | Fail | 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 presentational skills are minimally effective or ineffective. |
| Communication-intensive Course | N |
| Course Type | Lecture with laboratory component course |
| Assessment Methods Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
| | Assignments | home work (30%) and lab. assignment (20%) | 50 | CLO 1,2,3 |
| | Examination | 40 | CLO 1,2,3 |
| | Presentation | 10 | CLO 1,3 |
| Course Website | http://moodle.hku.hk/ |

### ENVS3401

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Understanding tropical ecosystems in a changing world (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Biological Sciences</td>
<td>Quota</td>
<td>20</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr A L Ashton, Biological Sciences (<a href="mailto:lasleyton@hku.hk">lasleyton@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr A L Ashton, School of Biological Sciences)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr A L Ashton, Biological Sciences (<a href="mailto:lasleyton@hku.hk">lasleyton@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr A L Ashton, School of Biological Sciences)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Course Content | 1. Overview of plant ecophysiology, with particular focus on the interactions between plants and climate.  
2. Fundamental biophysical principles that regulate the strengths of ecosystem metabolism (i.e. photosynthesis, transpiration and etc).  
3. Introduction to various remote sensing and modelling approaches to quantify the impacts of climate variability on plant metabolism (e.g. proximate and satellite remote sensing, ecosystem modelling, biological scaling processes, etc).  
4. Case studies introducing practical applications of cutting edge technology to current ecological and environmental issues. |
| Course Learning Outcomes | On successful completion of this course, students should be able to:  
CLO 1 understand the fundamental principles that regulate terrestrial ecosystem metabolism  
CLO 2 understand the basic of remote sensing data and how to analyze remote sensing data for plant ecophysiology  
CLO 3 understand how to use scientific understanding of plant physiology and remote sensing data to help explain several pressing environmental problems associated with global climate change |
| Pre-requisites | Pass in BIOL2306 or ENVS2001 or ENVS2002 or EASC2404.  
Priority will be given to students majoring in Environmental Science, Biological Science, and Earth System Science. |
| Offer in 2022 - 2023 | Y 1st sem Offer in 2023 - 2024 : Y | Examination | Dec |
| Grade Descriptors | 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 presentational skills. |
| | C | 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 presentational skills. |
| | D | 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 presentational skills. |
| | Fail | 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 presentational skills are minimally effective or ineffective. |
| Communication-intensive Course | N |
| Course Type | Lecture with laboratory component course |
| Assessment Methods Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
| | Assignments | home work (30%) and lab. assignment (20%) | 50 | CLO 1,2,3 |
| | Examination | 40 | CLO 1,2,3 |
| | Presentation | 10 | CLO 1,3 |
| Course Website | http://moodle.hku.hk/ |

Additional Course Information

The major course objectives will be assessed by examining the biophysical processes that affect the transfer of momentum, energy and material (water, CO2, and atmospheric trace gases) between terrestrial biosphere and the atmosphere. Key instrumentation and associated multi-scale measurements of this course are also discussed. This course complements the content covered in EASC3405 Environmental Remote Sensing, but students may take this course before or after having taken EASC3405.
Course Objectives
In this field course, students will learn how to use natural history and ecology to answer important environmental questions relevant to tropical ecosystems. Through field studies in both degraded and pristine habitats, students will gain an understanding of the major drivers of ecosystem change and biodiversity loss in a tropical landscape in Sabah, Borneo and learn about measures to mitigate the impacts of human activities in these vital ecosystems. Students will work in groups to develop and carry out a research project to address ecological or environmental questions. After the field portion of the course, students will write up the results of their projects in the style of a scientific paper.

Course Contents & Topics
Tropical rainforests are the most biologically rich terrestrial ecosystems, providing important environmental services such as nutrient cycling, carbon storage and new medicines. Rainforests are under increasing anthropogenic pressure due to logging, burning and conversion to agriculture, as well as climate change. Effective conservation efforts over the next few decades are essential if we are to slow down our impacts on these vital ecosystems. In this course, through a series of lectures, tutorials and fieldwork, students will learn about tropical rainforests, ecosystems, investigate the environmental impacts of land use change, and discuss conservation measures which can help mitigate these impacts. Students will also learn techniques for designing and carrying out field research projects, and about the importance of data generated from research to inform efforts to minimize the impact of human activities in such important ecosystems. The bulk of the course will be carried out in Danum Valley, a primary tropical rainforest located in Sabah, Malaysia. We will visit some sites impacted by human activities, including palm oil plantations, to observe how land-use changes impact biodiversity and observe in situ conservation efforts. Students will work in groups to conduct research projects which will tie together the concepts learned through the lectures and field trips.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 demonstrate an understanding of the importance of ecological and natural history knowledge for conservation
CLO 2 understand the major impacts of human activity on tropical rainforest ecosystems
CLO 3 work collaboratively to design and carry out a research project (collect and analyze data and present results) on an ecological or environmental topic
CLO 4 carry out a range of field sampling and observational techniques for collecting data in the field

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in ENVS2001 or ENVS2002 or BIOL2306; 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 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : Y

Grade Descriptors (A+ to F)
A Demonstrate 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. Ability to apply knowledge of the natural history of a tropical rainforest and ecological studies to conservation ecology. Produce a scientific paper that is written at high enough quality for publication.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining most of the course learning outcomes. Show very good analytical and critical abilities and logical thinking, with evidence of original thought. Ability to apply knowledge of the natural history of a tropical rainforest and ecological studies to conservation ecology. Produce a well written scientific paper.
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show some analytical and critical abilities and logical thinking, with evidence of original thought. Able to apply some knowledge of the natural history of a tropical rainforest and ecological studies to conservation ecology. Produce a scientific paper that communicates your results.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show some analytical and critical abilities and logical thinking, but not original thought. Limited ability to use knowledge of natural history of a tropical rainforest and ecological studies to conservation ecology. Produce a scientific paper that communicates your results.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. No demonstration of analytical and critical abilities and logical thinking, with evidence of original thought. Not able to apply knowledge of the natural history of a tropical rainforest, ecological studies to conservation ecology. Fail to produce a standard scientific paper.

Communication-intensive Course
N

Course Type
Field camps

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures Briefing at HKU on field course activities 2
Field work 10 days field work experience 40
Laboratory work Lab work during the field trip 30
Tutorials Lectures/workshops during field trip 10
Presentation Presentation during the field camp, based on the research project 5
Reading / Self study Preparation of report after the field trip 40

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Field journal: Students will create a natural history field journal, with scientific drawings and observations 20 CLO 2
Report Journal-style paper based on the research carried out on the field course 50 CLO 1,2,3,4
Test Oral presentation: Presentation during the field camp, based on the research project 30 CLO 1,2,3

Course Website
http://moodle.hku.hk

Additional Course Information
This is an overseas experiential learning course designed for ENVS/E&B/ESS Major/Minor students as free elective. It is especially suitable for students aiming to major in environmental science, ecology & biodiversity or biological sciences.

ENVS3402 Qualitative data, social science methods and decision-making in environmental science (6 credits) Academic Year 2022
### Course Objectives
This course will introduce social science and qualitative approaches in environmental science. We will introduce the historical context and philosophical background to different approaches to environmental sciences. The course will then take a case study-based approach, using the case studies to introduce methodologies and methods. These include the ethical process, collection and analysis of qualitative and quantitative data from focus groups, surveys, interviews and questionnaires. We will also discuss wider methodologies including ethnographic approaches. Attention will be paid to suitability of methods to research questions, how studies are conducted and what analyses are used. We will also investigate how these data are or can be integrated into decision-making processes, including different tools that can be used for decision-making.

### Course Contents & Topics
- Research philosophy: how researchers approach questions in environmental science
- Research methodology: the rationale and framework for research
- Ethical considerations, concepts of 'bias', objectivity, truths and the role of the researcher
- Methodologies including biographical techniques, ethnography and case studies.
- Methods, sampling data and analyses, including questionnaires and surveys, interviews, focus groups, and decision-making tools.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 Determine and distinguish a range of social science approaches and qualitative data analysis techniques
- 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 science questions
- CLO 4 Critically evaluate studies using social science and/or qualitative approaches.

### Pre-requisites (and Co-requisites and Impermissible combinations)
Offer in 2022 - 2023

### Grade Descriptors (A+ to F)

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<th>Grade</th>
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<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. Demonstrate highly effective organizational and presentational skills.</td>
</tr>
<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 presentational skills.</td>
</tr>
<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 presentational skills.</td>
</tr>
<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 presentational skills.</td>
</tr>
<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 presentational skills are minimally effective or ineffective.</td>
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### Communication-intensive Course
Lecture-based course

### Course Teaching & Learning Activities
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<th>Activities</th>
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### Assessment Methods and Weighting
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<th>Assessment Methods to CLO Mapping</th>
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<td>Project reports</td>
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<td>CLO 2,4</td>
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<tr>
<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
5. Spatial data in climate studies: understanding climate related tools and approaches in spatial analysis, applying spatial models to understand potential impacts of climate change
6. Spatial modelling and target setting
7. Automatizing spatial analysis in R

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 Understand and obtain spatial data from multiple sources, understand data limits and integration
- CLO 2 Design studies which use spatial data, and to select and analyse data appropriately
- CLO 3 Understand the applications of spatial analysis for modelling diversity patterns and using these types of technique to develop targets and understand environmental impacts
- CLO 4 Create basic R scripts to process spatial data

#### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in ENVS2001 or ENVS2002 or EASC2402 or BIOL2306

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Examination ---</td>
</tr>
<tr>
<td>A</td>
<td>Demonstrate 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.</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 very good analytical and critical abilities and logical thinking, with evidence of original thought.</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 some analytical and critical abilities and logical thinking, with evidence of original thought.</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 some analytical and critical abilities and logical thinking, but not original thought.</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. No demonstration of analytical and critical abilities and logical thinking, with evidence of original thought.</td>
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#### Communication-intensive Course

<table>
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<th>Course Type</th>
<th>Lecture with laboratory component course</th>
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#### Course Teaching & Learning Activities

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<td>Laboratory</td>
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#### Assessment Methods and Weighting

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#### Course Website

http://moodle.hku.hk

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<tr>
<th>ENVS4110</th>
<th>Environmental remediation (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
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<td>Biological Sciences</td>
<td>Quota</td>
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<tr>
<td>Course Co-ordinator</td>
<td>TBC, Biological Sciences ()</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(TBC,Biological Sciences)</td>
<td></td>
<td></td>
</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 techniques 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>
<td></td>
<td></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 degradation genes in bacteria, in situ and ex situ remediation techniques; green technologies.</td>
<td></td>
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</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>
<td></td>
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<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in BIOL3109 or BIOL3110 or BIOL3401 or ENVS3042</td>
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<tr>
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<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 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>
<td></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>
<td></td>
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</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>
<td></td>
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<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</td>
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</tbody>
</table>
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.

Fail

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.

<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
<th>N</th>
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</thead>
<tbody>
<tr>
<td>Course Type</td>
<td>Lecture with laboratory component course</td>
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<td>Course Teaching &amp; Learning Activities</td>
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<td>Laboratory</td>
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<td>Field work</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>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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<td>Assignments</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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<td>5</td>
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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.
**Course Objectives**
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 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 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.

**Pre-requisites (and Co-requisites and Impermissible combinations)**
NIL

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Offer in 2022 - 2024 : Y</th>
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<tr>
<td>A</td>
<td>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 demonstrate an ability to fully comprehend and critically interpret spoken and written texts. Written language contains very few, if any, systematic errors in grammar and vocabulary. Spoken language is always comprehensible and fluent.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>B</td>
<td>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.</td>
<td></td>
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</tr>
<tr>
<td>C</td>
<td>Satisfactory to reasonably good result. Students are sometimes unable to clearly and concisely explain academic concepts. While they can argue for a position, it is not very detailed and tends 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 citations and referencing but also evidence of correct systematic use. Students have some difficulty comprehending and critically interpreting texts. They can 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 and there is some evidence of control of simple grammatical structures. Spoken language is generally comprehensible and fluent but at times places strain on the listener.</td>
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</tr>
<tr>
<td>D</td>
<td>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 only sometimes comprehensible and fluent and strain is frequently placed on the listener.</td>
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</tr>
<tr>
<td>Fail</td>
<td>Unsatisfactory result. Productive skills are too limited to be able to successfully carry out spoken and written assessments. Texts are unstructured 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.</td>
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**Communication-intensive Course**
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>
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<td>30</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>84</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>report</td>
<td>40</td>
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<tr>
<td>Essay</td>
<td></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>individual presentation</td>
<td>30</td>
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<td><strong>Course Code</strong></td>
<td><strong>Course Name</strong></td>
<td><strong>Academic Year</strong></td>
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<tr>
<td>CAES9820</td>
<td>Academic English for science students (6 credits)</td>
<td>2022</td>
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</table>

**Offering Department**

English

**Course Co-ordinator**

Mr S D Boynton, English (sboynton@hku.hk)

**Teachers Involved**

(Mr S D Boynton, Centre for Applied English Studies)

**Course Objectives**

This 6-credit English-in-the-Discipline course aims to develop students' professional and technical communication skills for disciplinary studies in the sciences. There are three main components in the course: 1) Writing a popular science article 2) An oral presentation and 3) Independent language learning. Students will learn rhetorical skills for presenting and explaining scientific concepts to a cross-disciplinary and non-specialist audience in both written and spoken communication. Students will also be given an opportunity to design a personalised language learning plan, carry out the plan and reflect on their own independent language learning experience.

**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**

NIL

**Offer in 2022 - 2023**

Y 1st sem 2nd sem Offer in 2023 - 2024: 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>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.</td>
</tr>
<tr>
<td>B</td>
<td>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.</td>
</tr>
<tr>
<td>C</td>
<td>Satisfactorily 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.</td>
</tr>
<tr>
<td>D</td>
<td>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 completed.</td>
</tr>
<tr>
<td>Fail</td>
<td>Unsatisfactory result. Does not demonstrate ability to summarize salient points accurately, identify, 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.</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

Y

**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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<tr>
<td>Tutorials</td>
<td>seminars</td>
<td>36</td>
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<tr>
<td>Reading / Self study</td>
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<td>120</td>
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<tr>
<td>Assessment</td>
<td>independent learning work</td>
<td>84</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>independent learning work</td>
<td>20</td>
<td></td>
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<tr>
<td>Essay</td>
<td>other genres of writing</td>
<td>55</td>
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<tr>
<td>Test</td>
<td></td>
<td>25</td>
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**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
Course Co-ordinator  Mr S D Boynton, English (sboynont@hku.hk)
Teachers Involved  (Mr S D Boynton, Centre for Applied English Studies)
Course Objectives  
This 6-credit English-in-the-Discipline course aims to develop students’ professional and technical communication skills for disciplinary studies in mathematical sciences. There are two main components in the course: 1) Case study report writing, 2) professional oral presentation. Students will learn rhetorical skills for presenting and explaining mathematical and statistical data and trends, and justifying analyses and recommendations convincingly in both written and spoken communication. This will be achieved through analysing samples of case study reports and presentations using a genre-based approach. Students of the BSc (Actuarial Science) and BSc (Applied AI) are required to take this course. Students who intend to major in decision analytics, mathematics, risk management, and statistics are strongly encouraged to take this course. Students from other science disciplines should take CAES9820.

Course Contents & Topics
There are two main components in the course:
1. Case study report writing
2. Professional oral presentation

Students will learn rhetorical skills for presenting and explaining mathematical and statistical data and trends, and justifying analyses and recommendations convincingly in both written and spoken communication. This will be achieved through analysing samples of case study reports and presentations using a genre-based approach.

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 (and Co-requisites and Impermissible combinations)
NIL

Offer in 2022 - 2023
Y  1st sem  2nd sem  Offer in 2023 - 2024 : Y

Examination  No Exam

Grade Descriptors (A+ to F)

A  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.

B  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.

C  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.

D  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 stain is at times placed on the listener.

Fail  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.

Communication-intensive Course
Y

Course Type  Lecture-based course

Course Teaching & Learning Activities

Activities  Details  No. of Hours
Lectures  seminars  30
Tutorials  small group tutorials  6
Reading / Self study  120
Assessment  independent learning work  84

Assessment Methods and Weighting

Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
Assignments  40
Presentation  30
Project reports  30

Additional Course Information
Students of the BSc (Actuarial Science) and BSc (Applied AI) are required to take this course. Students who intend to major in decision analytics, mathematics, risk management, and statistics are strongly encouraged to take this course. Students from other science disciplines should take CAES9820.
CHEM1041 Foundations of chemistry (6 credits)  
**Academic Year**: 2022  
**Quota**: 70

**Offering Department**: Chemistry

**Course Co-ordinator**: Dr A P L Tong, Chemistry (apltong@hku.hk)

**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 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Y</td>
<td>1st sem</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>D</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fail</strong></td>
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</table>

**Communication-intensive Course**: N

**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>
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<td>Tutorials</td>
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<td>12</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>
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<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
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<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
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</table>

**Required/recommended reading and online materials**


**Additional Course Information**

Suggested follow-up course: CHEM1042 General Chemistry I

**CHEM1042**

**Offering Department**: Chemistry

**General chemistry I (6 credits)**

**Academic Year**: 2022  
**Quota**: 450
### 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. **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.

2. **Chemical bonding and structures**

3. **Thermodynamics**
   - Heat, work, internal energy and enthalpy; the First Law of thermodynamics; entropy; the Second and Third Laws of Thermodynamics; spontaneity of changes.

4. **Chemical kinetics**
   - 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/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 solve 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 (and Co-requisites and Impermissible combinations)
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 2022 - 2023
<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Y 1st sem</th>
<th>2nd sem</th>
<th>Offer in 2023 - 2024 : Y</th>
<th>Examination</th>
<th>Dec</th>
<th>May</th>
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<tbody>
<tr>
<td>A</td>
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### Communication-intensive Course
N

### 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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<tr>
<td>Lectures</td>
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<tr>
<td>Laboratory</td>
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<td>Tutorials</td>
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<td>6</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>
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<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,5,6</td>
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<tr>
<td>Laboratory reports</td>
<td>including lab-class performance &amp; pre-lab assignments</td>
<td>30</td>
<td>CLO 1,2,3,4,5,6</td>
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<td>Test</td>
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<td>20</td>
<td>CLO 1,2,3,5,6</td>
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</tbody>
</table>

### Required/recommended reading and online materials
Zumdahl; Decoste: Chemical Principles, latest edition, Cengage. Brown; LeMay; Bursten; Murphy; Woodward; Stolzfu; Chemistry - The Central Science, latest edition, Pearson.

### Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

### CHEM1043 General chemistry II (6 credits)

### Academic Year
2022
This course is a continuation of CHEM1042 General Chemistry I. It aims to further consolidate some of the important fundamentals of chemistry that underlie many topics and principles across the physical sciences. The course prepares students to pursue a major in chemistry or in other aspects that require a good foundation in chemistry.

**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; colloidal 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; $E_{cell}$, $\Delta G$, and $K$; $E_{cell}$ as a function 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 reactions
- 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

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th></th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Offer in 2023 - 2024</th>
<th>Examination</th>
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<td></td>
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<td>Y</td>
<td>Y</td>
<td>Dec May</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 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.

**Communication-intensive Course**

- **Y**

**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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<td>Tutorials</td>
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**Assessment Methods and Weighting**

<table>
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<th>Methods</th>
<th>Details</th>
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<th>Assessment Methods to CLO Mapping</th>
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<td>Test</td>
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**Required/recommended reading and online materials**

- Petrucci; Herring; Madura; Bissonnette: General Chemistry: Principles and Modern Applications, latest edition, Pearson.
- Zumdahl; Decoste: Chemical Principles, latest edition, Cengage. Brown; LeMay; Bursten; Murphy; Woodward; Stolz; Chemistry - The Central Science, latest edition, Pearson.
- Prof D L Phillips, Chemistry
- Dr A P L Tong, Chemistry (apltong@hku.hk)
- Dr S K Lee, Chemistry

**Department of Chemistry**
CHEM1044 Mathematics in chemistry (6 credits) Academic Year 2022
Offering Department Chemistry
Course Co-ordinator Dr A M Y Yuen, Chemistry (maiyan@hku.hk)

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 1. 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 andImmutable 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 or SCNC1111

Offer in 2022 - 2023 Y 2nd sem Offer in 2023 - 2024 : 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 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, 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
- Demonstrates poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Communication-intensive Course N

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 20 CLO 1,2,3
- Examination 50 CLO 1,2,3
- Test mid-term test 30 CLO 1,2,3

Required/recommended reading and online materials Graham Doggett, Martin Cockett: Maths for Chemists, 2nd Edition, RSC

CHEM2041 Principles of chemistry (6 credits) Academic Year 2022
Offering Department Chemistry
Course Co-ordinator Dr I K Chu, Chemistry (ivankchu@hku.hk)

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, Gibbs 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, rate laws, 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 thermochemistry, 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 2022 - 2023

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<td>A</td>
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Communication-intensive Course

N

Course Type

Lecture-based course

Course Teaching & Learning Activities

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Assessment Methods and Weighting

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<td>CLO 1,2</td>
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Required/recommended reading and online materials


CHEM2241

Analytical chemistry I (6 credits)

Academic Year: 2022

Quota: 120

Offering Department: Chemistry

Course Name: CHEM2241

Course Code: 2241

Course Co-ordinator: Dr I K Chu

Teachers Involved: Dr I K Chu (1st sem); Dr E C M Tse (2nd sem), Chemistry (ivan_kchu@hku.hk; ecmtse@hku.hk)

Offer in 2023 - 2024 : Y

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 reaction, complexation reactivity, precipitation reactivity

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 explain the basic principles of chemical measurements
- CLO 2 explain the principles of classical methods of chemical analysis such as acid-base neutralization
- CLO 3 use laboratory apparatus for chemical analysis

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM1042; and Pass in CHEM1043, or already enrolled in this course

Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
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<td>B</td>
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<td>C</td>
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## Communication-intensive Course

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## Course Type

Lecture with laboratory component course

## Activities & Learning Activities

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## Assessment Methods and Weighting

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<td>Test</td>
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<td>20</td>
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## Offer in 2022 - 2023

Course Co-ordinator: Dr A M Y Yuen, Chemistry (hoyuyau@hku.hk)

Teachers Involved:
- (Dr A M Y Yuen, Chemistry)
- (Dr H Y Au Yeung, Chemistry)
- (Prof H Z Sun, Chemistry)

## 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 demonstrate knowledge and understanding of 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)

Pass in CHEM1042; and Pass in CHEM1043, or already enrolled in this course

## Additional Course Information

Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

## CHEM2341

Inorganic chemistry I (6 credits)

Offering Department: Chemistry

Academic Year: 2022

Quota: 120

## Required/recommended reading and online materials


## Course Co-ordinator

Dr H Y Au Yeung, Chemistry (hoyuyau@hku.hk)

## Teachers Involved

- (Dr A M Y Yuen, Chemistry)
- (Dr H Y Au Yeung, Chemistry)
- (Prof H Z Sun, Chemistry)

## 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 demonstrate knowledge and understanding of 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)

Pass in CHEM1042; and Pass in CHEM1043, or already enrolled in this course

## Additional Course Information

Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.
Department of Chemistry

Communication-intensive Course

Course Type Lecture with laboratory component course

Course Teaching & Learning Activities

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 15 CLO 1,2,3,4,5
Examination 50 CLO 1,2,3,4,5
Laboratory reports 15 CLO 1,2,3,4,5
Test 20 CLO 1,2,3,4,5

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.

CHEM2441 Organic chemistry I (6 credits) Academic Year 2022
Offering Department Chemistry Quota 200
Course Co-ordinator Prof Y Li (1st sem); Prof P Chiu (2nd sem), Chemistry (xiaoyuli@hku.hk; pchiu@hku.hk)
Teachers Involved (Dr S K Lee,Chemistry) (Prof P Chiu,Chemistry) (Prof Y Li,Chemistry)

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.

Course Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 visualize and draw stereochemically correct representations of three-dimensional organic molecules
CLO 2 define, classify, and name chirality, stereoisomers and diastereomers
CLO 3 understand the basic mechanism types: electrophilic addition, SN1, SN2, E1, E2, and radical propagation mechanisms
CLO 4 apply the basic mechanisms to rationalize the conditions and derive the outcomes of the reactions of alkanes, alkyl halides, alkenes, dienes, alkylns, alcohols, ethers, epoxides, and organometallic compounds
CLO 5 understand the structure, and bonding of alkanes, alkenes and dienes
CLO 6 apply reactions to the synthesis of target alkane, alkyl halide, alkene, diene, alkyl, alcohol, ether, epoxides, and bifunctional 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 Pass in CHEM1043, or already enrolled in this course

Offer in 2022 - 2023 Grade Descriptors (A+ to F)

Exam Grade Descriptors
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 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.
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 a 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 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 apply and integrate 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.
**CHEM2442**

**Course Co-ordinator:** Dr P H Toy, Chemistry (phtoy@hku.hk)

**Course Objectives:**
The major objective of this course is to give the students a basic understanding of organic chemistry, especially in the context of daily life. This will be achieved through the introduction of the chemistry of organic functional groups that form the basis of organic molecules. The concepts presented in the lectures will be reinforced by a series of laboratory experiments.

**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 be 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 CHEM2441, or have already enrolled in this course.

**Offer in 2022 - 2023:** Y 1st sem Offer in 2023 - 2024 : Y

**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 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 general but incomplete command of 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.
- **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.

**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>(Assignments and participation)</td>
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<td>Test</td>
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**Communication-intensive Course:** N

**Course Type:** Lecture with laboratory component course

**Assessment Methods and Weighting:**

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<tr>
<td>Test</td>
<td>(test/quiz)</td>
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<td>CLO 1,2,3</td>
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**Required/recommended reading and online materials:**
Bruce, P.Y.; Essential Organic Chemistry (Pearson, 2016, 3rd edition)

**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.

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**CHEM2443**

**Course Co-ordinator:** Dr P H Toy, Chemistry (phtoy@hku.hk)

**Course Objectives:**
The major objective of this course is to give the students a basic understanding of organic chemistry, especially in the context of daily life. This will be achieved through the introduction of the chemistry of organic functional groups that form the basis of organic molecules. The concepts presented in the lectures will be reinforced by a series of laboratory experiments.

**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 be 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 CHEM2441, or have already enrolled in this course.

**Offer in 2022 - 2023:** Y 1st sem Offer in 2023 - 2024 : Y

**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 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 general but incomplete command of 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.
- **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.

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<td>(test/quiz)</td>
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**Communication-intensive Course:** N

**Course Type:** Lecture with laboratory component course

**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>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td>(test/quiz)</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials:**
Bruce, P.Y.; Essential Organic Chemistry (Pearson, 2016, 3rd edition)

**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.

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**CHEM3441**

**Course Co-ordinator:** Dr P H Toy, Chemistry (phtoy@hku.hk)

**Course Objectives:**
The major objective of this course is to give the students a basic understanding of organic chemistry, especially in the context of daily life. This will be achieved through the introduction of the chemistry of organic functional groups that form the basis of organic molecules. The concepts presented in the lectures will be reinforced by a series of laboratory experiments.

**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 be 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 CHEM2441, or have already enrolled in this course.

**Offer in 2022 - 2023:** Y 1st sem Offer in 2023 - 2024 : Y

**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 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 general but incomplete command of 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.
- **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.

**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</td>
</tr>
<tr>
<td>Test</td>
<td>(test/quiz)</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Communication-intensive Course:** N

**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>
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<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td>(test/quiz)</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>
Course Objectives
The major objective of this course is to give pharmacy students a basic understanding of organic chemistry, especially in the context of daily life. This will be achieved through the introduction of the chemistry of organic functional groups that form the basis of organic molecules. The concepts presented in the lectures will be reinforced by a series of laboratory experiments.

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 be 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 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. (This course is for BPharm students only)

Offer in 2022 - 2023
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 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.</td>
</tr>
<tr>
<td>B</td>
<td>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.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of 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.</td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
</tr>
<tr>
<td>Fail</td>
<td>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.</td>
</tr>
</tbody>
</table>

Communication-intensive Course
N

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>20</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>5</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>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1.2.3</td>
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<tr>
<td>Test/Quiz</td>
<td></td>
<td>40</td>
<td>CLO 1.2.3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Bruice, 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.

CHEM2541 Introductory physical chemistry (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Course Co-ordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>Dr J Y Tang, Chemistry (<a href="mailto:jinyao@hku.hk">jinyao@hku.hk</a>)</td>
</tr>
</tbody>
</table>

Course Objectives
The purpose of thermodynamics is 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.

Course Contents & Topics
- 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. The application of three laws of thermodynamics for classical systems as well as new applications.
- Simple Mixtures
- The thermodynamics of phase equilibrium and surface. 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.
- Rates of Chemical Reactions
- Empirical chemical kinetics including experimental methods, rates of reactions, integrated rate laws and...
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 CHEM1043

Grade Descriptors

(A+ to F)

Grade Descriptors

(A+ to F)

On successful completion of this course, students should be able to:

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.
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.
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.
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.
CLO 5 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.

Communication-intensive Course

No

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>
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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>
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Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
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</tr>
<tr>
<td>Examination</td>
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<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2</td>
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</table>

Required/recommended reading and online materials

Recommended Book: ‘Physical Chemistry’ 6th edition by Ira N. Levine

CHEM3141

Environmental chemistry (6 credits)

Offering Department

Chemistry

Academic Year

2022

Course Co-ordinator

Dr Y X Li, Chemistry

Quota

50

Teachers Involved

(Dr Y X Li, Chemistry)

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, air pollution
Energy and climate change: energy resources, carbon emission, carbon neutrality, and climate change
Water Chemistry: water resources and cycle, water pollution, water purification, and water crisis
Pollutants: persistent organic pollutants, pesticides, toxic heavy metals, toxicology
Waste treatment: domestic waste treatment, landfill, incineration

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 atmosphere, 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 CHEM2341 or CHEM2441 or CHEM2442 or CHEM2541

Grade Descriptors (A+ to F)

Y 2nd sem Offer in 2023 - 2024 : Y Examination May

A - 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.
B - 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.
C - Demonstrate partial but limited 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.
D - 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
**CHEM3142 Chemical process industries and analysis (6 credits)**

**Offering Department** Chemistry

**Course Co-ordinator** Prof G K Y Chan, Chemistry (hrscky@hku.hk)  
(Prof G K Y Chan,Chemistry) (Visiting Professor Chemistry)

**Course Objectives** To familiarize with typical chemical industries important in local and global economy. To understand the technology of chemicals manufacturing and chemical processes in general industry.

**Course Contents & Topics** Process flow charts, units and conversions, materials and energy balances, unit operations. Selection of chemical processes to include variation in products, scale, and types of operation, e.g. for petrochemical industries, industrial gases, beverage processes, chloroalkaline manufacturing. To familiarize with typical chemical industries important in local and global economy. To understand the technology of chemicals manufacturing and chemical processes in general industry.

**Pre-requisites (and Co-requisites and Impermissible combinations)** Pass in CHEM2241 or CHEM2341 or CHEM2441 or CHEM2442 or CHEM2541

**Grade Descriptors (A+ to F)**

- **A** Demonstrate thorough knowledge of industrial chemical processes and mastery of mass and energy balance 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.
- **B** Demonstrate substantial knowledge of industrial chemical processes and command of mass and energy balance 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.
- **C** 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 solve problems to most familiar situations. Mostly correct but some erroneous use of data and references. Apply moderately effective organizational and presentational skills. Apply limited or barely effective organizational and presentational skills.
- **D** Demonstrate partial but limited knowledge of industrial chemical processes and command of mass and energy balance 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.
- **Fail** Demonstrate little or no evidence of knowledge of industrial chemical processes and command of mass and energy balance 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.

**Communication-intensive Course** N

**Course Type** Lecture-based course

**Course Teaching & Learning Activities**

<table>
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<th>Activities</th>
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<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>computational laboratory</td>
<td>12</td>
</tr>
<tr>
<td>Field work</td>
<td>1 - 2 plant visits</td>
<td>12</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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</table>

**Assessment Methods and Weighting**

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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>(continuous assessment)</td>
<td>20</td>
<td>CLO 1.2</td>
</tr>
<tr>
<td>Examination</td>
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<td>50</td>
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<td>Laboratory reports</td>
<td></td>
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<td>CLO 2.3</td>
</tr>
<tr>
<td>Test</td>
<td>(test/quiz)</td>
<td>25</td>
<td>CLO 1.2</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Felder and Rousseau: Elementary Principles of Chemical Processes

**Additional Course Information** Laboratory courses are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.
CHEM3143

Introduction to materials chemistry (6 credits)

Offering Department
Chemistry

Course Co-ordinator
Dr Y F Wang, Chemistry (wanglab@hku.hk)

Teachers Involved
(Dr Y F Wang, Chemistry)

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 describe different materials classification and their composition, structures, and properties, and to understand the concept of structure/property relationship.
- 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 (and Co-requisites and Impermissible combinations)
Pass in CHEM2441; and Pass in CHEM2541 or CHEM2341

Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : Y

Grade Descriptors (A+ to F)

A

- 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.

B

- 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 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.

C

- Demonstrate general but incomplete command of knowledge of essential facts, concepts, principles, and theories related to classification of materials. Show some but insufficient understanding of materials structures at different length scales and the relationship with materials properties particularly for classical solid materials and soft materials. Show some 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 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.

D

- 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.

Communication-intensive Course
N

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 1,2,3,4,5,6,7
- Test (mid-term tests and assignments) 50 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)

CHEM3146

Principles and applications of spectroscopic and analytical techniques (6 credits)

Offering Department
Chemistry

Course Co-ordinator
Dr X Li, Chemistry (xiangli@hku.hk)

Course Objectives
To cover the principles and applications of modern practical spectroscopic and analytical techniques. This course is a pre-requisite for the advanced chemistry courses.

Course Contents & Topics
**Course Learning Outcomes**

On successful completion of this course, students should be able to:

**CLO 1** understand the basic principles and applications of IR, UV/Vis, MS and NMR spectroscopic techniques.

**CLO 2** describe and explain the terminology of IR, UV/Vis, MS and NMR spectroscopies.

**CLO 3** perform chemical structure elucidation and analysis based on UV/Vis, MS and NMR spectroscopic data.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass any CHEM2XXX level course.

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</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, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations.</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.</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.</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.</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>
</tr>
</tbody>
</table>

**Communication-intensive Course**

N

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<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>
<tr>
<td>Assignments</td>
<td>15</td>
<td>CLO 1.2.3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>70</td>
<td>CLO 1.2.3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>(2 quizzes) 15</td>
<td>CLO 1.2.3</td>
<td></td>
</tr>
</tbody>
</table>

**Chemistry**

**Chemistry**

**Offering Department**

Chemistry

**Course Co-ordinator**

Dr Y Li, Chemistry (yingli0e@hku.hk)

**Teachers Involved**

Dr I K Chu, Chemistry (yingli0e@hku.hk)

**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 concept of 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 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</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 mostly 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...</td>
</tr>
</tbody>
</table>
Examination
May

Grade Descriptors
Course Co-ordinator
Dr K K H Ng, Chemistry
Teachers Involved
(Course Co-ordinator, Chemistry)

Outcomes & Topics
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:

- Demonstrate a general command of knowledge and skills required in theory and laboratory work in food and water analysis to acquire accurate results with full interpretation for analytical application as described in 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 the analysis of food and water. Apply highly effective organization and presentation skills as shown in class work.

- 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 the analysis of food and water. Apply effective organization and presentation skills as shown in class work.

- Demonstrate a partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show limited ability to apply knowledge learnt to solve a wide range of complex issues and problems related to the analysis of food and water. Apply limited or barely effective organization and presentation skills as shown in class work.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM2241 or CHEM2341 or CHEM2441 or CHEM2541.

Please note that School of Biological Sciences stipulates that students who have passed CHEM3242 are not allowed to take BIOL3209 Food and nutrient analysis.

Offer in 2022 - 2023
Y 2nd sem

Offer in 2023 - 2024 : Y

Examination
May

Grade Descriptors (A+ to F)
A
Demonstrate through a thorough grasp of the knowledge and skills required in theory and laboratory work in food and water analysis to acquire accurate results with full interpretation for analytical application as described in 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 the analysis of food and water. 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 the analysis of food and water. 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 capability to apply knowledge learnt to solve a wide range of complex issues and problems related to the analysis of food and water. 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. Show limited ability to apply knowledge learnt to solve a wide range of complex issues and problems related to the analysis of food and water. Apply limited or barely effective organization and presentation skills 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 abilities, logical and coherent thinking. Show very little 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.

Communication-intensive Course
N

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities
Details
No. of Hours
Lectures
24
Laboratory
28
Tutorials
6

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
Examination
50 CLO 1,2,3
Laboratory reports
25 CLO 1,2,3
Test
(mid-term and in-class quiz)
15 CLO 1,2,3

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
2022

Offering Department
Chemistry

Course Co-ordinator
Dr K K H Ng, Chemistry (kkhn3@hku.hk)

Teachers Involved
(Dr K K H Ng, Chemistry)

Academic Year
2022

Quota
50

Enrolment Limitation
Y

Department of Chemistry
CHEM3243

Introductory instrumental chemical analysis (6 credits)

Offering Department: Chemistry
Course Co-ordinator: Dr X Li, Chemistry (xiangli@hku.hk)

Course Objectives
This course is designed for non-chemistry major students covering basic principles of separation and spectroscopy for chemical analysis. This course provides a general foundation for further studies in pharmacology, life and environmental sciences.

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 concept of mass spectrometry; electrospray ionization (ESI) and matrix-assisted laser desorption ionization (MALDI); time-of-flight (TOF) and quadrupole (Q) mass analyzers.
NMR: basic principle of nuclear magnetic resonance.
Analysis and quality assurance: statistical analysis of small sets of data, control chart.

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, 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.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM2041 or CHEM2241; and
Not for students who have passed CHEM3241, or have already enrolled in this course.

Offer in 2022 - 2023
N

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 incoherent organization and poor presentation skills.

Communication-intensive Course
N

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities | Details | No. of Hours
--- | --- | ---
Lectures | | 24
Laboratory | | 28
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
Laboratory reports | | 15 | CLO 1.2
Test | | 15 | CLO 1.2

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.

CHEM3244

Analytical techniques for pharmacy students (6 credits)

Offering Department: Chemistry
Course Co-ordinator: Dr X Li, Chemistry (xiangli@hku.hk)
**Course Objectives**
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.

**Course Contents & Topics**
Principles and applications of different analytical and measurement techniques in pharmaceutical sciences. Analysis and quality assurance: method validation, sampling, statistics, hypothesis tests
Optical spectroscopy: Beer's law, UV/Vis, infrared, fluorescence, and atomic spectroscopy
Separation and purification: gas chromatography and liquid chromatography
Modern mass spectrometry: ionization techniques (ESI, MALDI), mass analysis techniques (TOF, quadrupole), protein sequencing.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1 demonstrate knowledge and understanding of principles of data analysis, optical spectroscopic methods, separation techniques, and modern mass spectrometry
- CLO 2 describe the basic experimental setup and the properties of the basic components of the instruments used in the laboratory classes
- CLO 3 apply experimental skills in experiments including sample preparation, standard solution preparation, instrument calibration, and matrix effect correction

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in BPHM2136
(This course is for BPharm students only)

**Course Type**
Lecture with laboratory component course

**Course Teaching & Learning Activities**
**Activities**
- Lectures
- Laboratory
- Reading / Self study

**Assessment Methods and Weighting**
**Methods**
- Examination
- Laboratory reports
- Test

**Weighing in final course grade (%)**
- Examination 70
- Laboratory reports 15
- Test 15

**Assessment Methods to CLO Mapping**
- CLO 1,2,3

**Required/recommended reading and online materials**

**Additional Course Information**
This course is for Pharmacy students ONLY. Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.
This course is a continuation from Basic Inorganic Chemistry and Basic Organic Chemistry, giving further and more intensive course

**Course Objectives**

On successful completion of this course, students should be able to:

1. Understand the principles and concepts of inorganic/organic chemistry in biological systems.
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 in medicine.

Pass in CHEM2341

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</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 bioinorganic chemistry, especially those related to soft-hard 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 apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry.</td>
<td>25</td>
<td>CLO 1,2,3,4</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 bioinorganic chemistry, especially those related to soft-hard 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.</td>
<td>50</td>
<td>CLO 1,2,3,4</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 bioinorganic chemistry, especially those related to soft-hard 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 some abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry.</td>
<td>25</td>
<td>CLO 1,2,3,4</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 bioinorganic chemistry, especially those related to soft-hard 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 limited ability to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry.</td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Fail</td>
<td>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 soft-hard 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.</td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Communication-intensive Course

N

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></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>including literature survey &amp; presentation</td>
<td>12</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>CLO (quiz/test)</td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Lippard, S. J. and Berg, J. M. Principles of Bioinorganic Chemistry (University Science Books; Mill Valley, CA, 1994)

CHEM3441

Organic chemistry II (6 credits)

Chemistry

Academic Year

2022

Quota

300

Offering Department

Chemistry

Teachers Involved

Dr Z X Huang (1st sem); Prof X Y Li (2nd sem), Chemistry (huangzx@hku.hk; xiaoyuli@hku.hk)

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, carboxyl compounds, aldehydes, ketones, carboxylic acids, acyl halides, anhydrides, esters, amides, nitriles, and amines)
CHEM3442 Organic chemistry of biomolecules (6 credits)  
Academic Year 2022  
Offering Department Chemistry  
Course Co-ordinator Dr P H Toy, Chemistry (phtoy@hku.hk)  
Teachers Involved (Dr P H Toy, Chemistry) (Dr. Y X Li, Chemistry)  
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 CHEM2441 or CHEM3441  
Offer in 2022 - 2023 Y  
Grade Descriptors (A+ to F)  
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for achieving 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 breadth 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.  
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 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.  
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.  
Communication-intensive Course N  
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 (assignment x 2) 20 CLO 1.2.3.4.5.6  
Examination (mid-term test x 2) 30 CLO 1.2.3.4.5.6  
Tutorials 12  
Lectures 36  
Examination 50 CLO 1.2.3.4.5.6  
Assignments (assignment x 2) 20 CLO 1.2.3.4.5.6  
Assignments (mid-term test x 2) 30 CLO 1.2.3.4.5.6  
Assignments 50 CLO 1.2.3.4.5.6  
Tutorials 12  
Lectures 36  
Examination 50 CLO 1.2.3.4.5.6  
Tutorials 12  
Lectures 36  
Examination 50 CLO 1.2.3.4.5.6
CHEM3443

Organic chemistry laboratory (6 credits)

Offering Department: Chemistry
Course Co-ordinator: Dr A M Y Yuen, Chemistry (maiyan@hku.hk)

Teachers Involved:
(Dr A M Y Yuen, Chemistry)
(Dr Y F Wang, Chemistry)

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;
NOT for students who have passed CHEM3441A in semester 1, 2015-16, or CHEM3441 in or before 2014-2015
(for students admitted in 2014-15 or before)
Pass in CHEM2441 or CHEM2442 or CHEM2443; and Pass in CHEM3441 or CHEM3442, or already enrolled in any of these two courses (for students admitted in 2015-16 or thereafter)

Offer in 2022 - 2023:
Y  1st sem  2nd sem  Offer in 2023 - 2024 : 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 abilities, but with limited analytical and critical abilities. Demonstrated partially effective lab skills and techniques. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of 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 abilities, but with limited analytical and critical abilities. Demonstrated partially effective lab skills and techniques. Apply limited or barely effective organizational and presentational skills.

Communication-intensive Course: N

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
--- | --- | --- | ---
Examination | (20% practical exam and 30% 2-hr written exam) | 50 | CLO 1,2,3,4,5
Laboratory reports | (Include Lab Quiz 15%, Lab Report and Notebook 25% and Lab Performance 10%) | 50 | 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)

Offering Department: Chemistry
Course Co-ordinator: Dr A M Y Yuen, Chemistry (maiyan@hku.hk)
Teachers Involved:
(Dr A M Y Yuen, Chemistry)
(Dr J He, Chemistry)

Department of 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 2022 - 2023 | Y Summer Offer in 2023 - 2024 : Y |
| | Examination No Exam |
| 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 combine knowledge and skills 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. |
| | Fail |
| Communication-intensive Course | N |
| 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 (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) |
| Offering Department | Chemistry |
| Quota | 100 |
| Course Co-ordinator | Prof G H Chen, Chemistry (ghc@yangtze.hku.hk) |
| Teachers Involved | (Dr J Yang,Chemistry) (Prof G H Chen (Visiting Professor) Prof. Karl Johnson,Chemistry) |
| Course Objectives | The course presents fundamental principles and topics on quantum chemistry in order to provide a soiled foundation for students intending to further their studies in chemistry. |
| 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

Pre-requisites
(Pass in CHEM2541)

Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : 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 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.

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 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 of data 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 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.

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 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.

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 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.

Course Type
Lecture with laboratory component 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>
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</tr>
<tr>
<td>Laboratory</td>
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<tr>
<td>Tutorials</td>
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<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>
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<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</td>
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<tr>
<td>Laboratory reports</td>
<td>(experiment &amp; lab report)</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td>(test/quiz)</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Communication-intensive Course
N

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
- Statistical model and state distribution for thermodynamics
- Statistical entropy
- Ensembles and partition functions: microcanonical and canonical
- Systems of independent molecules: ideal gas
- Molecular degrees of freedom: translation, rotation, vibration, and electronic
- Ideal gas mixture: chemical equilibrium
- Calculation of free energies in gaseous reaction

Chemical equilibrium and kinetics theory
- Rate theory: collision theory, transition state theory and applications

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

Required/recommended reading and online materials
D. A. McQuarrie: Quantum Chemistry (2nd Edition, 2007)

Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

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
- Statistical model and state distribution for thermodynamics
- Statistical entropy
- Ensembles and partition functions: microcanonical and canonical
- Systems of independent molecules: ideal gas
- Molecular degrees of freedom: translation, rotation, vibration, and electronic
- Ideal gas mixture: chemical equilibrium
- Calculation of free energies in gaseous reaction

Chemical equilibrium and kinetics theory
- Rate theory: collision theory, transition state theory and applications

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
(Pass in CHEM2541)

Offer in 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : Y

Grade Descriptors
(A+ to F)

A 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.

B 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
## Course Description

**Course Name:** CHEM3999  
**Department:** Chemistry  
**Offering:** Directed studies in chemistry (6 credits)

### Course Objectives

- 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.

### Course Contents & Topics

- This capstone 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.
- 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.
- 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.

### Course Learning Outcomes

- 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 the their particular chemical project to the wider area of chemistry.

### Pre-requisites

- Pass in at least 24 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major including a pass in CHEM2341 or CHEM2441 or CHEM2442 or CHEM2541 or CHEM3146.

### Additional Course Information

- There are three mandatory homework assignments. 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.

### Assessment Methods and Weighing

<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</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

- Atkins: Physical Chemistry (10th edition)
- B. Widom: Statistical Mechanics: a concise introduction to chemists
- L. Nash: Elements of statistical thermodynamics (2nd edition)

### Course Website

- Nil

### Communication-intensive Course

- N

## Assessment to CLO Mapping

<table>
<thead>
<tr>
<th>CLO</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</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>
</tr>
<tr>
<td>CLO 2</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>
</tr>
<tr>
<td>CLO 3</td>
<td>Little or no evidence of command of knowledge of statistical thermodynamics and reaction dynamics.</td>
</tr>
</tbody>
</table>

### Course Type

- Project-based course

### Course Teaching & Learning Activities

- Lecture with laboratory component course

### Assessment Methods

- Methods: Lecture with laboratory component course
- Details: Lecture, Laboratory, Tutorials, Reading / Self study
- No. of Hours: 24, 24, 4, 100

### Academic Year

- Offer in 2022 - 2023: Y  
- Offer in 2023 - 2024: Y  
- Examination: No Exam

### Reading / Self study

- 100

### Tutorials

- 4

### Laboratory

- 24

### Lectures

- 24

### Grade Descriptors

- 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 which 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 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.

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### Course Website

- Nil

### Communication-intensive Course

- N
## Course Information

**CHEM4142 Symmetry, group theory and applications (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 E C M Tse, Chemistry (<a href="mailto:ecmtse@hku.hk">ecmtse@hku.hk</a>)</td>
</tr>
<tr>
<td><strong>Course Objectives</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Course Contents &amp; Topics</strong></td>
<td>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.</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></td>
<td>CLO 1 understand the basic principles and concepts of symmetry and group theory and to apply them in solving chemical problems</td>
</tr>
<tr>
<td></td>
<td>CLO 2 demonstrate knowledge and understanding in the use of character tables and projection operator techniques</td>
</tr>
<tr>
<td></td>
<td>CLO 3 demonstrate knowledge and understanding of bonding theories involving hybrid orbitals and molecular orbitals for organic, inorganic, and organometallic systems</td>
</tr>
<tr>
<td></td>
<td>CLO 4 demonstrate knowledge and understanding in the application of symmetry and group theory in electronic and vibrational spectroscopy</td>
</tr>
<tr>
<td><strong>Pre-requisites (and Co-requisites and Impermissible combinations)</strong></td>
<td>Pass in CHEM3341</td>
</tr>
</tbody>
</table>

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to symmetry and group theory and their applications in solving chemical problems, especially those related to symmetry elements and symmetry operations; symmetry point groups; reducible and irreducible representations; character tables; direct products; symmetry-adapted linear combinations; projection operators; treatment of bonding theories including hybrid orbitals and molecular orbitals for organic, inorganic and organometallic systems; and applications in electronic and vibrational spectroscopy.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to symmetry and group theory and their applications in solving chemical problems, especially those related to symmetry elements and symmetry operations; symmetry point groups; reducible and irreducible representations; character tables; direct products; symmetry-adapted linear combinations; projection operators; treatment of bonding theories including hybrid orbitals and molecular orbitals for organic, inorganic and organometallic systems; and applications in electronic and vibrational spectroscopy.</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 symmetry and group theory and their applications in solving chemical problems, especially those related to symmetry elements and symmetry operations; symmetry point groups; reducible and irreducible representations; character tables; direct products; symmetry-adapted linear combinations; projection operators; treatment of bonding theories including hybrid orbitals and molecular orbitals for organic, inorganic and organometallic systems; and applications in electronic and vibrational spectroscopy.</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 symmetry and group theory and their applications in solving chemical problems, especially those related to symmetry elements and symmetry operations; symmetry point groups; reducible and irreducible representations; character tables; direct products; symmetry-adapted linear combinations; projection operators; treatment of bonding theories including hybrid orbitals and molecular orbitals for organic, inorganic and organometallic systems; and applications in electronic and vibrational spectroscopy.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to symmetry and group theory and their applications in solving chemical problems, especially those related to symmetry elements and symmetry operations; symmetry point groups; reducible and irreducible representations; character tables; direct products; symmetry-adapted linear combinations; projection operators; treatment of bonding theories including hybrid orbitals and molecular orbitals for organic, inorganic and organometallic systems; and applications in electronic and vibrational spectroscopy.</td>
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</table>

### Communication-intensive Course

<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
<th>Lecture-based course</th>
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<table>
<thead>
<tr>
<th><strong>Course Type</strong></th>
<th>Lecture-based course</th>
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</thead>
<tbody>
<tr>
<td><strong>Course Teaching &amp; Learning Activities</strong></td>
<td>Details</td>
</tr>
<tr>
<td>Lectures</td>
<td>36</td>
</tr>
<tr>
<td>Tutorials or discussion</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
</tr>
</tbody>
</table>

**Dissertation including a written report and an oral presentation**

Required/recommended reading and online materials

Recommended reading material will be assigned depending on the project.

Additional Course Information

Exceptional academic strength of the students is required for taking this course. The course may involve Laboratory component as Course Teaching & Learning Activities.
CHEM4143 Interfacial science and technology (6 credits)

Offering Department Chemistry
Course Co-ordinator Prof G K Y Chan, Chemistry (hrscky@hku.hk)
Teachers Involved Prof G K Y Chan, Chemistry (Visiting Professor, Chemistry)

Course Objectives
To understand the science and technology of interfacial phenomena and processes often appeared in high value added products and modern technologies.

Course Contents & Topics
Physics and Chemistry of Interfaces: coatings and surfactants, colloids and interfaces, wetting, microemulsion, thin films, nanomaterials, porous materials.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- 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.

Required/recommended reading and online materials

Additional Course Information
This course is also offered to RPg students, and the course code for RPg students is CHEM6116.

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></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Test</td>
<td>(test/project)</td>
<td>25</td>
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Communication-intensive Course
N

Course Type
Lecture-based course

Course Teaching & Learning Activities

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<tr>
<th>Activities</th>
<th>Details</th>
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<tr>
<td>Tutorials</td>
<td>or discussion</td>
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<td>Reading / Self study</td>
<td></td>
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Assessment Methods and Weighting

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<td>CLO 1</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>25</td>
<td>CLO 1</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Barnes and Gentle: Interfacial Science

Additional Course Information
This course is offered every other year.

CHEM4144 Advanced materials (6 credits)

Offering Department Chemistry
Course Co-ordinator Dr E C M Tse, Chemistry (ecmtse@hku.hk)
Teachers Involved Dr E C M Tse, Chemistry (Visiting Professor, Chemistry) (Dr K Okuro, Chemistry)

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
This course covers both hard and soft materials in the macroscale and nanoscale regimes for renewable energy, catalytic devices, sustainable recouperation, wearable biosensors, nanoelectronics, membrane technology, and...
### 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

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Grade</th>
<th>Offering in 2022 - 2023</th>
<th>Examination</th>
<th>Date</th>
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<tbody>
<tr>
<td>A</td>
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<td>Y</td>
<td>May</td>
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<td>B</td>
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<td>D</td>
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<tr>
<td>Fail</td>
<td></td>
<td>Y</td>
<td>May</td>
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</table>

### Communication-intensive Course

- N

### Course Type

- Lecture-based course

### Course Teaching & Learning Activities

<table>
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<tr>
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<td>100</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>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Literature (Article / Patent)</td>
<td>30</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td>Exam / Presentation</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td>Test / Project</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</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
- Dr Y Li, Chemistry (yingli0e@hku.hk)

#### Teachers Involved
- (Dr P H Toy, Chemistry)
- (Dr Y 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, combinatorial chemistry 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.

#### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Grade</th>
<th>Offering in 2022 - 2023</th>
<th>Examination</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>Y</td>
<td>May</td>
<td></td>
</tr>
</tbody>
</table>

### Other courses

- CHEM3441
- CHEM3442

- Description of other courses, including their prerequisites, learning outcomes, and assessment methods.

#### Other notes

- Department of Chemistry
Course Objective:
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:
Pass in CHEM3341 and CHEM3441

Offer in 2022 - 2023:
Y 2nd sem Offer in 2023 - 2024 : Y

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 analyze and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of supramolecular systems.

B 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; 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 moderately effective basic techniques, basic techniques for medicinal chemistry, especially in drug discovery and metabolism.

C 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 limited abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal 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 medicinal chemistry. Demonstrate partially effective basic techniques for medicinal chemistry, especially in drug discovery and metabolism.

D 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 little or no abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal 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 medicinal chemistry. Demonstrate minimally effective basic techniques for medicinal chemistry, especially in drug discovery and metabolism.

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 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 little or no evidence of abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal 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 medicinal chemistry. Demonstrate minimally effective basic techniques for medicinal chemistry, especially in drug discovery and metabolism.

Communication-intensive Course
N

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>or discussion</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</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>(essay)</td>
<td>15</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>Presentation</td>
<td></td>
<td>20</td>
<td>CLO 2,3</td>
</tr>
<tr>
<td>Test</td>
<td>(mid-term test)</td>
<td>15</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
An Introduction to Medicinal Chemistry (3/e), G.L. Patrick, Oxford University Press, 2005
Medicinal Chemistry- An Introduction, G. Thomas, John Wiley, 2000

Additional Course Information
This course is also offered to RPg students, and the course code for RPg students is CHEM6113.
### CHEM4148 Frontiers in Modern Chemical Science (6 credits)

**Offering Department** Chemistry  
**Course Co-ordinator** Prof X D Li, Chemistry (xiangli@hku.hk)  
**Teachers Involved** (Dr J Y Tang, Chemistry)  

**Course Objectives**
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 electrolyzers will be discussed.

**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  
- 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

**Pre-requisites and Co-requisites**
Pass in CHEM3341 and CHEM3441.

**Offer in 2022 - 2023**
Y 2nd sem Offer in 2023 - 2024 : Y  
**Examination** May

### Communication-intensive Course

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough knowledge and understanding of essential facts, concepts and principles in chemical sciences, especially those relating to biomedical chemistry, nanomaterials, and energy sciences. Show strong ability to apply and integrate knowledge in chemical sciences in explaining the formation and properties of chemical species and in designing different chemical systems. Show strong ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of chemical systems.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial knowledge and understanding of essential facts, concepts and principles in chemical sciences, especially those relating to biomedical chemistry, nanomaterials, and energy sciences. Show evidence to apply and integrate knowledge in chemical sciences in explaining the formation and properties of chemical species and in designing different chemical systems. Show evidence to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of chemical systems.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete knowledge of understanding of essential facts, concepts and principles in chemical sciences, especially those relating to biomedical chemistry, nanomaterials, and energy sciences. Show some ability to apply and integrate knowledge in chemical sciences in explaining the formation and properties of chemical species and in designing different chemical systems. Show some ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of chemical systems.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but incomplete command of knowledge and understanding of essential facts, concepts and principles in chemical sciences, especially those relating to biomedical chemistry, nanomaterials, and energy sciences. Show limited ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of chemical systems.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts and principles in chemical sciences, especially those relating to biomedical chemistry, nanomaterials, and energy sciences. Show little or no ability to apply and integrate knowledge in chemical sciences in explaining the formation and properties of chemical species and in designing different chemical systems. Show limited ability to analyse and interpret experimental data to draw appropriate conclusions relating to the advanced principles and properties of chemical systems.</td>
</tr>
</tbody>
</table>

**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>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>15</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>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>
</tr>
</tbody>
</table>

**Supplementary Reading and Online Materials**
- References to specialist texts and other published materials will be made throughout the course.
Communication-intensive Course

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<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>100</td>
</tr>
</tbody>
</table>

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>(20% Tests/Assignments; 5% participation)</td>
<td>25</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination Presentation</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

References to specialized texts and other published materials will be made throughout the course.

Additional Course Information
This course is also offered to RPg students, and the course code for RPg students is CHEM6118.

CHEM4241
Modern chemical instrumentation and applications (6 credits)

Offering Department
Chemistry

Quota
50

Course Co-ordinator
Dr I K Chu, Chemistry (ivankchu@hku.hk)
(Dr H B Jiang, Chemistry)

Teachers Involved
(Dr I K Chu, Chemistry)

Course Objectives
The aim of the course is to provide an understanding of modern instrumentation, covering both fundamental principles and practical aspects of instrument design. The course will be of particular benefit to those pursuing a higher research degree or a career in technical sales/service.

Course Contents & Topics
Biological Mass spectrometry: Liquid Chromatography-Tandem Mass Spectrometry for Proteomics & Metabolomics.
Microscopy and analysis with light and electron beams: instrumentation and applications in physical and life sciences.

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 CHEM3241

Offer in 2022 - 2023
Y 1st sem

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the modern chemical instrumentations and applications. Show strong ability to apply and integrate knowledge and theory, and strong ability to analyze problems related to fundamental principles and practical aspects of instrument design.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the modern chemical instrumentations and applications. Show evidence to apply and integrate knowledge and theory, and ability to analyze problems related to fundamental principles and practical aspects of instrument design.</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 modern chemical instrumentations and applications. Show evidence of some abilities to apply and integrate knowledge and theory, and to analyze problems to most familiar situations to fundamental principles and practical aspects of instrument design.</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 modern chemical instrumentations and applications. Show evidence of limited abilities to apply and integrate knowledge and theory, and limited ability to analyze problems to most familiar situations related to fundamental principles and practical aspects of instrument design.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the modern chemical instrumentations and applications. Show little or no evidence of abilities to apply and integrate knowledge and theory, and little or no ability to analyze problems to most familiar situations related to fundamental principles and practical aspects of instrument design.</td>
</tr>
</tbody>
</table>

Communication-intensive Course

N

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>16</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></td>
<td>10</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>
Course Objectives

This course focuses on the basic principle, practice and methodology in chemical and biochemical analysis. The 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

Sample preparation and enrichment techniques for biomedical, pharmaceutical and forensic chemical analysis; Advanced separation techniques for complex mixture analysis; Theoretical background and practical techniques of biological sample analysis;

Advanced instrumental techniques and analytical methods; Recent developments in microscopy and imaging techniques; Introduction to spatial omics technologies;

Problem-based design of analytical strategy for chemical & biochemical analysis; Case study and review of analytical chemistry literature/scenario.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 apply statistical methods to assess analytical measurement data quality and interpret their significance, validate analytical methods and results

CLO 2 demonstrate understanding on the working principle of different analytical techniques and recognize their advantages and limitations

CLO 3 integrate different analytical techniques to solve analytical and bioanalytical problems

Pre-requisites

Pass in CHEM3241 or CHEM3242

Grade Descriptors (A+ to F)

A

B

C

D

E

F

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.

Demonstrate a substantial command of a broad range of knowledge and skills required for attaining least 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.

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.

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. Apply limited or barely effective organization and presentation skill as shown in class work.

Demonstrate little or no evidence for the 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 related to chemical analysis. Organization and presentation skills are minimally effective or ineffective as shown in class work.

Communication-intensive Course

N

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>15</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>45</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Laboratory reports</td>
<td>(experiment &amp; lab report)</td>
<td>15</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


A. Manz, P. S. Dittrich, N. Pamme, D. Iossifidis: Bioanalytical Chemistry (Imperial College Press, latest edition)

References to specialist texts and other published materials will be made throughout the course.

Additional Course Information

Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.
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 Y 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 2022 - 2023: Y 1st sem Offer in 2023 - 2024: Y

Grade Descriptors: (A+ to F)

- A: Demonstrate thorough 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 organizational 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 moderately effective organizational and presentational skills.
- C: Demonstrate 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 partially effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles and theories relating to the more advanced knowledge in inorganic chemistry. Show evidence of limited abilities to apply and integrate knowledge and theory, and limited ability to analyze problems to most familiar situations in inorganic chemistry. Demonstrate partially effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles and theories relating to the more advanced knowledge in inorganic chemistry. Show little or no evidence of abilities to apply and integrate knowledge and theory, and little or no ability to analyze problems to most familiar situations in inorganic chemistry. Demonstrate minimally effective organizational and presentational skills.

Communication-intensive Course: N

Course Type: Lecture-based course

Course Teaching & Learning Activities:
- 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: 25 CLO 1,2,3,4
  - Examination: 50 CLO 1,2,3,4
  - Test: (quiz/ test) 25 CLO 1,2,3,4

Required/recommended reading and online materials:
- References to specialist texts and other published materials will be made throughout the course.

Additional Course Information:
- (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: Dr. J Z Liu, Chemistry (juliu@hku.hk)

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.


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 alkylidyne.
- CLO 3: Demonstrate knowledge and understanding in the application of organometallics in organic synthesis, polymerization and catalysis.
Course Objectives
To provide students with knowledge in organic chemistry reaction mechanisms and organic compound structure determination.

Course Contents & Topics
The course covers chemical bonding, advanced stereochemistry, conformational analysis, techniques for investigating reaction mechanisms, reactive intermediates, rearrangement reactions, and pericyclic reactions.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 describe, analyze and interpret the structure and reactivity relationship of organic molecules
- CLO 2 identify and predict the selectivities (chemoselectivity, regioselectivity and stereoselectivity) in organic reactions
- CLO 3 describe the general approaches to study organic mechanisms
- CLO 4 have a general understanding and working knowledge of pericyclic reactions, reactive intermediates (radicals, carbenes and nitrenes), and polar rearrangements

Communication-intensive Course
N

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>
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<td>Laboratory</td>
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<td>30</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>5</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>15</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>20</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

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.

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

Pass in CHEM3341

Y 1st sem Offer in 2023 - 2024 : Y Examination Dec
**Course Name:** Integrated organic synthesis (6 credits)  
**Offering Department:** Chemistry  
**Teachers Involved:** Prof P Chiu, Chemistry (pchiu@hku.hk)  
**Course Objectives:** To introduce aspects of modern organic reactions with relevance to and in the context of the synthesis of natural products. 
**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: 
- 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 integrate knowledge and theory, and a strong ability to analyze novel synthetic organic chemistry situations and problems. 
- Demonstrate effective organization and application of lab skills and techniques in synthetic experiments. 
**Pre-requisites:** Pass in CHEM3441; or Pass in CHEM3443 (without lab component) and CHEM3444  
**Offer in 2022 - 2023:** Y  
**Grade Descriptors (A+ to F):**  
**Communication-intensive Course:** N  
**Course Type:** Lecture-based course  
**Grade Descriptors:**  
- **Grade Group A**: Demonstrate a 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. 
- **Grade Group B**: Demonstrate substantial command of a broad range 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. 
- **Grade Group 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. 
- **Grade Group 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. 
- **Grade Group 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. 
**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</td>
<td>25</td>
<td>CLO 1.2,3,4,5,6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1.2,3,4,5,6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>25</td>
<td>CLO 1.2,3,4,5,6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Course Information:** This course is also offered to RPg students, and the course code for RPg students is CHEM6114.
Department of Chemistry

Examination Department of Chemistry

Grade Descriptors

Teachers Involved (Prof X C Li, Chemistry)

Course Co-ordinator

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.

Pre-requisites (and Co-requisites and Impermissible combinations)

Offering Department

Course Co-ordinator

Teachers Involved (Prof X C Li, Chemistry)

Course Objectives

Course Contents & Topics

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

Required/recommended reading and online materials

Top drugs, top synthetic routes, J. Saunders, Oxford Science Publications

Additional Course Information

Lecture 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 2022
Quota 50

Offering Department Chemistry

Course Co-ordinator Prof X C Li, Chemistry (xuechenl@hku.hk)

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 and Impermissible combinations)

Pass in BIOC3601 or CHEM3441

Offer in 2022 - 2023 Y 2nd sem Offer in 2023 - 2024 : 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, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentional skills. 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. Apply effective organizational and presentional skills. Critical use of relevant information from sources, showing 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. Apply moderately effective organizational and presentional skills. Use of relevant information from sources, showing 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. Apply limited or barely effective organizational and presentional skills. Use 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. Organization and presentional skills are minimally effective or ineffective. Limited use of secondary sources and no critical comparison of them.

Communication-intensive Course

N

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures 36
Tutorials (tutorials/discussion) 12
Reading / Self study 100

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 5 CLO 1,2,3
Examination 50 CLO 1,2,3

Communication-intensive Course

Assessment Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments (Problem sets) 10 CLO 1,2,3,4
Examination 50 CLO 1,2,3,4
Laboratory reports (Practicals & lab test) 25 CLO 1,2,3,4
Test 15 CLO 1,2,4

Reading / Self study 100

CLO 3 compare chemical biology and traditional biology approaches in drug discovery

CLO 2 give examples of how to use chemical methods to produce natural biomolecules and new biomolecules with altered functions

CLO 1 understand chemical biology approaches in studying biology

CLO 1,2,4
CHEM4541  Physical chemistry III: statistical thermodynamics and kinetics theory (6 credits)  

Offering Department  Chemistry  
Course Co-ordinator  ---, 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  
1. **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  
   - Lattice statistics: Ising model and phase transition  
   - Quantum statistics  
   - Chemical equilibrium and kinetics theory  
   - Rate theory: collision theory, transition state theory  

Course Learning Outcomes  
1. CLO 1 understand and use the terminology and nomenclature in statistical thermodynamics and topics discussed in the course  
2. CLO 2 demonstrate knowledge and understanding of basic concepts in statistical thermodynamics  
3. CLO 3 understand correlation between macroscopic observables and microscopic statistical model systems  

Pre-requisites  
Pass in CHEM3541  

Grade Descriptors  
A  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.  
B  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.  
C  General but incomplete command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate evidence of analytical thinking. Can apply the knowledge to familiar situations.  
D  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.  
Fail  Little or no evidence of command of knowledge of statistical thermodynamics and reaction dynamics.  

Assessment Methods and Weighting  
- Assignments: continuous assessment on class quizzes & assignments (40% CLO 1,2,3)  
- Examination: (60% CLO 1,2,3)  

Required/recommended reading and online materials  
T. L. Hill, An introduction to Statistical Thermodynamics  
P. Atkins, Physical Chemistry  

Communication-intensive Course  
N  

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: Details  
  - Assignments: continuous assessment of on class quizzes & assignments  
  - Examination: (60% CLO 1,2,3)  

Required/recommended reading and online materials  
T. L. Hill, An introduction to Statistical Thermodynamics  
P. Atkins, Physical Chemistry  

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  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.  
Course Contents & Topics  
# Course Outcomes

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 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Exam</th>
<th>Grade Descriptors</th>
<th>Offer in 2023 - 2024</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>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.</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>B</td>
<td>N</td>
<td>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. Strong analytical and critical abilities and logical thinking, with strong ability to apply knowledge to practical problems in physical chemistry.</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>C</td>
<td>Y</td>
<td>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 analytical and critical abilities and logical thinking, with ability to apply knowledge to practical problems in physical chemistry.</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>D</td>
<td>N</td>
<td>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 analytical and critical abilities and logical thinking, with limited ability to apply knowledge to practical problems in physical chemistry.</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Fail</td>
<td></td>
<td>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.</td>
<td>Y</td>
<td>Y</td>
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## Communication-intensive Course

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Communication-intensive Course</th>
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</thead>
<tbody>
<tr>
<td>N</td>
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## Course Learning & Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Details</th>
<th>No. of Hours</th>
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<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>lab sessions 6×4 hours of computational laboratory</td>
<td>24</td>
</tr>
<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>Assignments</td>
<td>(continuous assessment/projects)</td>
<td>50</td>
<td>CLO 1,2,3</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

- 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)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>40</td>
</tr>
</tbody>
</table>

## 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 & Topics

Time-resolved spectroscopy methods, excited states and reactive intermediates, photophysics and photochemical processes, chemical reaction mechanisms, advanced quantum mechanical methods, reaction pathways and surface crossings.

## 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 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Exam</th>
<th>Grade Descriptors</th>
<th>Offer in 2023 - 2024</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</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>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>B</td>
<td>N</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 strong ability to apply knowledge to practical problems in physical chemistry.</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>C</td>
<td>Y</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 analytical and critical abilities and logical thinking, with strong ability to apply knowledge to practical problems in physical chemistry.</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>D</td>
<td>N</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. Evidence of some analytical and critical abilities and logical thinking, with limited ability to apply knowledge to practical problems in physical chemistry.</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>
CHEM4544: Electrochemical science and technology (6 credits)

Offering Department: Chemistry
Offer in 2022 - 2023: N
Quota: 36

Course Objectives:
To understand the science of electrochemistry, methods to characterise electrochemical cells, and factors affecting electrochemical applications and technologies.

Course Contents & Topics:

Course Learning Outcomes:
On successful completion of this course, students should be able to:
- CLO 1: Understand the thermodynamic and kinetics 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:
Pass in CHEM3241 or CHEM3541 or CHEM3542

Communication-intensive Course
N

Course Type:
Lecture-based course

Activities
Details
No. of Hours
Lectures
36
Tutorials
tutorials/discussion
12
Reading / Self study
100

Assessment Methods and Weighting:
Methods
Details
Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments
(continuous assessment/test) 50 CLO 1,2,3
Examination
50 CLO 1,2,3

Required/recommended reading and online materials:
- R. W. Atkins: Physical Chemistry
- R. D. Levine, R. B. Bernstein: Molecular Reaction Dynam
- R. C. Tolman: The Principles of Statistical Mechanics
- N. Levine: Quantum Chemistry (Prentice Hall, 4th ed.)
- R. D. Levine, R. B. Bernstein: Molecular Reaction Dynam

Course Website
Nil

Additional Course Information:
This course is also offered to RPg students, and the course code for RPg students is CHEM6112.

Communication-intensive Course
N

Course Type:
Lecture with laboratory component course

Activities
Details
No. of Hours
Lectures
24
Laboratory
Laboratory/Project
24
Tutorials
6
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
Examination
50 CLO 1,2,3
Laboratory reports
(Report or Project) 10 CLO 1,2,3
Test
(Test/ Quiz) 30 CLO 1,2,3

Required/recommended reading and online materials:
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 chemistry research.

**CHEM4910** Chemistry literacy and research (6 credits)  
**Offering Department** Chemistry  
**Course Co-ordinator** Prof X D Li, Chemistry (xiangli@hku.hk)  
**Teachers Involved** (Various teachers in the Department, Chemistry)  
**Course Objectives**  
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 laboratory-based projects are provided by the students' supervisors who are assigned by the department.

**Course Learning Outcomes**  
On successful completion of this course, students should be able to:  
CLO 1 demonstrate knowledge of academic databases and search engines of chemistry literature  
CLO 2 understand the terminology and nomenclature associated with their own research project  
CLO 3 demonstrate knowledge and understanding of the chemical techniques they used to do the research in their own research project  
CLO 4 demonstrate knowledge and understanding of the results of their own research project and its context in the broader research area

**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 students only.  
The earliest that a student is allowed to take this capstone course is their year 3 study.

**Offer in 2022 - 2023**  
Y 2nd sem  
**Grade Descriptors (A+ to F)**  
A 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.]  
B 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.  
C 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.  
D Show a partial but limited comprehension, with knowledge of some relevant information, of the research project. Presence of some component 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 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.

**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>12 hrs tutorials; 46 hrs of workshops and 100 hrs reading/self study</td>
<td>158</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>50</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Research report</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**  
Reading materials will be assigned depending on the project.

**Additional Course Information**  
Satisfactory completion of this course will be counted towards the Capstone requirement.

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CHEM4911 Capstone experience for chemistry undergraduates: HKUtopia (6 credits)  
**Offering Department** Chemistry  
**Course Co-ordinator** Dr A P L Tong, Chemistry (apltong@hku.hk)  
**Teachers Involved** (Various teachers in the Department, Chemistry)  
**Course Objectives**  
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 students to think what are the key issues 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 & Topics**  
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 Outcomes**  
On successful completion of this course, students should be able to:
### Course Details

**CHEM4966** Chemistry internship (6 credits)

**Offering Department** Chemistry

**Course Co-ordinator** Dr K K H Ng, Chemistry (kknhn3@hku.hk)

**Course Objectives**
This course aims to offer students the opportunities to gain work experience in the industry related to their major 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 Contents & Topics**
- 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 (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. This capstone course is for Chemistry Major/ Chemistry Major (Intensive) students only.

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
<th>Offer in 2023 - 2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Examination</td>
<td>Y</td>
</tr>
<tr>
<td>B</td>
<td>Examination</td>
<td>Y</td>
</tr>
<tr>
<td>C</td>
<td>Examination</td>
<td>Y</td>
</tr>
<tr>
<td>D</td>
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<td>Y</td>
</tr>
<tr>
<td>Fail</td>
<td>Examination</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Assessment Methods & Weights**
<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>Oral presentation</td>
<td>40%</td>
<td>10% Presentation; 10% Participation; 10% Peer evaluation</td>
<td>60 CLO 1,2,3,4,5,6</td>
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<tr>
<td>Research report</td>
<td></td>
<td></td>
<td>40 CLO 1,2,3,4,5,6</td>
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</tbody>
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**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>Tutorials</td>
<td>10</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Group work or project</td>
<td>80</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>

**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.
A short research project provided by a member of staff (e.g. the students supervisor).

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
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.

Communication-intensive Course
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
Course Website
https://chemistry.hku.hk/staff/kkh/34966
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
Teachers Involved (Various teachers in the Department, Chemistry)
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

Grade Descriptors (A* to F)
A 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.]
B 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 meaningful comparisons between different interpretations. Correct utilization of data and results to form appropriate conclusions. Perform effective organizational and presentational skills.
C 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.
D Show a partial but limited comprehension, with some knowledge related 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.
Fail 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.

Assessment Methods
Methods Details
Written report including a written report and an oral presentation 100 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 |
CSCI9001 Practical Chinese for science students (6 credits)  Academic Year  2022
Offering Department  Chinese  Quota  ---
Course Co-ordinator  Dr H F Poon, Chinese (hfpoon@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 (and Co-requisites and Impermissible combinations)  NIL

Offer in 2022 - 2023  Y  1st sem  2nd sem  Offer in 2023 - 2024 : 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.

Communication-intensive Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities  Details  No. of Hours
Lectures  12
Tutorials  Small group tutorials  12
Group work  Workshops  24
Discussion  24
Reading / Self study  Reading/self study (20 hours) and preparation (12 hours)  32
Assessment  16

Assessment Methods and Weighting
Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
Assignments  coursework  50
Examination  50

Required/recommended reading and online materials
EASC1020  Introduction to climate science (6 credits)  Academic Year 2022
Offering Department Earth Sciences  Quota ---
Course Co-ordinator Prof Z H Liu, Earth Sciences (zhliu@hku.hk)
Teachers Involved (Dr S H Li, Earth Sciences) (Prof Z H Liu, Earth Sciences)

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 2022 - 2023 Y 2nd sem  Offer in 2023 - 2024 : 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 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 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 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 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.

Assessment Methods and Weighting
Method Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 50 CLO 2.3
Examination 50 CLO 1, 2.3, 4


EASC1401  Blue Planet (6 credits)  Academic Year 2022
Offering Department Earth Sciences  Quota ---
Course Co-ordinator Dr M H Lee, Earth Sciences (mhlee@hku.hk)
Teachers Involved (Dr M H Lee, Earth Sciences)

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 This introductory 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 environments
CLO 5 develop skills to synthesize observation and knowledge in a report in essay form

Pre-requisites (and Co-requisites and Impermissible combinations)
NIL

Offer in 2022 - 2023
Y 1st sem  Offer in 2023 - 2024 : Y
Grade Descriptors (A+ to F)

A
- 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 depth and original thoughts.

B
- 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.

C
- 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.

D
- 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 limited or barely effective organizational and presentional skills to present observed details and facts correctly. Limited ability to draw appropriate conclusions.

Fail
- 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 presentional skills. Ineffective presentation of observed details and facts and unable to draw appropriate conclusions.

Communication-intensive Course
N

Course Type
Lecture with laboratory component 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>Lectures</td>
<td>32</td>
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<tr>
<td>Laboratory</td>
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<tr>
<td>Field work</td>
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<tr>
<td>Group work</td>
<td>Oral presentation</td>
<td>4</td>
</tr>
<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>Examination</td>
<td>40</td>
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<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>25</td>
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<td>Presentation</td>
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<tr>
<td>Test</td>
<td>20</td>
<td>CLO 1,2,3</td>
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Required/recommended reading and online materials
Murphy, B and Damian N.: Earth Science Today (1999)

EASC1402 Principles of geology (6 credits) Academic Year 2022
Offering Department Earth Sciences Quota ---
Course Co-ordinator Dr M C Cheung, Earth Sciences (hmcc@hku.hk)
Teachers Involved (Dr M C Cheung,Earth Sciences) (Dr Martin Li,Earth Sciences) (Prof M Sun,Earth Sciences)

Course Objectives

This course is an introduction to fundamental principles and concepts in geology.

- Earth's formation, history and geological time scale
- Rocks and rock cycle
- Plate tectonics: a unifying theory
- Earthquakes and Earth's interior
- Igneous processes and igneous rocks
- Geomorphology and surficial processes
- Sedimentary rocks
- Folds, Faults and Metamorphism
- Metamorphic rocks
- Principles of stratigraphy; stratigraphic dating methods
- Biostratigraphic methods; fossils and index fossils
- Radiometric dating methods

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 recite the rock cycle and the rock material in the earth's crust
CLO 2 describe the overall structure of the earth and the key external and internal processes
CLO 3 explain the major geological phenomena in the context of plate tectonics theory
CLO 4 describe the methods in geological dating
CLO 5 name the major events in earth's history

Pre-requisites and Co-requisites
NIL
EASC1403  
**Geological heritage of Hong Kong (6 credits)**

**Offering Department**  
Earth Sciences

**Course Co-ordinator**  
Dr M C Cheung, Earth Sciences (hmcc@hku.hk)

**Teachers Involved**  
Dr M C Cheung, Earth Sciences (hmcc@hku.hk)

**Course Objectives**  
To give an overview of the geology 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 2022 - 2023**  
Y 2nd sem  Offer in 2023 - 2024 : Y

**Communication-intensive Course**  
N

**Course Type**  
Lecture-based course

**Lectures**  
6 sessions x 2 hours

**Field work**  
4 field trips

**Group work**  
1 presentation and report

**Reading / Self study**  
Essay and exercises

**Assessment**  
2-hour written exam (40%)

**Academic Year**  
2022

**Quota**  
35

### Assessment Methods and Weighting

<table>
<thead>
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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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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>attendance of compulsory guided field trips</td>
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<td>CLO 1,2,3,4</td>
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<td>Essay</td>
<td>Individual essay and exercises</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td>2-hour written examination</td>
<td>40</td>
<td>CLO 1,2,4</td>
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<tr>
<td>Presentation</td>
<td>Group presentation</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Project report</td>
<td>Group project</td>
<td>5</td>
<td>CLO 1,2,3,4</td>
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### EASC1404

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Earth Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Earth Sciences ()</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr S H Li, Earth Sciences (<a href="mailto:shli@hku.hk">shli@hku.hk</a>)</td>
</tr>
</tbody>
</table>

#### Course Objectives
- 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.

#### Course Contents & Topics
- 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.

#### Course Learning Outcomes
- 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

#### Pre-requisites (and Co-requisites and Impermissible combinations)
- NIL

#### Offer in 2022 - 2023
- Grade Descriptors
  - A: 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, 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.
  - B: 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 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.
  - C: 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 the field of the "origins of life". Student shows the ability to apply moderately effective organizational and presentational skills.
  - D: 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.
  - Fail: 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.

#### Communication-intensive Course
- N

#### 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>
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<tr>
<td>Laboratory</td>
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<td>24</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>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>1 midterm, group presentations, short-essay</td>
<td>60</td>
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<tr>
<td>Examination</td>
<td>2-hour written examination</td>
<td>40</td>
<td></td>
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</tbody>
</table>

#### Required/recommended reading and online materials
- Sections from: Mason, S.F.: Chemical Evolution (Oxford University Press, 1991)

### EASC1405

<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:shli@hku.hk">shli@hku.hk</a>)</td>
</tr>
</tbody>
</table>

#### Course Objectives
- To provide students with the science backgrounds and knowledge on application of nuclear technologies in daily life and to invoke an awareness of current applications of nuclear sciences by case studies.

#### Course Contents & Topics
- Man and radiation; principles of nuclear technology; case studies of nuclear techniques applied in arts, engineering, biological, physical and social sciences; radiation on earth and beyond; industrial application of nuclear techniques; nuclear techniques in medical study. Future development in nuclear technologies.
Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 recognize the science fundamentals in nuclear technologies
- CLO 2 explain and describe the principles of nuclear technologies applied
- CLO 3 have the awareness of current applications of nuclear sciences
- CLO 4 demonstrate the knowledge and understanding of the underlying concepts associated with nuclear technologies

Pre-requisites (and Co-requisites and Impermissible combinations)
NIL

Offer in 2022 - 2023
N Offer in 2023 - 2024 : 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.

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.

Communication-intensive Course
N

Course Type
Lecture-based course

Course & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
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<tr>
<td>Lectures</td>
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<td>36</td>
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<tr>
<td>Tutorials</td>
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<td>12</td>
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<tr>
<td>Field work</td>
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<td>Group work</td>
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<td>Project work</td>
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<td>Reading / Self study</td>
<td></td>
<td>92</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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<tr>
<td>Assignments</td>
<td>Group activities and reports</td>
<td>30</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Examination</td>
<td>2-hour</td>
<td>50</td>
<td>CLO 1,2,4</td>
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<tr>
<td>Project reports</td>
<td>Individual Report</td>
<td>20</td>
<td>CLO 1,3,4</td>
</tr>
</tbody>
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Required/recommended reading and online materials
To be announced

EASC1406 Introduction to the earth-life system (6 credits) Academic Year 2022

Offering Department Earth Sciences
Course Co-ordinator Dr S Crowe, Earth Sciences (sacrowe@hku.hk)
Teachers Involved (Dr S Crowe, Earth Sciences)

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

Offer in 2022 - 2023
N Offer in 2023 - 2024 : N

Grade Descriptors (A+ to F)
A Demonstrate thorough and complete grasp of the subject in order to fulfill 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 to solve problems. Poor organization and presentational skills.
This course aims to introduce:

1. Introduction to dinosaurs:
   - Dinosaur biology.
   - How palaeontologists reconstruct ancient ecosystems using fossil and modern evidence.
   - Traits and significance of a Late Cretaceous ecosystem.
   - Therapy discovered in Erlian, including their biology and insights into the preserved ecosystem.
   - Erlian’s herbivores from the dominant hadrosaurian ornithischians to the rare sauropodomorphs and the rarer non-hadrosaurian ornithischians: Insights into herbivore biology at the time and into the local ecosystem.
   - Living with dinosaurs:
     - Theropods discovered in Erlian, including their biology and insights into the preserved ecosystem.
     - Non-dinosaurian reptiles, mammals, fish and invertebrates that lived with the dinosaurs of Erlian and their roles in the ecosystem.
   - Bringing dinosaurs and their ecosystems to life: evidence palaeontologists use to gain insight into dinosaur diet, behaviour, and growth.

The course covers five topics:

1. Introduction to dinosaurs:
2. Meat-eating dinosaurs - theropods:
   - Theropods discovered in Erlian, including their biology and insights into the preserved ecosystem.
3. Plant-eating dinosaurs - sauropodomorph and ornithischian dinosaurs:
   - Erlian’s herbivores from the dominant hadrosaurian ornithischians to the rare sauropodomorphs and the rarer non-hadrosaurian ornithischians: Insights into herbivore biology at the time and into the local ecosystem.
4. Living with dinosaurs:
   - Theropods discovered in Erlian, including their biology and insights into the preserved ecosystem.
   - Non-dinosaurian reptiles, mammals, fish and invertebrates that lived with the dinosaurs of Erlian and their roles in the ecosystem.
5. Bringing dinosaurs and their ecosystems to life: evidence palaeontologists use to gain insight into dinosaur diet, behaviour, and growth.

On successful completion of this course, students should be able to:

CLO 1 Memorise and correctly use the terminology covered.
CLO 2 Recall knowledge of dinosaur biology and demonstrate understanding of it in familiar and unfamiliar situations.
CLO 3 Remember how palaeontologists reconstruct ancient ecosystems using fossil and modern evidence and show understanding of it in familiar and unfamiliar situations.
CLO 4 Recall the traits and significance of the Late Cretaceous ecosystem of Erlian and compare and contrast Erlian with other contemporaneous ecosystems.

Communication-intensive Course

Offering Department Earth Sciences
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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<tr>
<td>Tutorials</td>
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<td>12</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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<td>80</td>
<td>CLO 1,2,3,4,5</td>
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<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
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</table>

Required/recommended reading and online materials


EASC1407 Dinosaur Ecosystems (6 credits)

Offering Department Earth Sciences
Course Co-ordinator Dr Michael Pittman, Earth Sciences (mpittman@hku.hk)
Teachers Involved (Dr Diego Pol, Museo Paleontológico Egidio Feruglio (Trelew, Argentina)) (Dr Michael Pittman, Earth Sciences) (Prof Xing Xu, Institute of Vertebrate Paleontology and Paleoanthropology (Beijing, China))
Course Objectives

The course covers five topics:

1. Introduction to dinosaurs:
2. Meat-eating dinosaurs - theropods:
   - Theropods discovered in Erlian, including their biology and insights into the preserved ecosystem.
3. Plant-eating dinosaurs - sauropodomorph and ornithischian dinosaurs:
   - Erlian’s herbivores from the dominant hadrosaurian ornithischians to the rare sauropodomorphs and the rarer non-hadrosaurian ornithischians: Insights into herbivore biology at the time and into the local ecosystem.
4. Living with dinosaurs:
   - Theropods discovered in Erlian, including their biology and insights into the preserved ecosystem.
   - Non-dinosaurian reptiles, mammals, fish and invertebrates that lived with the dinosaurs of Erlian and their roles in the ecosystem.
5. Bringing dinosaurs and their ecosystems to life: evidence palaeontologists use to gain insight into dinosaur diet, behaviour, and growth.

On successful completion of this course, students should be able to:

CLO 1 Memorise and correctly use the terminology covered.
CLO 2 Recall knowledge of dinosaur biology and demonstrate understanding of it in familiar and unfamiliar situations.
CLO 3 Remember how palaeontologists reconstruct ancient ecosystems using fossil and modern evidence and show understanding of it in familiar and unfamiliar situations.
CLO 4 Recall the traits and significance of the Late Cretaceous ecosystem of Erlian and compare and contrast Erlian with other contemporaneous ecosystems.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 Memorise and correctly use the terminology covered.
CLO 2 Recall knowledge of dinosaur biology and demonstrate understanding of it in familiar and unfamiliar situations.
CLO 3 Remember how palaeontologists reconstruct ancient ecosystems using fossil and modern evidence and show understanding of it in familiar and unfamiliar situations.
CLO 4 Recall the traits and significance of the Late Cretaceous ecosystem of Erlian and compare and contrast Erlian with other contemporaneous ecosystems.

Pre-requisites (and Co-requisites and Impermissible combinations) NIL
Offer in 2022 - 2023 N Offer in 2023 - 2024 : N

Grade Descriptors (A+ to F)

A Demonstrate thorough mastery of the knowledge and skills required for attaining all the course learning outcomes. Show strong analytical abilities and strong critical and logical thinking. Evidence of lateral thinking and original thought. Ability to apply knowledge to a wide range of complex situations, both familiar and unfamiliar.
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 good analytical abilities and good critical and logical thinking. Rare instances of lateral thinking and original thought. Ability to apply knowledge to familiar situations and some uncommon 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 abilities and some critical and logical thinking. 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 only limited analytical abilities and limited critical thinking. 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. Lack of analytical abilities and lack of critical thinking, logical thinking and coherent thinking. Show little or no ability to apply knowledge to solve problems.

Communication-intensive Course

Offering Department Earth Sciences
Course Type Lecture with laboratory component 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>
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<td>24</td>
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<tr>
<td>Laboratory</td>
<td></td>
<td>24</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
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</table>
This course provides an overview of the physical and chemical principles that govern Earth processes (Dr K H Lemke, Earth Sciences).

Teaching and Learning: E-learning components are hosted on the easy-to-use HKU Online Learning platform (https://learning.hku.hk/catalog/), whilst tutorials and labs are in person and include fossil specimens from the Department of Earth Sciences, Stephen Hui Geological Museum and the HKU Vertebrate Palaeontology Laboratory.

### EASC2401

**Fluid/solid interactions in earth processes (6 credits)**

**Offering Department**: Earth Sciences

**Course Co-ordinator**: Dr K H Lemke, Earth Sciences (kono@hku.hk)

**Course Contents & Topics**

This course provides an overview of the physical and chemical principles that govern Earth processes.

- 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 2022 - 2023**

- Y 2nd sem Offer in 2023 - 2024 : Y

**Assessment**

- Examination No Exam

**Communication-intensive Course**

- N

**Course Type**

Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
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<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>Laboratory</td>
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<td>24</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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<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>Assignments</td>
<td>lab assignments</td>
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<tr>
<td>Examination</td>
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<tr>
<td>Test</td>
<td>online weekly assessments (multiple-choice quizzes)</td>
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<td>CLO 1,2,3,4</td>
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**Recommended reading (e-books and regular books):**

EASC2402 Field and laboratory methods (6 credits)

Offering Department Earth Sciences
Course Co-ordinator Dr M Y H Li, Earth Sciences (lyhm@hku.hk)
Teachers Involved (Dr M C Cheung, Earth Sciences) (Dr M Y H Li, 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.
- 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 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

Pre-requisites and Co-requisites
Pass in EASC1401 or EASC1402

Exam and Quota
Offer in 2022 - 2023: Y
Offer in 2023 - 2024: Y
Exam No Exam

Grade Descriptors (A+ to F)
A Demonstrate thorough and complete grasp of the subject in order to fulfill most or all learning outcomes. Shows strong ability to record observations on earth processes in the field and to apply knowledge to familiar and unfamiliar situations. Evidence of strong independent analytical, critical and logical thinking. Shows strong ability to synthesize all observations made and knowledge in a field report and geological map with highly effective organizational and presentational skills.
B Demonstrate substantial grasp of the subject required for most of the learning outcome. Shows evidence of ability to record observations on earth processes in the field and to apply knowledge to familiar and some unfamiliar situations. Evidence of independent analytical, critical and logical thinking. Shows ability to synthesize all observations made and knowledge in a field report and geological map with effective organizational and presentational skills.
C Demonstrate general but incomplete grasp of the subject required for most of the learning outcome. Evidence of some ability to record observations on earth processes in the field and apply knowledge to most familiar situations. Evidence of some independent analytical, critical and logical thinking. Shows ability to synthesize most observations made and knowledge in a field report and geological map with moderately effective organizational and presentational skills.
D Demonstrate partial but limited grasp of the subject required for most of the learning outcome. Evidence of limited ability to record observations on earth processes in the field and apply knowledge to familiar situations. Evidence of some independent analytical, critical and logical thinking, but with limited analytical and critical abilities. Shows limited ability to synthesize some observations made and knowledge in a field report and geological map with barely effective organizational and presentational skills.
Fail Demonstrate little or no grasp of the subject required for most of the learning outcome. Little or no evidence of ability to record observations on earth processes in the field and show very little or no ability to apply knowledge to solve problems. Evidence of little or lack of analytical and critical abilities, coherent and logical thinking. Shows very little or no ability to synthesize observations made and knowledge in a field report and geological map with incoherent organizational and poor presentational skills.

Communication-intensive Course
Field camps

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 12 sessions x 1 hour 12
Field work 5-day field camp & 2 day trips 56
Laboratory work 12 hours paper exercises 12
Reading / Self study

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Practical Exercises 35 CLO 1.2
Report Lab Report 20 CLO 2.3,4,5.6
Test Geologic Field Work (Map + Field Report) 45 CLO 1.2,3,4,5

Required/recommended reading and online materials
Comprehensive Course Notes provided.

EASC2404 Introduction to atmosphere and hydrosphere (6 credits)

Offering Department Earth Sciences

**Course Co-ordinator**
Dr B Zhang, Earth Sciences (binzh@hku.hk)

**Teachers Involved**
(Prof B Zhang, Earth Sciences)
(Prof J R Ali, Earth Sciences)

**Course Objectives**
This course introduces the atmosphere and hydrosphere systems, and explains at a basic level how they interact with one another.

**Course Contents & Topics**
Introduction and course plan, Earth within a broader context (Solar System and other key features); Geological forces shaping the floor of the Oceans and Seas; Water Structure, Ocean Structure and Seawater Composition/Chemistry; Introduction to the Atmosphere: Heating Earth's surface and Atmosphere; Temperature; Moisture and Atmospheric Stability; Forms of condensation and precipitation; Hydrological Cycle - an overview; Air Pressure and Winds; Intro to Atmospheric Circulation and Weather Systems; Ocean Circulation; Waves; Tides; Coasts; Groundwater basics; Groundwater usage, contamination, caves and karst; Glaciers and glacial landscapes; Climate system, proxy data, causes of climate change; Effects of climate change.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1 understand the important features which distinguish Earth from the other planets within our Solar System, particularly with regards to its outer fluid envelopes
- CLO 2 appreciate that on a geological timescale, the ocean basins and the seas are continually changing their location and morphology, and why this is the case
- CLO 3 understand the key features of water, and the critical role the compound plays in the Atmosphere-Hydrosphere system
- CLO 4 understand the basic physical phenomena associated with the Atmosphere and the Oceans/Seas and their important lower-order elements
- CLO 5 have an awareness of the scientifically "hot" Atmosphere and Hydrosphere topics

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in EASC1401 or EASC1402

**Offer in 2022 - 2023**
Y 1st sem  Offer in 2023 - 2024 : Y

**Grade Descriptors (A+ to F)**
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; 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; 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; limited integration of theories, principles, evidence and techniques.
F Little or no grasp of the knowledge and understanding of the subject; little or no evidence of critical abilities and logical coherent thinking; incoherent organization and poor presentational skills; limited use of secondary sources and no critical comparison of them; little or no integration of theories, principles, evidence and techniques.

**Communication-intensive Course**
N

**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>
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<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>including tutorials &amp; discussion</td>
<td>24</td>
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<tr>
<td>Project work</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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<td>CLO 4.5</td>
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<tr>
<td>Examination</td>
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<td>CLO 1, 2, 3, 4, 5</td>
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<tr>
<td>Presentation</td>
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<td>5</td>
<td>CLO 1, 2, 3, 4, 5</td>
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**Required/recommended reading and online materials**
Tom S. Garrison: Oceanography: An Invitation to Marine Science
Frederick K. Lugens and Edward J. Tarbuck: The Atmosphere: An Introduction to Meteorology

**Additional Course Information**
If by any chance it is not possible for the group presentations to carried out, as was the case in Semester 1 2019 (November) due to the University campus activities being suspended, the associated individual essay mark will be increased from 25 to 30 and the group presentation score will be dropped.

**EASC2406**
Geochemistry (6 credits)

**Offering Department**
Earth Sciences

**Quota**
---

**Academic Year**
2022
## Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 demonstrate an understanding of basic principles of geochemistry and their applications to geological studies
- CLO 2 describe element distribution in major rocks
- CLO 3 apply the principles of isotopes to dating and studies of petrogenesis and climate changes
- CLO 4 demonstrate knowledge of the chemical weathering processes

## Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in EASC1402

## Offer in 2022 - 2023
<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
<th>Grade Descriptors (A+ to F)</th>
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<td>May</td>
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<td>F</td>
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<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>12 sessions x 2 hours</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>paper exercises</td>
<td>24</td>
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<tr>
<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>50</td>
<td>CLO 1, 2, 3, 4</td>
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<tr>
<td>Examination</td>
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<td>50</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

## Required/recommended reading and online materials
Walther J.V.: Essentials of Geochemistry (Jones and Bartlett Publishers 2005)

## EASC2407
Mineralogy (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences</td>
<td>2022</td>
</tr>
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<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Quota</th>
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<tbody>
<tr>
<td>Dr Y Li, Earth Sciences (<a href="mailto:yiliang@hku.hk">yiliang@hku.hk</a>)</td>
<td>30</td>
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<table>
<thead>
<tr>
<th>Teachers Involved</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>(Dr Y Li, Earth Sciences)</td>
<td></td>
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<tr>
<td>(Prof M Sun, Earth Sciences)</td>
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</tbody>
</table>

## 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 crystal system, mineral chemistry
- 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 (and Co-requisites and Impermissible combinations)
Pass in EASC1402

## Offer in 2022 - 2023
<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
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<td>A</td>
<td>Y</td>
<td>Dec</td>
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<tr>
<td>B</td>
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## Communication-intensive Course
N

## Lectures
12 sessions x 2 hours

## Laboratory Paper Exercises
24

## Tutorials
6

## Reading / Self Study
100

## Evaluation & Assessment

<table>
<thead>
<tr>
<th>CLO 1</th>
<th>CLO 2</th>
<th>CLO 3</th>
<th>CLO 4</th>
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<tbody>
<tr>
<td>Describe methods and systems used in classification of minerals</td>
<td>Apply the physical properties to identify rock-forming minerals</td>
<td>Describe the principle of optical mineralogy</td>
<td>Identify the common rock-forming minerals in hand specimens and thin sections</td>
</tr>
</tbody>
</table>

## Examination
May
EASC2408 Planetary geology (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Dr H Lee, Earth Sciences (mhlee@hku.hk)

Teachers Involved
Dr J Michalski,Earth Sciences
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 2022 - 2023
N

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.

Communication-intensive Course
N

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>
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</tr>
<tr>
<td>Laboratory</td>
<td>12 sessions x 2 hours</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>
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<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
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<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
<td></td>
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</tbody>
</table>

Required/recommended reading and online materials

**Course Objectives**

This course is field-based and introduces geology of China, Taiwan, Japan 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 have acquired a broad understanding of the geology of east Asia, in particular, Taiwan, Japan and/or South China
- CLO 2 be able to undertake basic field observations, stratigraphic measurements and identifications of rocks and minerals
- CLO 3 have acquired at least 3 days of experience in independent stratigraphic logging and geological mapping
- CLO 4 develop skills in integrating geological field data in determining a geological history and writing a structured field report

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in EASC1401 or EASC1402; and consent of course coordinator

**Communication-intensive Course**

N

**Course Type**

Field camps

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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</thead>
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<tr>
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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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<tr>
<td>Report</td>
<td>Dr J Ali's fieldtrip (50%) &amp; Dr AAG Webb’s fieldtrip (50%)</td>
<td>100</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Comprehensive course notes provided

**Additional Course Information**

Priority for being able to take this course is given to Year 3 and 4 students, especially those who have already participated in the linked field trip in the preceding academic year and completed the associated assignment(s), and those doing the Geology/Geology Intensive majors.

The Taiwan trip will be in early January of each year, the Kyushu trip will start in March of each year. However, in light of the current COVID-19 outbreak situation, the exact arrangement of Taiwan trip and Kyushu trip for 2020-2021 have yet to be confirmed.

The Jan 2020 fieldtrip to Taiwan (part of EASC2409) will be led by Dr Jason Ali. If the COVID-19 pandemic development makes it not viable to go to Taiwan in Jan, the Taiwan field trip will be postponed to May 2020 or a 6-day session for local field exposures will be an alternative of the Taiwan field trip (to run it preferably in early January but possibly in late May/early June).

A virtual version of Kyushu field trip (or somewhere else) will be an alternative option for the second part of EASC2409 to be carried out during the March Reading/Field trip week, subject to the COVID-19 development.
### Course Objectives

This course uses a hands-on approach to introduce the basic principles of data analysis and mathematical modeling in Earth sciences using Python through practical examples.

### Course Contents & Topics

Python programming basics; NumPy and Matplotlib; Data wrangling with Pandas; Visualisation, Maps; Statistical data analysis including distributions, hypothesis testing, regression; Time series analysis including spectrum and decomposition; Introduction to geospatial data analysis; numerical solutions to mathematical equations.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1**: Explain basic statistical concepts and their applications to earth science data processing and modeling
- **CLO 2**: Demonstrate knowledge in basic numerical methods, their applications in earth sciences, and limitations
- **CLO 3**: Apply appropriate methods to analyze, process and visualize earth science data, with the help of computer software

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in EASC1401

### Offer in 2022 - 2023

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<th>Grade Descriptors (A+ to F)</th>
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#### Assessment Methods and Weighting

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<td>CLO 1,2,3</td>
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### Course Teaching & Learning Activities

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<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>
<tr>
<td>Laboratory</td>
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</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
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<td>100</td>
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</table>

### Required/recommended reading and online materials

Python for beginners: https://www.python.org/about/gettingstarted/

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### EASC2411

**Introduction to the Earth-Life system (6 credits)**

**Offering Department**: Earth Sciences  
**Quota**: ---  
**Course Co-ordinator**: Dr Y Li, Earth Sciences (yiliang@hku.hk)  
**Teachers Involved**: (Dr Y Li, Earth Sciences)

### Course Objectives

This course provides students with an introduction to the biosphere, including physical, chemical, geological and biological interpretations on the co-evolution of life, atmosphere, hydrosphere and geosphere through deep geological time, the current Earth-Life interactions with the influence of human impact 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  
Not for students who have passed in EASC1406

### Offer in 2022 - 2023

<table>
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<th>Grade Descriptors (A+ to F)</th>
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#### Assessment Methods and Weighting

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<thead>
<tr>
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<tbody>
<tr>
<td>Methods</td>
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<tr>
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<td>CLO 1,2,3</td>
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<td>50</td>
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</tbody>
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657
Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: recognise the complexity of global climate systems
- CLO 2: recognise the controversy of anthropogenic global warming
- CLO 3: identify modern environmental issues
- CLO 4: assess the credibility of various scientific arguments

Course Contents & Topics

Global warming, greenhouse gas emission, past climates, climatic and environmental changes vs. culture evolution, natural vs. anthropogenic climate change, model projections of future climate change, scientific uncertainty, impacts of climate change, including sea level, fresh water, food, ecosystems and human health

Outcomes

Pass in EASC2404 or ENV52001

Pre-requisites

Offer in 2022 - 2023

Y 1st sem Offer in 2023 - 2024: N

Assessment Methods

<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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<tr>
<td></td>
<td>Assignments</td>
<td>50 CLO 1,2,3,4,5</td>
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<tr>
<td></td>
<td>Examination</td>
<td>50 CLO 1,2,3,4,5</td>
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</tbody>
</table>

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

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 wide range of complex, familiar and unfamiliar situations. Demonstrate critical use of data and results to draw appropriate and insightful conclusions. Show insight and critical analysis / evaluation of information drawn from a full range of high quality sources and ability to quote/reference aptly.

CLO 2: demonstrate partial but limited 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. 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.

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 familiar situations. Demonstrate modestly correct but some erroneous use of data and results to draw appropriate conclusions. Use evidence of some critical and logical thinking, and ability to apply knowledge to familiar situations. 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.

CLO 4: demonstrate limited ability to use data and results to make comparisons between different interpretations and to quote/reference aptly.

CLO 5: 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.

CLO 6: 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.
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
Pass in EASC2407

Offer in 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : Y

Assessment Methods
Examination
Methods Details Weighting in final
course grade (%) Assessment
Methods to CLO Mapping
Assignments 50 CLO 1,2,3,4
Examination 50 CLO 1,2,3,4

Communication-intensive Course
N

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 12 sessions x 2 hours 24
Lab specimen descriptions & thin-section observations under microscope 24
Lab microscope 24
Lab microscope 24

Reading / Self study 100

Assessment Methods and Weighting
Methods Details
Assignments
Examination

Assignments
Examination

Activities Details

EASC3403 Sedimentary environments (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Dr N R McKenzie, Earth Sciences (ryan00@hku.hk)

Teachers Involved
(Dr J C Liu, Earth Sciences)
(Dr N R McKenzie, Earth Sciences)

Course Objectives
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.

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

Required/recommended reading and online materials
### Course Type

Lecture with laboratory component course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>12 sessions x 2 hours</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>6 sessions x 2 hours</td>
<td>12</td>
</tr>
<tr>
<td>Field work</td>
<td>2 days trip with field project</td>
<td>8</td>
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<tr>
<td>Project work</td>
<td>Examples for sedimentary environments</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>90</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>In-class</td>
<td>40</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>Labs and Field Exercise</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 3</td>
</tr>
<tr>
<td>Test</td>
<td>Quizzes</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

Sedimentology and Stratigraphy (Second Edition), Gary Nichols

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in EASC2402 or EASC3402

### Offer in 2022 - 2023

Y 2nd sem Offer in 2023 - 2024 : 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>Demonstrate thorough grasp of the subject. Show strong analytical abilities and logical thinking. Apply highly effective organizational and presentional skills. Apply highly effective lab/fieldwork skills and techniques. Apply moderately effective organizational and presentional skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial grasp of the subject. Show strong analytical abilities and logical thinking. Apply effective lab/fieldwork skills and techniques. Apply moderately effective organizational and presentional skills.</td>
</tr>
<tr>
<td>C</td>
<td>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 presentional skills.</td>
</tr>
<tr>
<td>D</td>
<td>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 presentional skills are ineffective.</td>
</tr>
</tbody>
</table>

### Course Objectives

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.

### Course Contents & Topics

Class-room based: lecture and laboratory

- Introduction: basics on stress, strain, stress-strain relation
- Stress
- Stereonets
- Deformation mechanisms
- Strain
- Joints
- Rheology
- Faults and fault systems
- Fault plane solutions
- Folds
- Shear Zones
- Fabrics (foliosions, lineations)
- Contractional and extensional systems
- Kink method for cross-section construction
- Structurally focused map interpretation
- Balanced cross sections
- Key Structures in HK

- Fieldwork
  - Joints - Pokfulam Reservoir plus an associated day of self-survey work
  - Folds plus - Ma Shi Chau
  - Shear zone - Sai O; and overturned fold limb Ma Tso Lung

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- Understand a moderate level rock deformation
- Apply effective lab/fieldwork skills and techniques
- Interpret structural data from a geology map
- Plot and interpret structural data on a stereonet
- Appreciate 3D rock and 4D rock-time relationships
### Course Objectives
This course serves as an introduction to remote sensing of the Earth and other planets. In this course, we will focus on remote sensing of the Earth using visible, infrared, and microwave radiation.

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.
7. How to integrate remote sensing data with Geographic Information Systems (GIS)
8. How to apply remote sensing to modern problems in geoscience, climate science, planetary science, and your science.
9. How to relate your work to bigger career goals and how to be a professional scientist.
10. How to integrate your new skills into your CV so that you have an advantage in the job market.

### 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 ENV2002

### Offer in 2022 - 2023
Y 2nd sem Offer in 2022 - 2023 : Y Examination No Exam
EASC3406 Reconstruction of past climate (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)  
(Prof Z H Liu,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),
Quantitative 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

Pre-requisites (and Co-requisites and Impermissible combinations)  
Pass in EASC2401

Offer in 2022 - 2023  
N  Offer in 2023 - 2024 : Y  
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 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 moderately 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 some problem situations. Apply barely effective or ineffective 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.
Communication-intensive Course

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>2 sessions</td>
<td>4</td>
</tr>
<tr>
<td>Field work</td>
<td>1 half-day fieldtrip</td>
<td>5</td>
</tr>
<tr>
<td>Tutorials</td>
<td>8 sessions</td>
<td>16</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>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</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

---

EASC3408 Geophysics (6 credits)

Offering Department Earth Sciences

Course Co-ordinator Dr X Liu, Earth Sciences (liuxine@hku.hk)

Teachers Involved (Dr B Z Zhang, Earth Sciences)

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
- Geomagnetism
- 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

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in EASC2401 or PHYS2250

Offer in 2022 - 2023 Y 2nd sem Offer in 2023 - 2024 : Y

Grade Descriptors (A* to F)

A Demonstrated an in-depth understanding of the subject well above the expected level of an university undergraduate and achieving over 80% of total marks and an ability to pursue advance-level study in some of the geophysics subdisciplines.

B Demonstrate an understanding of the subject at the appropriate level of a university student and achieving 70% of the total course marks. A greater effort and further preparation are needed if student plans to pursue further study of geophysics.

C Coursework and examination results reflect only a basic understanding of the subject without the ability to carry out in-depth analysis. Achieved 60-70% of total course marks.

D Demonstrated an insufficient understanding of the subject as total course mark achieved is below 60%. The pass grade is reflective only of the time the student puts in on the subject.

Fail A total lack of effort and insufficient ability to understand the subject and failure to achieve 50% of the available course marks.

Communication-intensive Course

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>2 computer exercises, 2 field exercises on exploration geophysical methods</td>
<td>24</td>
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<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>Homework assignments</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>Two in-class examinations</td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,4,5</td>
</tr>
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</table>

EASC3409 Igneous and metamorphic petrogenesis (6 credits)

Offering Department Earth Sciences

Course Co-ordinator Prof G Zhao, Earth Sciences (gzhao@hku.hk)

Teachers Involved (Prof G Zhao, Earth Sciences)

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: physiochemical 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, AKF, 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 metamorphic processes and their cause-and-effect relationships with tectonic settings and crustal evolution

Pre-requisites and Co-requisites

Pass in EASC3402

Offer in 2022 - 2023

Y 2nd sem Offer in 2023 - 2024 : 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 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.

Communication-intensive Course

N

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 50 CLO 1,2,3,4
Examination 50 CLO 1,2,3,4

Required/recommended reading and online materials

John D Winter: An Introduction to Igneous and Metamorphic Petrology (Prentice Hall, 2001)

EASC3410 Hydrogeology (6 credits)

Offering Department Earth Sciences
Course Co-ordinator Prof J J Jiao, Earth Sciences (jjiao@hku.hk)

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 & Topics

Hydrologic Cycle And water Budgets, Introduction to Hydrogeology (1 Week)
Properties Of Aquifers (2 Weeks)
Hydraulic head and flow net(2 Weeks)
Basic Equations of Groundwater Flow (1 Week)
Groundwater Flow To Wells (1 Week)
Analysis Of Aquifer Test(2 Weeks)
Well installation & pumping test design(1 Week)
Regional Groundwater Flow Systems (HK case study)(1 Week)
Groundwater contamination (China case study)(Week 12)

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 appreciate the importance of hydrogeology in geotechnical and environmental engineering
CLO 2 understand basic concepts of hydrological cycle and water balance, and interaction between groundwater and surface water
CLO 3 appreciate the close relationship between groundwater system and geology and topography
CLO 4 understand basic concepts of aquifer and aquifer properties, hydraulic head, flow net, and basic principles of groundwater flow
# EASC3412: Earth resources (6 credits)

**Offering Department**: Earth Sciences  
**Course Co-ordinator**: Earth Sciences (/)  
**Quota**: 40

## 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 hand 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, porphyre deposits, volcanicogenic 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**: understand methods of exploration and exploitation for mineral deposits

## Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in EASC2402 or EASC3402

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Y 1st sem</td>
<td>Dec</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Y 1st sem</td>
<td>Dec</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Y 1st sem</td>
<td>Dec</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Y 1st sem</td>
<td>Dec</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>Y 1st sem</td>
<td>Dec</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>50</td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
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</table>

## Communication-intensive Course
N

## 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>10 x 2 hours</td>
<td>20</td>
</tr>
<tr>
<td>Field work</td>
<td>Half day field trip</td>
<td>5</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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## Required/recommended reading and online materials

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**EASC3412**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2023 - 2024</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Y 1st sem</td>
<td>Dec</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Y 1st sem</td>
<td>Dec</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Y 1st sem</td>
<td>Dec</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Y 1st sem</td>
<td>Dec</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>Y 1st sem</td>
<td>Dec</td>
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## Assessment Methods and Weighting

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<thead>
<tr>
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<tr>
<td>Assignments</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
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</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
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## Communication-intensive Course
N

## 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></td>
<td>20</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
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</table>

## Required/recommended reading and online materials
### EASC3413: Engineering Geology (6 credits)

**Offering Department:** Earth Sciences  
**Quota:** 35

**Course Co-ordinator:** Dr L N Y Wong, Earth Sciences (lnywong@hku.hk)  
**(Prof J J Jiao, Earth Sciences)**

**Course Objectives:** To present some of the concepts and skills of importance in the profession of Engineering Geology and illustrate their use by case histories.

**Course Contents & Topics:** Introduction to engineering design and the role of the Engineering Geologist; site investigation concepts and skills (air photo interpretation, soil and rock description, engineering geological plans, reporting); slopes, foundations. Case histories from Hong Kong.

**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 and skills to solve a wide range of complex, familiar and unfamiliar practical problems. 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 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.
- 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 and skills to solve most familiar, but not unfamiliar, practical problems. 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 evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge and skills to practical problems. Organization and presentational skills are minimally effective or ineffective.  
- CLO 5: 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.

**Assessment Methods and Weighting:**
- Assignments including field report: 50%  
- Laboratory reports: 50%


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### EASC3414: Soil and Rock Mechanics (6 credits)

**Offering Department:** Earth Sciences  
**Quota:** 40

**Course Co-ordinator:** Prof J J Jiao, Earth Sciences (jjiao@hku.hk)  
**(Dr L N Y Wong, 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 & Topics:** Stress and strain; properties and classifications of soil and rock; clay minerals; pore pressure and effective stress; strength and failure criteria, initial stresses and their measurement; deformation; consolidation; planes of weakness in rocks; ground treatment methods.

**Course Learning Outcomes:**
- 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:** Pass in EASC3410, or already enrolled in this course.
<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 2nd sem Offer in 2023 - 2024 : N</td>
<td>Examination May</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. 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. 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. 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. 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. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

N

**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>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>50</td>
<td>CLO 1,2,3</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**

R. F. Craig: Soil Mechanics (Chapman & Hall, 6th ed.)


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**EASC3415 Meteorology (6 credits)**

**Offering Department**

Earth Sciences

**Course Co-ordinator**

Dr Jed Kaplan, Earth Sciences (jkaplan@hku.hk)

**Teachers Involved**

(Dr J O Kaplan, Earth Sciences)

**Course Objectives**

This course will cover the five major components of meteorology: (1) thermodynamics, (2) physical meteorology, (3) observation and analysis, (4) dynamics, and (5) weather systems (cyclones, fronts, thunderstorms). The aim is to provide students with a modern understanding of drivers and behavior of weather by examining the processes that govern atmospheric structure and behavior, weather elements, and weather systems.

**Course Contents & Topics**

- Atmospheric Basics
- Solar & Infrared Radiation
- Thermodynamics
- Water Vapor
- Atmospheric Stability
- Clouds
- Precipitation Processes
- Satellites & Radar
- Weather Reports & Map Analysis
- Atmospheric Forces & Winds
- General Circulation
- Fronts & Air Masses
- Thunderstorm Fundamentals
- Thunderstorm Hazards
- Tropical Cyclones

**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.)

Pass in EASC2404

**Pre-requisites (and Co-requisites and Impermissible combinations)**

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 1st sem Offer in 2023 - 2024 : Y</td>
<td>Examination No Exam</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. 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>
</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. 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.</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. 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.</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</td>
</tr>
</tbody>
</table>
EASC3416

**Course Name:** Advanced geochemistry and geochronology (6 credits)

**Academic Year:** 2022

**Offering Department:** Earth Sciences

**Course Co-ordinator:** , Earth Sciences (/)

**Teachers Involved:**

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>To present key concepts of modern geochemistry and geochronology and their application to environmental and Earth science problems.</th>
</tr>
</thead>
</table>
| **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** | Pass in EASC2401 or EASC2406 or EASC2407 |

**Communication-intensive Course**

**Course Type:** Lecture-based course

<table>
<thead>
<tr>
<th>Activities &amp; Learning Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>16.5</td>
<td></td>
</tr>
<tr>
<td>Field work</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>20.5</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>101.5</td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>2</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>problem sets</td>
<td>15</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>in-class presentations and weather reports</td>
<td>25</td>
<td>CLO 1,4,5</td>
<td></td>
</tr>
<tr>
<td>Project report</td>
<td>research report</td>
<td>35</td>
<td>CLO 1,4,5</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>end of semester test</td>
<td>25</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


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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>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>
</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>
</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>
</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. Show 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>
</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 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.</td>
</tr>
</tbody>
</table>

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**Communication-intensive Course**

**Course Type:** Lecture with laboratory component course

<table>
<thead>
<tr>
<th>Activities &amp; Learning 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>Up to 24 hours</td>
<td></td>
</tr>
<tr>
<td>Group work</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>80</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>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>

### Required/recommended reading and online materials

Geochemistry by William M. White (Wuley, Apr 1, 2013)

### EASC3417

**Earth through time (6 credits)**

**Offering Department:** Earth Sciences  
**Course Type:** Lecture with laboratory component course  
**Course Objectives:** To introduce the concept of geological time and basic geological principles. To provide an understanding of the fossil 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 (and Co-requisites and Impermissible combinations):** Pass in EASC3403  
**Offer in 2022 - 2023:** Y  
**Grade Descriptors:**  
- **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.  
- **Fail:** 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.  
**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>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Presentation</td>
<td>Group Presentation</td>
<td>20</td>
<td>CLO 2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td>MCO Test</td>
<td>20</td>
<td>CLO 2,4,5</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials


### EASC3418

**Coasts and coastal change (6 credits)**

**Offering Department:** Earth Sciences  
**Course Co-ordinator:** Dr N Khan, Earth Sciences  
**Course Objectives:** This course offers students an opportunity to explore coastal systems through classroom studies, lab sessions and fieldtrips. Teaching material covers short-term to long-term processes of different coastal systems, natural and human drivers for coastal landform formation and evolution, and economic development and natural hazards on coastal environments.  
**Course Contents & Topics:** The content of this course includes:  
- Major coastal environments: rocky coast, beaches and dunes, lagoons, estuaries, river deltas  

669
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 (and Co-requisites and Impermissible combinations)

Pass in EASC2401 and EASC2402 OR Pass in ENVS2001

Offer in 2022 - 2023

N Offer in 2023 - 2024 : Y Examination ---

Grade Descriptors (A+ to F)

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 presentational skills.

C: 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 presentational skills.

D: 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 presentational skills.

Fail: 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 presentational skills are minimally effective or ineffective.

Communication-intensive Course

N

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 lectures @2 hours each</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Field work</td>
<td></td>
<td>16</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>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Project report</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


EASC3419

Earth System Science Field Studies (6 credits)

Offering Department

Earth Sciences

Academic Year

2022

Quota

15

Course Co-ordinator

Dr Jed O Kaplan, Earth Sciences (jkaplan@hku.hk)

Teachers Involved

(Prof G. Alexander, Earth Sciences)

Course Objectives

In this field-based course, students will study the structure and dynamic processes of coastal zones, mountain glaciers, deserts and loess landforms. Students will learn basic methods of field observation and survey so as to find out the systematics differences 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-environment relationships

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass one of the following 2000-level courses:
EASC2402 or ENVS2001 or GEOG2137
Or upon special arrangement with the course coordinator

Offer in 2022 - 2023

Y 2nd sem Offer in 2023 - 2024 : Y Examination No Exam

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 analyze the Earth system structure. Can insightfully combine the field investigation and indoor analysis to understand the interactions between the different components of the Earth system and human impact. Show high competence in integrating knowledge and presentational 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 difference between the natural and human-impacted processes. Show competence in integrating knowledge and presentational 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 apply the knowledge to analyze the 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 presentational skills.
### Course Information

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASC3999 Directed studies in earth sciences (6 credits)</td>
<td>Offered in 2022-2023. Requires 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>
</tr>
</tbody>
</table>

### Course Learning Outcomes

- **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.

### Prerequisites

- System Science Majors; and
- 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.

### Course Contents & Topics

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 encompasses range of landforms, climates, geology, soils, and biomes that are both relatively easy to access and visible over short distances.

### 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>Daily assessment</td>
<td>33</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Report</td>
<td>Video project</td>
<td>34</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td>Oral examination</td>
<td>33</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

- Required reading to be announced.
- Three two-hour pre-trip course meetings, including two film screenings and discussion.
- Practical seminar with a documentary filmmaker.

### Course Teaching & Learning Activities

- **Activities**: Directed studies in earth sciences (6 credits) are designed to enhance the student's knowledge of a particular topic and the student's self-directed learning and critical thinking skills. 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.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field work</td>
<td>Field trip (23 days x 8 hours per day)</td>
<td>184</td>
</tr>
<tr>
<td>Preparation of final video (in groups)</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Communication-intensive Course

- N

### Course Type

- Field camps

### Course Teaching & Learning Activities

- **Activities**: The student is expected to spend at least 120 hours on the project.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>

### 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>Research report</td>
<td>Report and presentation</td>
<td>100</td>
<td>CLO 1,2</td>
</tr>
</tbody>
</table>

### Quota

- Available for 2022-2023 and 2023-2024.

### Examination

- None

### Department of Earth Sciences

- Earth Sciences
- Prof Z H Liu, Earth Sciences (zhliu@hku.hk)

### Communications-intensive Course

- N

### Course Type

- Project-based course

### Course Teaching & Learning Activities

- **Activities**: The student is expected to spend at least 120 hours on the project.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
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<tbody>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>Research report</td>
<td>Report and presentation</td>
<td>100</td>
<td>CLO 1,2</td>
</tr>
</tbody>
</table>

### Grade Descriptors (A+ to F)

- **A**: Demonstrates 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 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**: Demonstrates 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 presentational skills.

- **C**: Demonstrates 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**: Demonstrates 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**: Demonstrates 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.
### EASC4403
**Biogeochemical cycles (6 credits)**

**Offering Department**: Earth Sciences  
**Course Co-ordinator**: Dr Y Li, Earth Sciences (yiliang@hku.hk)  
**Teachers Involved**: (Dr Y Li, Earth Sciences)

#### 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 ENVS3313

#### 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 most of the course learning outcome. 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. Show 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.

#### Assessment 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>50</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
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<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
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</table>

#### Communication-intensive Course
N

#### Course Teaching & Learning Activities
- **Lecture-based course**

<table>
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<tr>
<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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<td>Field work</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>54</td>
</tr>
</tbody>
</table>

#### Required/recommended reading and online materials

### EASC4406
**Earth dynamics & global tectonics (6 credits)**

**Offering Department**: Earth Sciences  
**Course Co-ordinator**: Prof G Zhao, Earth Sciences (gzhao@hku.hk)  
**Teachers Involved**: (Dr X Liu, Earth Sciences)

#### 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;  
- 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
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 how energy release within the Earth is translated into geological processes
- CLO 3 appreciate the importance of a knowledge of the history of investigation of global scale tectonic processes
- CLO 4 distill of a wide range of data to differentiate competing geological theories
- CLO 5 produce concise written and oral summaries of literature research on specific topics in global dynamics

Communication-intensive Course

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>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td>student seminars and exercises</td>
<td>20</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>essay, presentation plus additional reading</td>
<td>100</td>
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Required/recommended reading and online materials

EASC4407 Regional geology (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Dr A A G Webb, Earth Sciences (aagwebb@hku.hk)

Teachers Involved
- Dr A A G Webb, Earth Sciences
- Dr J R Ali, Earth Sciences

Course Objectives
This course explores regional geologies as well as the approaches that geologists use to resolve regional tectonic phenomena. 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 Contents & Topics
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 how energy release within the Earth is translated into geological processes
- CLO 3 appreciate the importance of a knowledge of the history of investigation of global scale tectonic processes
- CLO 4 distill of a wide range of data to differentiate competing geological theories
- CLO 5 produce concise written and oral summaries of literature research on specific topics in global dynamics

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in EASC3403 or EASC3404 or EASC3408 or EASC3409

Offer in 2022 - 2023
Y 2nd sem  Offer in 2023 - 2024 : Y Examination May

Grade Descriptors
Adopted on 5 April 2013

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 presentation 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 presentation 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 be 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 critical thinking and at least marginally effective organizational and presentation skills. Have limited ability to use data and results to draw appropriate conclusions and use and reference a variety of sources mainly in summary rather than through analysis and comparison.

Fail The student shows little or no evidence of knowledge and skills required for attaining even the minority of course learning outcomes, lacks an overall grasp of the subject area and shows an absence of analytical and critical thinking abilities. Shows little ability to a apply knowledge to solve problems and has poor and ineffective presentation and/or organizational skills. Shows little evidence of the integration of theories, principles and evidence.

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>CLO 1,2,3,4,5</td>
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<tr>
<td>Essay</td>
<td>Including essays and seminars</td>
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<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
</tbody>
</table>

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Y 1st sem  Offer in 2023 - 2024 : Y Examination No Exam
EASC4408 Special topics in earth sciences (6 credits) Academic Year 2022
Offering Department Earth Sciences Quota 30
Course Co-ordinator Dr M H Lee, Earth Sciences (mhlee@hku.hk)

Course Objectives
- Topic: Planetary system and Biogeochemistry
- 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 abiotic 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, including impacts, differentiation, and volcanism on planetary objects.

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

Offer in 2022 - 2023 N Offer in 2023 - 2024 : N Examination ---

Grade Descriptors (A+ to F)
- A Thorough grasp of the subject; evidence of strong critical abilities and logical thinking; highly effective organizational and presentation skills; insightful 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 presentation 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 presentation 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 presentation 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; incoherent organization and poor presentation skills; limited use of secondary sources and no critical comparison of them.

Communication-intensive Course
- Y Lecture with laboratory component course

Assessment Methods and Weighting
- Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
  - Assignments assignments 36.25 CLO 1,2,3
  - Essay 33.75 CLO 3
  - Test 3 tests 30 CLO 1,2

- 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

Offer in 2022 - 2023 N Offer in 2023 - 2024 : 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, 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 presentation 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 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 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 presentation 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...
EASC4911 Earth system: contemporary issues (6 credits)  Academic Year 2022

Offering Department Earth Sciences

Course Co-ordinator Dr S C Chang, Earth Sciences (suchin@hku.hk)
(Dr M C Cheung, Earth Sciences)

Teachers Involved

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 & Topics

Introductions to Contemporary Environmental Issues
Overpopulation & Natural Resources
Overpopulation & Waste Management
Global Trend in Green Technology
Global Trend in Space Exploration
Contemporary Environmental Issues & Solutions

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 mankind 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 (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 Earth System Science Major including at least two of the following courses: EASC3410, EASC3415, EASC3418 or ENV53313.

This capstone course is for Earth System Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2022 - 2023

Y 2nd sem Offer in 2023 - 2024 : Y Examination No Exam

Grade Descriptors

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. 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.

Communication-intensive Course N

Course Type Project-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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<tr>
<td>Meeting with supervisor</td>
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<td>36</td>
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<tr>
<td>Reading / Self study</td>
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<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>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>group presentation</td>
<td>30</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
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<tr>
<td>Presentation</td>
<td>individual essay</td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 6</td>
</tr>
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Required/recommended reading and online materials

Introduction to Astrobiology, Gilmour and Sephton, 2004. ISBN 9780521837361
Introduction to Organic Geochemistry, Killops and Killops, 2013. ISBN 9780852065042
In Quest of the Universe, Koupelis, 2012. ISBN: 9781449647940

Enrichment:

There are numerous opportunities to read further on the subjects presented - just ask for details.
EASC4955 Integrated field studies (6 credits)  
**Offering Department**: Earth Sciences  
**Quota**: 35  
**Course Co-ordinator**: Dr N R McKenzie, Earth Sciences (ryan00@hku.hk)  
(Or N R McKenzie,Earth Sciences)  
**Teachers Involved**: (Dr M Y H Li, Earth Sciences)  
**Dates**: 27th May-17th June 2023  
**Venue**: Indiana University Geologic Field Station. Arrive IUGFS Saturday May 27th, leave Saturday 17th June (total nights at IUGS = 21).  
Field days: Sunday 28th May-Friday 16th June (total field days = 20)  
**Tentative Schedule:**  
**WEEK 1**  
(Days 1-7): PROJECT 1 Geological Mapping & Sedimentology  
(Days 5-6): Project 1 Map area MAPPING including Field Test  
End of Day 6 - 5pm: hand in Project 1 Map  
Day 7): REST!  
**WEEK 2**  
(Days 8-14): PROJECT 2 Igneous and Metamorphic field studies  
(Days 8 & 9): Metamorphics!  
(Days 10-13): Project 2 Igneous Mapping Field Test 2  
End of Day 13-5pm: hand in Project 2, geochemical analysis, and evolution diagrams.  
(Day 14): REST!  
**WEEK 3**  
(Day 15-21) PROJECT 3 Geological Mapping & Tectonics  
(Day 15): YELLOWSTONE  
(Day 16-20): Project 3 Mapping inc. Field Test 3  
End of Day 20-4pm: Hand-in Project 3 AND Final Evolution Diagram  
**Course Learning Outcomes**  
On successful completion of this course, students should be able to:  
- CLO 1 Describe the petrography and petrogenesis of rocks and minerals.  
- CLO 2 Identify geological setting from lithologies and stratigraphy.  
- CLO 3 Measure, record and analyse structural data.  
- CLO 4 Construct geological maps and cross-sections.  
- CLO 5 Synthesize varied geological information pertaining to an area in order to derive a basic model of tectonic evolution.  
- CLO 6 Identify and basically evaluate areas of potential natural hazard/economic potential.  
**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 Major / Geology Major (Intensive).  
This must include either a PASS in, or student must be already enrolled in EASC3403, EASC3404 and EASC3409.  
This capstone course is for Geology Major/ Geology Major (Intensive) students only.  
This capstone course is for Geology Major/ Geology Major (Intensive) students only.  
**Offer in 2022 - 2023**:  
**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 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 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 grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective 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 fieldwork skills and techniques. Limited
Department of Earth Sciences

Outcomes

Course Objectives

This course aims to offer students the opportunities to gain work experience in the industry related to their major of combinations).

Course Contents & Topics

(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 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 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).

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 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.

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 2022 - 2023

Y 1st sem 2nd sem Summer Offer in 2023 - 2024 : Y Examination No Exam

Grade Descriptors Distinction/Pass/Fail

Distinction Demonstrates excellent ability in applying knowledge to solve problems in the workplace. Demonstrates excellent performance in handling and carrying out the work required in the job or assigned by supervisor(s). Establishes highly 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, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.

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.

Communication-intensive Course

N

Course Type

Internship

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures 18 sessions x 1 hour 18
Field work 18 field days x 5 hours/day 90
Reading / Self study 72

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Projects (30%) + Participation (10%) 40 CLO 1,2,3,4
Report 1 Final Project (20%) + Professionalism (10%) 30 CLO 1,2,3,4,5,6
Test Field Exams 30 CLO 1,2,3,4

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.

EASC4966 Earth sciences internship (6 credits)

Offering Department

Earth Sciences

Course Co-ordinator

Dr M C Cheung, Earth Sciences (hmcc@hku.hk)

Teachers Involved

(Or M C Cheung,Earth Sciences)

Course Description regarding working hours, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.

Written report 10 CLO 1,2,3

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Oral presentation 10 CLO 1,2,3
Supervisor's feedback 80 CLO 1,2,3
Written report 10 CLO 1,2,3

To CLO Mapping

Distinction/Pass/Fail

Grade Descriptors

Demonstration 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 fieldwork skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentional skills are minimally effective or ineffective.

Pass

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 fieldwork skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentional skills are minimally effective or ineffective.

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

2022

Quota

---

Reading / Self study

Field work

Written report

Supervisor's feedback

Internship work it is expected that students are to work at least 160 hours (or the equivalent of 4 weeks full-time)

on satisfactory mid-term examination result or laboratory performance.

On successful completion of this course, students should be able to:

To CLO Mapping

Y 1st sem 2nd sem Summer Offer in 2023 - 2024 : Y Examination No Exam

Academic Year

2022

Quota

---

General Course Information

Distinction Demonstrates excellent ability in applying knowledge to solve problems in the workplace. Demonstrates excellent performance in handling and carrying out the work required in the job or assigned by supervisor(s). Establishes highly 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, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.

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.
Department of Earth Sciences

Offering Department Earth Sciences
Course Co-ordinator Prof Z H Liu, Earth Sciences (zhliu@hku.hk)
(Various teachers (ERS),Earth Sciences), (Various teachers (SBS),Biological 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 Co-requisites
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 2022 - 2023
Year long
Offer in 2023 - 2024 : Y
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.

Communication-intensive Course
N

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 240
the project

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)
Offering Department Earth Sciences
Course Co-ordinator Dr C Not, Earth Sciences (cnot@hku.hk)

Teachers Involved
(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
The teaching and learning will be organized around key issues, and loosely divided into three sections.

Part I: The basics: application of science to solve environmental problems; key ecological, chemical, and earth
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? Can sustainable development be
achieved? Will we be able to limit our contribution to global climate change?

Course Learning Outcomes
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 oversusing our resources and compare different approaches to resolving specific
problems presented in class.

Pre-requisites and Co-requisites
NIL
and Impermissible combinations)

Offer in 2022 - 2023 | Y | 1st sem | Offer in 2023 - 2024 : Y | Examination | No Exam

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.

Communication-intensive Course

N

Course Type

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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<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td>group discussion/case studies</td>
<td>24</td>
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<tr>
<td>Field work</td>
<td>two half day field trips</td>
<td>10</td>
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<tr>
<td>Reading / Self study</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>
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<tr>
<td>Assignments</td>
<td>Assignment</td>
<td>30</td>
<td>CLO 1.2,4</td>
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<tr>
<td>Presentation</td>
<td>Group project</td>
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<td>CLO 1.2,3,4</td>
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<td>Project reports</td>
<td>Group project</td>
<td>20</td>
<td>CLO 1.2,3,4</td>
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<tr>
<td>Test</td>
<td>Quizzes</td>
<td>40</td>
<td>CLO 1.2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Keller and Botkin: Essential Environmental Science (Wiley, 2008)

ENVS2020 Biogeochemistry of the environment (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
, --- (1)

Teachers Involved

Course Objectives

Course Contents & Topics

Course Learning Outcomes

On successful completion of this course, students should be able to:

Pre-requisites (and Co-requisites and Impermissible combinations)

Offer in 2022 - 2023 | N | Offer in 2023 - 2024 : N | Examination | ---

Grade Descriptors (A+ to F)

A

B

C

D

Fail

Communication-intensive Course

N

Course Type

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Course Teaching & Learning Activities

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<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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Assessment Methods and Weighting

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</thead>
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ENVS3004 Environment, society and economics (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Dr N Khan, Earth Sciences (nskhan@hku.hk)

Teacher Involved

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 Environmental Economics

- Identification of and engagement with relevant stakeholders

Academic Year 2022

Quota ---
Resourcer 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 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : Y Examination Dec

Grade Descriptors (A+ to F)
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.
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 presentational skills.
C 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 presentational skills.
D 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 presentational skills.
Fail 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 presentational skills are minimally effective or ineffective.

Communication-intensive Course
N

Course Type
Lecture-based course

Course Teaching & Learning Activities
<table>
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<th>Activities</th>
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<td>Discussion</td>
<td>Interactive learning</td>
<td>24</td>
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<td>Reading / Self study</td>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>25</td>
<td>CLO 1,2,3</td>
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<td>Examination</td>
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<td>30</td>
<td>CLO 1,2</td>
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<td>Project reports</td>
<td></td>
<td>45</td>
<td>CLO 1,2,3</td>
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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)
Academic Year 2022
Offering Department Earth Sciences
Quota ---

Course Co-ordinator Dr N S KHAN, Earth Sciences (nkhkhan@hku.hk) (Dr N S KHAN, 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 2022 - 2023
N Offer in 2023 - 2024 : Y Examination ---

Grade Descriptors (A+ to F)
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.
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 presentational skills.
C 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 presentational skills.
Communication-intensive Course
Course Type
Lecture-based course
Course Teaching & Learning Activities

<table>
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<tr>
<th>Activities</th>
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<tr>
<td>Lectures</td>
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<tr>
<td>Tutorials</td>
<td>Project tutorials</td>
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<td>Discussion</td>
<td>Group discussion</td>
<td>16</td>
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<td>Reading / Self study</td>
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Assessment Methods and Weighting

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<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>40</td>
<td>CLO 1</td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td>40</td>
<td>CLO 1</td>
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<tr>
<td>Test</td>
<td>Four in-class quizzes</td>
<td>20</td>
<td>CLO 1</td>
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Required/recommended reading and online materials
Bryant E.: Natural Hazards (Cambridge University Press, 2005)
Hyndman and Hyndman: Natural Hazards and Disasters (Amazon, 2009)

Additional Course Information
Previous course code: ENVS2007

ENVS3042 Pollution (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Dr X Luo, Earth Sciences (xinluo@hku.hk)

Teachers Involved
(Dr X Luo, 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 2022 - 2023
Y 1st sem  Offer in 2023 - 2024 : 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. 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 errors in 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.

Communication-intensive Course
N

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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<tbody>
<tr>
<td>Lectures</td>
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<td>24</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>24</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>92</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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<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>40</td>
<td>CLO 1</td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td>40</td>
<td>CLO 1</td>
</tr>
<tr>
<td>Test</td>
<td>Four in-class quizzes</td>
<td>20</td>
<td>CLO 1</td>
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</table>
ENVS3313
Offering Department: Earth Sciences
Course Co-ordinator: Dr C Not, Earth Sciences
Course Type: Lecture with laboratory component course
Course Objectives:
1. Describe the major surface and deep currents of the ocean
2. Identify and describe important processes in the ocean controlling large scale circulation and nutrient transport
3. Describe sources and distribution of critical chemicals and sea water properties in the ocean
4. Illustrate connections between physical ocean processes, climate systems and biological activity

Course Contents & Topics:
- Ocean transport
- Data and results
- Appropriate conclusions
- Critical evaluation
- Logical and critical thinking
- Effective presentation

Additional Course Information:
- Course will be offered every year starting from 2014-2015 and coordinated by DES.

Assessment Methods and Weighting:
- Assignments: 25 CLO 1,2,3,4,5
- Examination: No Exam
- Quota: ---

ENVS3999
Offering Department: Earth Sciences
Course Co-ordinator: Dr N S Khan, Earth Sciences (nskhan@hku.hk)
Course Objectives:
- This is a Capstone Course designed to provide an opportunity for Environmental Science students to integrate the knowledge obtained through their Environmental Science courses. Through this course, students will enhance their knowledge on a particular topic in environmental science and critical thinking skills through self-directed learning. Both the written and oral report emphasize communication skills.
### Course Contents & Topics
The directed study is typically a review of the literature on a specific topic related to environmental sciences, undertaken under the supervision of a staff member. However, the exact format of the project is flexible and alternative formats can be considered with the approval of the supervisor and the Course Coordinator. The topic is flexible, but must be related to the field of environmental science. 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 work under the guidance of their supervisor to complete the study and the research report.

### 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. This capstone course is for Environmental Science Major students only.

### Offer in 2022 - 2023
<table>
<thead>
<tr>
<th>Y</th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Offer in 2023 - 2024</th>
<th>Y</th>
<th>Examination</th>
<th>No Exam</th>
</tr>
</thead>
</table>

### 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 mainly 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.

### Communication-intensive Course
- **N**: Not applicable.

### 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>research work &amp; report</td>
<td>120</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting
- **Oral presentation**: 20 (CLO 1,2)
- **Research report**: 80 (CLO 1,2)

### 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
- **Course Co-ordinator**: Dr M Yasuhara, Biological Sciences (yasuhara@hku.hk)
- **Teachers Involved**: (Dr M Yasuhara, Biological Sciences)
- **Course Objectives**: 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.

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### ENVS4955
- **Offering Department**: Earth 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 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.

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<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
</table>
| A: | Demonstrates 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. Correct 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 presentational 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. 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.
| 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 Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field work</td>
<td>Field work and other learning students will take part in at least 66 hours of field trips and other learning 68 hours</td>
<td>66</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>Laboratory reports</td>
<td>field reports</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Presentation</td>
<td>group presentations</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Project reports</td>
<td>individual report</td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Course Website**

http://www.biosch.hku.hk/ecology/lsc/

**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. Moriaki Yasuhara (yasuhara@hku.hk) and Ms. Maria Lo (gylo@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.

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**ENVS4966**

**Environmental science internship (6 credits)**

**Offering Department**

Earth Sciences

**Course Co-ordinator**

Dr N S Khan, Earth Sciences (nskhan@hku.hk)

**Teachers Involved**

(Dr N S Khan,Earth Sciences)

**Course Objectives**

This course offers students the opportunity to gain work experience related to their major of study. This work experience will allow the students to apply their knowledge gained in their studies to the real environmental issues.

**Course Contents & Topics**

In the case of the work being carried out in an external agency, students will be supervised by a staff member of the external agency (the External Supervisor) and a staff member of the University (the Internal Supervisor). If the work is carried out within HKU, there is no need for an additional internal supervisor. The work to be performed by students 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: gain at least 4 weeks of work experience environmental-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 Impermissible combinations)**

Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses 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.

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (Distinction/Pass/Fail)</th>
<th>Distinction</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Year</td>
<td>2022</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quota</td>
<td>---</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

N

**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>Oral presentation</td>
<td></td>
<td>10</td>
<td>CLO 3</td>
</tr>
<tr>
<td>Supervisor's feedback</td>
<td></td>
<td>20</td>
<td>CLO 1.2</td>
</tr>
<tr>
<td>Written report</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Course Website**

http://moodle.hku.hk/

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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.
ENVS4999 Environmental science project (12 credits)  Academic Year 2022
Offering Department Earth Sciences  Quota ---
Course Co-ordinator Dr N S Khan, Earth Sciences (nskhan@hku.hk)
Teachers Involved (Various teachers, Architecture)
Course Objectives The objective of this course is to provide an opportunity for students to integrate and apply their knowledge and skills obtained from the Environmental Science major. Students will gain experience in designing and carrying out a scientific study, and in communicating the results of their research in a professional manner.
Course Contents & Topics Students will undertake a research project in the form of an undergraduate dissertation under the supervision of a staff member. The dissertation will be written in the style of a scientific paper. The research topic is flexible but should be related to the field of Environmental Science. 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 work under the guidance of their supervisor to complete the research project.
Course Learning Outcomes 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
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; and
- 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.
Offer in 2022 - 2023 Y Year long  Offer in 2023 - 2024 : Y Examination No Exam
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 mainly 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.
Communication-intensive Course N
Course Type Project-based course
Course Teaching & Learning Activities Activities Details No. of Hours
- Reading / Self study research work & report 240
Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
- Dissertation 80 CLO 1, 2
- Oral presentation 20 CLO 2
Additional Course Information Previous course code: ENVS3015.
Consent from major coordinator is required.
**MATH1009**  
**Basic mathematics for business and economics (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>2022</td>
<td>540</td>
</tr>
</tbody>
</table>

**Course Co-ordinator:** Dr Y M Chan (1st sem); Dr K H Law (2nd sem), Mathematics  
(ymchan@maths.hku.hk; lawkaho@connect.hku.hk)

**Teachers Involved:**  
(Dr K H Law, Mathematics)  
(Dr Y M Chan, Mathematics)

**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:**

1. Logic  
2. Linear Equations  
3. Quadratic Equations  
4. Graphs and Functions  
5. Differentiation  
6. Unconstrained optimization  
7. Partial differentiation  
8. Constrained optimization  
9. Integration  
10. Geometric series  
11. Difference equations (optional)  
12. Differential equations (optional)  
13. Matrix algebra (optional)

**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  

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).

**Offer in 2022 - 2023:**

**Grade Descriptors (A+ to F):**

<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>
<th>Course Website</th>
<th>Additional Course Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture-based course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</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>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>

<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>Tutorials and Assignments</td>
<td>10</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>40</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Communication-intensive Course:** N

**Course Objectives:**

- Demonstrates an excellent understanding of key concepts and ideas by being able to identify 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.

- 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.

- 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.

- 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.

- Demonstrates poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

**Communication-intensive Course:** N

**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>Assignments</td>
<td>Tutorials and Assignments</td>
<td>10</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>40</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials:**

- Course Website: [http://moodle.hku.hk/](http://moodle.hku.hk/)
- Additional Course Information:  
  - Timetable: [https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf](https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf)  
  - Timetable: [https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf](https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf)

**MATH1011**  
**University mathematics I (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>2022</td>
<td>400</td>
</tr>
</tbody>
</table>

**Course Co-ordinator:** Dr H Y Zhang, Mathematics  
(hyzhang@maths.hku.hk)

**Teachers Involved:**  
(Dr H Y Zhang, Mathematics)

**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 formulae.
Course Learning Outcomes

On successful completion of this course, students should be able to:

- Use the set notations; calculate probabilities; and prove by induction
- Solve problems involving exponential, logarithmic and trigonometric functions
- Evaluate limits and derivatives
- Compute simple definite and indefinite integrals
- Solve practical problems such as determining maxima and minima; finding area

Pre-requisites (and Co-requisites)

Not for students: (a) with Level 2 or above in M1 or M2 of HKDSE Math or equivalent; (b) have passed or already enrolled in any of following courses: MATH1009, 1013, 1821, 1851, PHYS1150, CHEM1044, level 2 or above math courses; (c) have passed MATH1853.

Offer in 2022 - 2023

Y 1st sem 2nd sem Offer in 2023 - 2024 : Y Examination Dec 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 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 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 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, 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.

Communication-intensive Course

N

Course Type

Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<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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</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>assignments, participation, etc</td>
<td>5</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
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<td>CLO 1,2,3,4,5</td>
<td></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
http://moodle.hku.hk/

Additional Course Information

Timetable:
https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf
https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf

MATH1013

University mathematics II (6 credits)

Offering Department
Mathematics

Course Co-ordinator
Dr T W Ching, Mathematics (lmtching@maths.hku.hk)

Academic Year
2022

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'Hopital's rule.
- Higher order derivatives; maxima and minima; graph sketching.
- Radian, calculus of trigonometric functions.
- Derivative and definite 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:

- Describe properties of functions and inverse functions
- Evaluate limits, and determine continuity and differentiability of functions
- Apply advanced rules/techniques of differentiation and integration to compute derivatives and integrals; sketch graphs of functions; approximation of functions
- Solve problems involving complex numbers
- Solve simple first and second order ordinary differential equations

Pre-requisites (and Co-requisites)

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.

### 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 correctly and carefully, 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>F</td>
<td>Fail</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>10</td>
<td>CLO 1.2,3,4,5</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
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<td>CLO 1.2,3,4,5</td>
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<td>40</td>
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<td></td>
</tr>
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</table>

### Communication-intensive Course

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</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>

### Required/recommended reading and online materials

- Adrian Banner: The Calculus Lifesaver: All the Tools You Need to Excel at Calculus (Princeton University Press, 2007)
- George B. Thomas, Maurice D. Weir and Joel Hass: Thomas' Calculus (12th edition, Addison Wesley)

### Course Website

- http://moodle.hku.hk/
- Students who have passed MATH1013 are not allowed to take MATH1009.
- Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf
- https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 recognize the importance of numerical methods in mathematical modelling
- 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
**MATH1851 Calculus and ordinary differential equations (6 credits)**

**Offering Department:** Mathematics  
**Course Co-ordinator:** Dr K H Law, Mathematics (lawkaho@connect.hku.hk)  
**Teachers Involved:** (Dr K H Law, 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.  
- Bisection method 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  
Not for students who have passed MATH11013 or (MATH1851 and MATH1853), or have already enrolled in these courses.  
For BSc(ActuarSc) students only.

**Offer in 2022 - 2023**  
Y 1st sem  
Offer in 2023 - 2024 : 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 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 incorrect 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.

**Communication-intensive Course**

- **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>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Students are expected to watch videos online before classes.</td>
<td>100</td>
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</tbody>
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<th>Methods</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>Tutorials, assignments, participation, etc.</td>
<td>10</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Examination</td>
<td>Test</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)

- **Spence, Insel & Friedberg: Elementary Linear Algebra -- A Matrix Approach** (Pearson, 2014)

**Course Website**

- **http://moodle.hku.hk/**

**Additional Course Information**

- **Timetable:** [https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf](https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf)

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**MATH1821 Mathematical methods for actuarial science I (6 credits)**

**Offering Department:** Mathematics  
**Course Co-ordinator:** Dr K H Law, Mathematics (lawkaho@connect.hku.hk)  
**Teachers Involved:** (Dr K H Law, Mathematics)

**Course Contents**

- Linear algebra: Basic matrix and vector (of orders 2 and 3) operations, determinants.
- Calculus: Derivatives and integrals; Taylor approximation and error estimation.
- Differential equations: Basic matrix and vector (of orders 2 and 3) operations, determinants.
- Analysis: Limits, continuity and differentiability.
- Optimization: Maxima and minima, graph sketching.
- Numerical methods: Trapezoidal rule and Simpson’s rule.

**Pre-requisites**

- Basic matrix and vector (of orders 2 and 3) operations, determinants.
- Simple differential equations.

**Course Learning Outcomes**

- 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

**Offer in 2022 - 2023**

- **Y** 1st sem
- Offer in 2023 - 2024 : **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, 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 incorrect analyses of 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.

**Communication-intensive Course**

- **Y**

**Course Type**

- **Lecture-based course**

**Course Teaching & Learning Activities**

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<th>No. of Hours</th>
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<td>Examination</td>
<td>Test</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)

- **Spence, Insel & Friedberg: Elementary Linear Algebra -- A Matrix Approach** (Pearson, 2014)

**Course Website**

- **http://moodle.hku.hk/**

**Additional Course Information**

- **Timetable:** [https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf](https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf)

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**MATH1851 Calculus and ordinary differential equations (6 credits)**

**Offering Department:** Mathematics  
**Course Co-ordinator:** Prof Y K Lau (1st sem); Dr X Zhang (2nd sem), Mathematics (yklaumaths.hku.hk; xzhang@maths.hku.hk)

**Teachers Involved:**
- (Dr L Xu, Mechanical Engineering)  
- (Dr X Zhang, Mathematics)  
- (Dr Y Chen, Mechanical Engineering)  
- (Prof K W Chow, Mechanical Engineering)  
- (Prof Y K Lau, Mathematics)

**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'Hôpital'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, Bernoulli 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)
Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>(A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>1st sem</td>
</tr>
<tr>
<td></td>
<td>2nd sem</td>
</tr>
<tr>
<td>Offer in 2023 - 2024 : Y</td>
<td>Examination Dec May</td>
</tr>
</tbody>
</table>

### Grade Descriptors
- 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.

### Communication-intensive Course
- 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>
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<td>12</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
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<th>Details</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>10</td>
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<tr>
<td>Examination</td>
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<td>70</td>
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<tr>
<td>Test</td>
<td>2 tests</td>
<td>20</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**Course Website**

http://moodle.hku.hk/

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. Timetable:

- https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf
- https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf

**MATH1853**

<table>
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<th>Quota</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2022</td>
<td>700</td>
</tr>
</tbody>
</table>

**Offering Department**

Mathematics

**Course Co-ordinator**

Prof G Han, Mathematics (ghan@maths.hku.hk)

(Dr N Wong, Electrical & Electronic Engineering) (Dr S H Cheung, Civil Engineering)

Teachers Involved
## 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 relationship to the modelling of engineering systems. Students could be furnished 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 [arithmetic of complex numbers, representations of complex numbers, De Moivre's theorem, roots of unity, complex functions, and their applications]
- Basic probability theory [axioms of probability, conditional probability, Bayes' theorem, the total probability formula, random variable, (joint) probability distribution, expectation, variance, independence, and their applications]
- Commonly used distributions [Bernoulli, Binomial, Geometric, Negative Binomial, Exponential, Poisson and Normal distribution, and their applications]
- Basic statistics [point estimates, sample mean, sample variance with known or unknown mean, confidence interval for a population mean with known or unknown population variances, inference for proportion, and their applications]

## Course Learning Outcomes
- 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: unerringly 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

## 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, or take MATH1011 and MATH1853 concurrently in the same semester. (This course is exclusively for Engineering students.)

## Offer in 2022 - 2023
<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem</td>
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<td>2nd sem</td>
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</tr>
<tr>
<td>Offer in 2023 - 2024</td>
<td>Y</td>
</tr>
<tr>
<td>Examination</td>
<td>Dec May</td>
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<tr>
<td>Methods Details</td>
<td>Weighting in final course grade (%)</td>
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<td>CLO 1</td>
<td>20 CLO 1,2,3</td>
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<tr>
<td>CLO 2</td>
<td>80 CLO 1,2,3</td>
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</table>

## Communication-intensive Course
- Lecture-based course

## Course Type
- Lecture-based course

## Assessment Methods and Weighting
<table>
<thead>
<tr>
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<td>Assignments</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>
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## Required/recommended reading and online materials
- D.C. Lay: Linear Algebra and its Applications (Addison-Wesley, 2012, 4th ed.)
- S.J. Leon: Linear Algebra with Applications (Pearson Education, 2006, 7th ed.)

## Course Website
- http://moodle.hku.hk/

## 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. TimeTable:
- https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf
- https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf

## MATH2012
- Fundamental concepts of mathematics (6 credits)
- Academic Year: 2022

## Offering Department
- Mathematics

## 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
matics. 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 demonstrate different proof strategies (e.g. proof by contradiction and mathematical induction) in proving a mathematical statement
CLO 4 demonstrate the basic properties of equivalence relations
CLO 5 understand the definition of limits of sequences of real numbers
CLO 6 demonstrate the operational properties of groups

Pre-requisites
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).

Offer in 2022 - 2023

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 construct the truth tables of a given statement.
- 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, 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.
- F: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Communication-intensive Course
N

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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<td>Reading / Self study</td>
<td></td>
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</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>Tutorials and Assignments</td>
<td>10</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<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

Course Website
http://moodle.hku.hk/

MATH2014 Multivariable calculus and linear algebra (6 credits)

Academic Year 2022

Offering Department Mathematics

Quota ---

Course Co-ordinator Dr H Y Zhang, Mathematics (hyzhang@maths.hku.hk)

Teachers Involved (Dr H Y Zhang, Mathematics)

Course Objectives
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.

Course Contents & Topics
- Vectors and Matrices: Vectors in space, dot product and cross product, determinants (with geometric interpretations).
- Partial Derivatives: Functions of several variables, partial derivatives, extreme values and Lagrange multipliers, Taylor's formula.
- Multiple Integrals: Double and triple integrals, substitution in multiple integrals.
- Matrix Algebra: Matrix addition and multiplication, system of linear equations as a matrix equation.
- Vector Spaces: The Euclidean spaces as vector spaces, its subspaces, span of vectors, linear independence, basis and dimension.
- Eigenvalues and Eigenvectors: Diagonalization and computing powers.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the geometric meaning of partial and directional derivatives
CLO 2 optimize multivariate objective functions (with/without constraints)
CLO 3 evaluate integrals over curvilinear regions in space
CLO 4 understand the concept of vector spaces, basis, dimension
CLO 5 solve simple eigenvalue problems and apply the theory to practical problems
# Examination

<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 analyzing 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 analyzing 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 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 analyzing problems with poor argument and presentation or a number of minor computational errors.</td>
</tr>
<tr>
<td>D</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>
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# Assessment Methods & Weighting

<table>
<thead>
<tr>
<th>Details</th>
<th>Methods</th>
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</thead>
<tbody>
<tr>
<td>Weighting in final course grade (%)</td>
<td>Assignment, participation, etc</td>
</tr>
<tr>
<td>Assessment Methods to CLO Mapping</td>
<td>Assignments, tutorials,</td>
</tr>
<tr>
<td></td>
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# Required/recommended reading and online materials

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# MATH2101

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<thead>
<tr>
<th>Details</th>
<th>Methods</th>
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<tbody>
<tr>
<td>Academic Year</td>
<td>2022</td>
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# 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

- 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^2, R^3, and more general vector spaces, matrix representations of some linear transformations.
- Inner Product: Gram-Schmidt process, least square problems.
- Eigenvalue Problem: Eigenvalues and eigenvectors, diagonalization of matrices, applications.
- Eigenvalue Problem: Eigenvectors and eigenvectors, diagonalization of matrices, 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 practical problems involving the least square concept

# Pre-requisites

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.
### MATH2102 Linear algebra II (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>Dr Z Hua, Mathemastics (<a href="mailto:huazheng@maths.hku.hk">huazheng@maths.hku.hk</a>)</td>
</tr>
</tbody>
</table>

**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, invariant subspaces, cyclic subspaces, Cayley-Hamilton theorem, Jordan canonical form
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)

**Offer in 2022 - 2023**

- Y 2nd sem
- Offer in 2023 - 2024 : 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.

- **Communication-intensive Course**
  - N

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<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>

**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>10</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
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<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Offering Department**

Mathematics

**Quota**

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**Course Website**

http://moodle.hku.hk/

**Additional Course Information**

Timetable:

https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf

https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf
| 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 | Timeetable: https://hkumath.hku.hk/~math/Timetabel/Timetabale2223_S2.pdf |

<table>
<thead>
<tr>
<th>MATH2211</th>
<th>Multivariable calculus (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Mathematics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr T W Ching, Mathematics (<a href="mailto:lmtching@maths.hku.hk">lmtching@maths.hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr T W Ching, Mathematics)</td>
<td></td>
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</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
<td></td>
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</tr>
</tbody>
</table>
| 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: parametrized 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. 
- Line integrals: scalar and vector line integrals; Green's Theorem; conservative vector fields. 
- Surface integrals and vector analysis: parametrized surfaces; surface integrals; Stokes' and Gauss' Theorems. |
| 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) | Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853) |
| Offer in 2022 - 2023 | Y 1st sem 2nd sem Offer in 2023 - 2024 : 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 or 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 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. |
| Communication-intensive Course | N |
| 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 |
| | Examination 50 CLO 1,2,3 |
| | Test 40 CLO 1,2,3 |
| Required/recommended reading and online materials | Susan J. Colley: Vector Calculus (Pearson, 2011, 4th edition) |
| Course Website | http://moodle.hku.hk/ |
| Additional Course Information | Students are assumed to have mastered calculus of one-variable prior to taking this course. Timeetable: https://hkumath.hku.hk/~math/Timetabel/Timetabale2223_S1.pdf https://hkumath.hku.hk/~math/Timetabel/Timetabale2223_S2.pdf |

<table>
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<tr>
<th>MATH2241</th>
<th>Introduction to mathematical analysis (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
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<tbody>
<tr>
<td>Offering Department</td>
<td>Mathematics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof M K P Ng, Mathematics (<a href="mailto:mng@maths.hku.hk">mng@maths.hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Prof M K P Ng, Mathematics)</td>
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<td></td>
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<tr>
<td>Course Objectives</td>
<td>To introduce students to the basic ideas and techniques of mathematical analysis.</td>
<td></td>
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</tbody>
</table>
| Course Contents & Topics | - 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, monotone
Course Learning Outcomes

On successful completion of this course, students should be able to:

- 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 is expected.

- Demonstrate a good understanding 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 is expected.

- 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.

- Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems for applications, or not being able to apply the theorems correctly.

Pre-requisites and Co-requisites

Pass in MATH1013 or (MATH1851 and MATH1853) or MATH2822. Students are strongly recommended to have taken MATH2012 if they wish to take this course.

Outcomes

This course is the second 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 multivariable calculus and linear algebra. It aims at students with MATH1821. It can be followed by other 2000 or 3000 level mathematics courses.

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>Tutorials and Assignments</td>
<td>10</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>Test</td>
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<td>CLO 1,2,3,4,5</td>
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<tr>
<td></td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Communication-intensive Course

N

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>
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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 Website

http://moodle.hku.hk/

Additional Course Information

Timetable: https://hkumath.hku.hk/~math/TimeTable/TimeTable2223_S1.pdf
https://hkumath.hku.hk/~math/TimeTable/TimeTable2223_S2.pdf

MATH2822 Mathematical methods for actuarial science II (6 credits)

Offering Department: Mathematics

Teachers Involved

Dr K H Law, Mathematics (lawkaho@connect.hku.hk)

Course Objectives

This course is the second 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 multivariable calculus and linear algebra. It aims at students with MATH1821. It can be followed by other 2000 or 3000 level mathematics courses.

Course Contents & Topics

- Functions of several variables; partial differentiation.
- Gradients and directional derivatives.
- Taylor approximation.
- Maxima and minima; Lagrange multipliers.
- Double and triple integrals, areas and volumes.
- Matrices, systems of linear equations, determinants.
- Vector spaces and subspaces.
- Eigenvalues and eigenvectors, diagonalization of matrices.

Course Learning Outcomes

On successful completion of this course, students should be able to:

- 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

Pass in MATH1821.
For BSc(ActuarSc) students only.
Department of Mathematics

and Impermissible combinations) | Y | 2nd sem | Offer in 2022 - 2024 : 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 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. | Examination | --- | ---
| 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. | Examination | --- | ---
| 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. | Examination | --- | ---
| 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. | Examination | --- | ---
| 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. | Examination | --- | ---

Communication-intensive Course | N | Lecture-based course

Course Type

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
Examination | 50 | CLO 1.2
Test | 40 | CLO 1.2

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
Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf

MATH3001 Development of mathematical ideas (6 credits) | Academic Year | 2022
--- | --- | ---
Offering Department | Mathematics
Course Co-ordinator | TBC, Mathematics

Teachers Involved

Course Objectives
To acquaint the students with the origin and growth of basic mathematical concepts. To assist the students to gain a deeper 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 evolvement 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 (and Co-requisites and Impermissible combinations)
Pass in MATH2101, MATH2102, MATH2211 and MATH2241

Offer in 2022 - 2023
N | Offer in 2022 - 2024 : N | Examination
--- | --- | ---
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 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.

Communication-intensive Course | N | Lecture-based course

Course Type

Course Teaching & Learning Activities | Activities | Details | No. of Hours
--- | --- | --- | ---
Lectures | 36
Tutorials | 12
Reading / Self study | 100

Grade Descriptors (A+ to F)
### MATH3002 Mathematics seminar (6 credits)

**Offering Department:** Mathematics  
**Academic Year:** 2022

<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Dr X Zhang, Mathematics (<a href="mailto:xzhang@maths.hku.hk">xzhang@maths.hku.hk</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Objectives</strong></td>
<td>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/independent study in mathematics.</td>
</tr>
</tbody>
</table>

| **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 |
| CLO 2 | Pass in MATH2012, MATH2101, MATH2211 and MATH2241 |
| **Pre-requisites (and Co-requisites and Impermissible combinations)** | Subject to approval by the Department. |

| **Offer in 2022 - 2023** | Y | 2nd sem | 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. 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 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. 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. 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. Make little or no meaningful contributions to class discussions. Organization and presentational skills are minimally effective or ineffective. |

| **Communication-intensive Course** | N |
| **Course Type** | Project-based course |
| **Course Teaching & Learning Activities** | Activities | Details | No. of Hours |
| Meeting with supervisor | meeting of the whole class for up to three hours each teaching week | 36 |
| Reading / Self study | individual meetings with the instructors | 72 |

| **Assessment Methods and Weighting** | Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
| Oral presentation | | | 50 | CLO 1 |
| Research report | | | 50 | CLO 1 |

| **Course Website** | http://moodle.hku.hk/ |
| **Additional Course Information** | (i) Senior students who are interested in taking a seminar course are recommended to take MATH4910. |
| | (ii) This course is not a capstone course.  |
| | TimeTable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf |

### MATH3301 Algebra I (6 credits)

**Offering Department:** Mathematics  
**Academic Year:** 2022

<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Prof Y K Lau, Mathematics (<a href="mailto:yklau@maths.hku.hk">yklau@maths.hku.hk</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teachers Involved</strong></td>
<td>(Prof Y K Lau, Mathematics)</td>
</tr>
<tr>
<td><strong>Course Objectives</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>

| **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 over fields and over the integers. |

| **Course Learning Outcomes** | 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"  |
### MATH3303 Matrix theory and its applications (6 credits)

**Offering Department**: Mathematics  
**Quota**: --

**Course Co-ordinator**: Prof M K P Ng, Mathematics  
**Prof M K P Ng, Mathematics**  

**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 applications 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**:

- **CLO 1**: have a good understanding on matrices, determinants, linear transformations, eigenvalues and eigenvectors
- **CLO 2**: understand the concept of similar matrices and the eigenvalue decomposition
- **CLO 3**: understand the concept of orthogonality
- **CLO 4**: understand the concept of unitary, normal, and Hermitian matrices
- **CLO 5**: find the singular value decomposition of a matrix and apply the theory of singular values to study polar decomposition, pseudo inverse and spectral norm of matrices
- **CLO 6**: understand the concept of the Jordan blocks, Jordan matrices and the Jordan canonical form of a matrix

**Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in MATH2101 and MATH2102.

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<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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<td>Assignments</td>
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<tr>
<td>Take-home and/or in tutorials</td>
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<tr>
<td>Examination</td>
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<td>Test</td>
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</table>

**Assessment Methods to CLO Mapping**

<table>
<thead>
<tr>
<th>CLO 1</th>
<th>CLO 2</th>
<th>CLO 3</th>
<th>CLO 4</th>
<th>CLO 5</th>
<th>CLO 6</th>
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<tbody>
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<td>Pass</td>
<td>Pass</td>
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**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Dec</td>
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<tr>
<td>B</td>
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<tr>
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<tr>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Fail</td>
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**Course Website**

http://moodle.hku.hk/

**Additional Course Information**

https://hkmath.hku.hk/~math/TimeTable/TimeTable2223_S1.pdf

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**MATH3303**  
**Matrix theory and its applications (6 credits)**  
**Offering Department**: Mathematics  
**Quota**: --

**Course Co-ordinator**: Prof M K P Ng, Mathematics  
**Prof M K P Ng, Mathematics**  

**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 applications 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**:

- **CLO 1**: have a good understanding on matrices, determinants, linear transformations, eigenvalues and eigenvectors
- **CLO 2**: understand the concept of similar matrices and the eigenvalue decomposition
- **CLO 3**: understand the concept of orthogonality
- **CLO 4**: understand the concept of unitary, normal, and Hermitian matrices
- **CLO 5**: find the singular value decomposition of a matrix and apply the theory of singular values to study polar decomposition, pseudo inverse and spectral norm of matrices
- **CLO 6**: understand the concept of the Jordan blocks, Jordan matrices and the Jordan canonical form of a matrix

**Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in MATH2101 and MATH2102.

### Assessment Methods and Weighting

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<th>CLO 4</th>
<th>CLO 5</th>
<th>CLO 6</th>
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**Offer in 2022 - 2023**

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<th>Examination</th>
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<tr>
<td>C</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td></td>
</tr>
</tbody>
</table>
**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. MATH3301 recommended but not required.

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>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.</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 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.</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 weak and fragmentary argument and presentation, or with moderate computational errors.</td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
</tr>
<tr>
<td>Fail</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

N

<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>Activities</td>
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<tr>
<td></td>
<td>Lectures</td>
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<tr>
<td></td>
<td>Tutorials</td>
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<tr>
<td></td>
<td>Reading / Self study</td>
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</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></td>
<td>Assignments</td>
<td>Tutorials and Assignments</td>
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<td>CLO 1,2,3,4,5,6</td>
</tr>
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<td></td>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
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<td></td>
<td>Test</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4,5,6</td>
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</tbody>
</table>
## MATH3401 Analysis I (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Course Co-ordinator</th>
<th>Teachers Involved</th>
<th>Course Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>Prof W S Cheung</td>
<td>(Prof W S Cheung, Mathematics)</td>
<td></td>
</tr>
</tbody>
</table>

### Course Contents & Topics

- Basic properties of metric spaces; openness; closedness; interior; closure; derived set; boundary; compactness; completeness; continuity; connectedness; uniform continuity; uniform convergence; Banach's fixed point theorem.

### Course Learning Outcomes

1. **CLO 1** demonstrate knowledge and understanding of the basic features of mathematical analysis and point set topology (e.g., able to identify objects that are topological equivalent).
2. **CLO 2** apply knowledge and skills acquired in mathematical analysis to analyze and handle novel situations in a critical way (e.g., able to determine whether a specific function is uniformly continuous).
3. **CLO 3** think creatively and laterally to generate innovative examples and solutions to non-standard problems (e.g., able to provide counterexamples to inaccurate mathematical statements).

### Pre-requisites and Co-requisites

- Pass in MATH2111

### 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 acceptable argument or presentation.
- **F**: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

### Communication-intensive Course

- **N**

### 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>
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<tbody>
<tr>
<td>Examination</td>
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<td></td>
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<tr>
<td>Test</td>
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<td></td>
</tr>
</tbody>
</table>

### Communication-Intensive Course

- **N**

### Required/recommended reading and online materials

- Apostol: Mathematical Analysis
- Rudin: Principles of Mathematical Analysis

### Course Website

- [http://moodle.hku.hk/](http://moodle.hku.hk/)

### Additional Course Information

- Timetable: [https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf](https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf)

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## MATH3403 Functions of a complex variable (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Course Co-ordinator</th>
<th>Teachers Involved</th>
<th>Course Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>Dr K K Wong</td>
<td>(Dr K K Wong, Mathematics)</td>
<td></td>
</tr>
</tbody>
</table>

### 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:
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 & Topics

- Review of elementary differential equations.
- Existence and uniqueness theorems.
- Second order differential equations, Wronskian, variation of parameters.
- Power series method, Legendre polynomials, Bessel functions.
- Linear systems, autonomous systems.
- Qualitative properties of solutions.
- The Laplace transform.

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.

Communication-intensive Course

N

Course Type

Lecture-based course

Offer in 2022 - 2023

Y 2nd sem

Offer in 2023 - 2024: Y

Examination

May

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 1,2,3,4</td>
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<tr>
<td>Test</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
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</tr>
</tbody>
</table>

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)
L.V. Ahlfors: Complex Analysis (McGraw-Hill, 3rd edition)
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)

Additional Course Information

http://moodle.hku.hk/
Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf

MATH3405 Differential equations (6 credits)

Academic Year 2022

Quota --

Offering Department Mathematics

Course Co-ordinator Dr T K Wong, Mathematics (takkwong@maths.hku.hk)

Teachers Involved Dr T K Wong, Mathematics

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH2211 and MATH2241

Offer in 2022 - 2023

Y 2nd sem

Offer in 2023 - 2024: 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 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 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.
New Course

Mathematics

Course Title
Mathematics

Course Code
MATH3408

Department
Department of Mathematics

Course Learning Outcomes

On successful completion of this course, students should be able to:

- Solution of linear difference equations.
- Mathematical modelling and dynamical systems.
- Numerical differentiation and integration.
- LU factorization for solving linear system of equations.
- Solution of nonlinear systems of equations.
- Elementary differential equations and power series method.
- Numerical solutions of ordinary and partial differential equations.

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
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<th>No. of Hours</th>
</tr>
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<tbody>
<tr>
<td>Assignments</td>
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</tr>
<tr>
<td>Examination</td>
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<tr>
<td>Test</td>
<td>40 CLO 1,2,3,4</td>
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Required/recommended reading and online materials

http://aimath.org/textbooks/approved-textbooks/trench-de/
E.A. Coddington: An Introduction to Ordinary Differential Equations (Prentice-Hall)
http://moodle.hku.hk/

Additional Course Information

Timetable:
https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf

MATH3408 Computational methods and differential equations with applications (6 credits)
Academic Year 2022

Offering Department Mathematics
Quota ---

Course Co-ordinator
Prof W K Ching, Mathematics (wching@hku.hk)

Teachers Involved (Prof W K Ching,Mathematics)

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.
- Matrix norms and iterative solutions of matrix equations.
- Solution of nonlinear systems of equations.
- Elementary differential equations and power series method.
- Numerical solutions of ordinary and partial differential equations.

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 minor 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.

Communication-intensive Course

N
This course aims at introducing students to fundamental knowledge in topology and some of its applications. We will emphasize more on building geometric intuition and links between topology and other subjects. It can help prepare students for more advanced Mathematics and Physics courses and future research in Mathematics, Physics, Computer Science and Biology.

Course Contents & Topics
Topics will be chosen among the following:
(i) Basic point-set topology: topological spaces, product and quotient spaces.
(ii) Topological groups and orbit spaces.
(iii) Fundamental groups, covering spaces, surfaces.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand basic constructions in point-set topology
CLO 2 give examples and counter examples for concepts in the “course contents”
CLO 3 understand basic ideas of fundamental groups and its application to the surface classification problem

Pre-requisites
Students are recommended to have passed or already enrolled in MATH3301 and MATH3401. Pass in MATH2101, MATH2102 and MATH2241.

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)
A.Ralston and P. Rabinowitz: A First Course in Numerical Analysis (McGraw-Hill)
C. F. Gerald and P.O. Wheatley: Applied Numerical Analysis (Addison Wesley)

Course Website
http://moodle.hku.hk/

Additional Course Information
Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf

MATH3401
Introduction to topology (6 credits)

Offering Department
Mathematics

Course Co-ordinator
Prof J H Lu, Mathematics (jhlu@maths.hku.hk)

Teachers Involved
(Prof J H Lu, Mathematics)

Course Objectives
This course aims at introducing students to fundamental knowledge in topology and some of its applications. We will emphasize more on building geometric intuition and links between topology and other subjects. It can help prepare students for more advanced Mathematics and Physics courses and future research in Mathematics, Physics, Computer Science and Biology.

Course Contents & Topics
Topics will be chosen among the following:
(i) Basic point-set topology: topological spaces, product and quotient spaces.
(ii) Topological groups and orbit spaces.
(iii) Fundamental groups, covering spaces, surfaces.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand basic constructions in point-set topology
CLO 2 give examples and counter examples for concepts in the “course contents”
CLO 3 understand basic ideas of fundamental groups and its application to the surface classification problem

Pre-requisites
Students are recommended to have passed or already enrolled in MATH3301 and MATH3401. Pass in MATH2101, MATH2102 and MATH2241.

Required/recommended reading and online materials
Recommended reference:
2. M A. Armstrong: Basic topology (UTM), Springer

Course Website
http://moodle.hku.hk/

Additional Course Information
Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf

MATH3600
Discrete mathematics (6 credits)

Offering Department
Mathematics

Course Co-ordinator
Dr K H Law, Mathematics (lawkaho@connect.hku.hk)

Teachers Involved
(Prof J H Lu, Mathematics)

Course Objectives
To introduce students to the basic ideas and techniques of discrete mathematics.
### 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
- **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)

### 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 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.

- **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 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 or presentation 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 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>Tutorials, assignments, participation, etc.</td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
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<td>50</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Test</td>
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### Offer in 2022 - 2023

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<th>Semester</th>
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<th>Examination</th>
<th>Dec</th>
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<td>2022</td>
<td>Y</td>
<td>1st sem</td>
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<td>Dec</td>
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### Course Website
http://moodle.hku.hk/
### Communication-intensive Course
- **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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<tr>
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### Assessment Methods and Weighting

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<tbody>
<tr>
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<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
- Instructor's Lecture Notes
- Course Website: [http://moodle.hku.hk/](http://moodle.hku.hk/)
- Additional Course Information: [https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf](https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf)

### 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 & Topics
- 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 understand 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)

### 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 presentation or 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.
MATH3901 Operations research I (6 credits)  
Offering Department Mathematics  
Course Co-ordinator Dr Z Qu, Mathematics (zhengqu@maths.hku.hk)  
Teachers Involved (Dr Z Qu, 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. There is an equal emphasis on all the three aspects of theories, algorithms and applications. The course serves, together with the course MATH3943 Network Models in Operations Research, as essential concept and background for more advanced studies in operations research.  
Course Contents & Topics - Linear programming  
- Duality theory  
- Sensitivity analysis and parametric linear programming  
- Ellipsoid methods  
- Interior point 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 2022 - 2023: Y  
Academic Year 2022  
Grade Descriptors (A+ to F)  
A Demonstrate an excellent understanding of key concepts and ideas by being able to identify basic principles, appropriate 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 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 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 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 algorithms, or their applications, or not being able to complete or compute the solution.  
Assessment Methods & Weighting  
Assignments Coursework assessment 10 CLO 1,2,3  
Examination 50 CLO 1,2,3  
Assignments Coursework assessment 10 CLO 1,2,3  
Examination 50 CLO 1,2,3  
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping  
Assignments Coursework assessment 10 CLO 1,2,3  
Examination 50 CLO 1,2,3  
Test Two midterm tests 40 CLO 1,2,3  
Communication-intensive Course N  
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  
Required/recommended reading and online materials J.P. Ignizio and T.M. Cavalier: Linear Programming (Prentice-Hall International, 1994)  
Course Website http://moodle.hku.hk/  
Additional Course Information Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf  
MATH3904 Introduction to optimization (6 credits)  
Offering Department Mathematics  
Course Co-ordinator Prof W Zang, Mathematics (wzang@maths.hku.hk)  
Teachers Involved (Prof W Zang, Mathematics)  
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 Outcomes On successful completion of this course, students should be able to:  
CLO 1 demonstrate knowledge and understanding of the basic theory and techniques of optimization  
CLO 2 demonstrate an acceptable understanding of key concepts and ideas by being able to identify basic principles, appropriate algorithms, and their applications but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.  
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 2022 - 2023: Y  
Academic Year 2022  
Grade Descriptors (A+ to F)  
A Demonstrate an excellent understanding of key concepts and ideas by being able to identify basic principles, appropriate 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 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 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 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 algorithms, or their applications, or not being able to complete or compute the solution.  
Assessment Methods & Weighting  
Assignments Coursework assessment 10 CLO 1,2,3  
Examination 50 CLO 1,2,3  
Assignments Coursework assessment 10 CLO 1,2,3  
Examination 50 CLO 1,2,3  
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping  
Assignments Coursework assessment 10 CLO 1,2,3  
Examination 50 CLO 1,2,3  
Test Two midterm tests 40 CLO 1,2,3  
Communication-intensive Course N  
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  
Required/recommended reading and online materials J.P. Ignizio and T.M. Cavalier: Linear Programming (Prentice-Hall International, 1994)  
Course Website http://moodle.hku.hk/  
Additional Course Information Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf
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<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
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<tr>
<td>B</td>
<td>Tutorials</td>
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<tr>
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<td>Examination</td>
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<td>Test</td>
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<tr>
<th>Required/recommended reading and online materials</th>
<th>Instructor’s lecture notes</th>
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<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
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<tr>
<td>Additional Course Information</td>
<td>Timetable: <a href="https://hkmath.hku.hk/~math/Timetable/Timetable2223_S1.pdf">https://hkmath.hku.hk/~math/Timetable/Timetable2223_S1.pdf</a></td>
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<th>MATH3905 Queueing theory and simulation (6 credits)</th>
<th>Academic Year</th>
<th>Quota</th>
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<tbody>
<tr>
<td>Offering Department</td>
<td>Mathematics</td>
<td>---</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr G Han, Mathematics (<a href="mailto:ghan@maths.hku.hk">ghan@maths.hku.hk</a>)</td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)</td>
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<tr>
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<td>Grade Descriptors (A+ to F)</td>
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<td>B</td>
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<td>C</td>
<td>Reading / Self study</td>
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<th>Communication-intensive Course</th>
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<tbody>
<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
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<td>------------------------------------------------</td>
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<tr>
<td>Activities</td>
<td>Reading / Self study</td>
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</table>
### MATH3906

**Offering Department**
- Mathematics

**Course Co-ordinator**
- Dr G Li, Mathematics (lotusli@maths.hku.hk)

**Teachers Involved**
- (Dr G Li, Mathematics)

**Course Objectives**
- This course gives an elementary treatment for the modeling of financial derivatives, asset pricing and market risks from an applied mathematician's point of view. Stochastic calculus and solution methods will be introduced.

**Course Contents & Topics**
- An introduction to financial instruments: stocks, bonds, options, forward and future contracts.

**Course Learning Outcomes**

- 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 and Impermissible combinations)**

- Pass in MATH2211 or MATH2014 or MATH2822.
- Students are strongly recommended to have passed or already enrolled in MATH3603 or STAT2601.

**Offer in 2022 - 2023**
- Y 2nd sem Offer in 2022 - 2024 : 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.
- E 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.

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<td>Examination</td>
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<td>CLO 1,2,3,4</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**

**Course Website**
- http://moodle.hku.hk/~math/Timetable/Timetable2223_S2.pdf

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### MATH3911

**Game theory and strategy (6 credits)**

**Offering Department**
- Mathematics

**Course Co-ordinator**
- Prof T W Ng, Mathematics (ntw@maths.hku.hk)

**Teachers Involved**
- (Prof T W Ng, Mathematics)

**Course Objectives**
- Game theory is the logical analysis of situations of conflict and cooperation. This course will introduce the students to the basic ideas and techniques of mathematical game theory in an interdisciplinary context.
- - Combinatorial games and Zermelo's Theorem; Prisoner's Dilemma; pure and mixed strategies, minimax theorem; mixed Nash equilibria.
- - Application to biology: evolutionary stable strategies; games in coalition form; Shapley value.
- - Application to politics: Shapley-Shubik power index; core and von Neumann-Morgenstern solution; bargaining set.

**Course Contents & Topics**

- Application to politics: Shapley-Shubik power index; core and von Neumann-Morgenstern solution; bargaining set.
- Application to biology: evolutionary stable strategies; games in coalition form; Shapley value.
- - Combinatorial games and Zermelo's Theorem; Prisoner's Dilemma; pure and mixed strategies, minimax theorem; mixed Nash equilibria.
- - Application to biology: evolutionary stable strategies; games in coalition form; Shapley value.
- - Application to politics: Shapley-Shubik power index; core and von Neumann-Morgenstern solution; bargaining set.
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**Assessment Methods and Weighting**

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<td>CLO 1,2,3,4</td>
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<tr>
<td>Test</td>
<td>50</td>
<td></td>
<td>CLO 1,2,3,4</td>
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</tr>
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</table>

**Required/recommended reading and online materials**
- R.B. Cooper: Introduction to Queueing Theory (Edward Arnold, 1981, 2nd ed.)

**Course Website**
- http://moodle.hku.hk/
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 and Impermissible combinations)
Pass in (MATH2101 and MATH2211) or (MATH1821 and MATH2822)

Offer in 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : Y Examination May

Grade Descriptors (A+ to F)

<table>
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</tr>
<tr>
<td>B</td>
<td>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.</td>
</tr>
<tr>
<td>C</td>
<td>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.</td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
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<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>
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Communication-intensive Course
N

Course Type
Lecture-based course

Course Teaching & Learning Activities

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<th>Activities</th>
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<th>No. of Hours</th>
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<tr>
<td>Lectures</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
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Assessment Methods and Weighting

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<tr>
<td>Assignments</td>
<td>Tutorials, assignments, project, participation, etc.</td>
<td>25</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination Test</td>
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<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
<td>CLO 1,2,3</td>
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Required/recommended reading and online materials

Course Website
http://moodle.hku.hk/

Additional Course Information
Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf

MATH3943 Network models in operations research (6 credits)

Offering Department
Mathematics
Quota ---

Course Co-ordinator
Dr. K H Law, Mathematics (lawkaho@connect.hku.hk)

Teacher Involved
(Dr K H Law, Mathematics)

Course Objectives
The course objective is to provide a fundamental account of the basic results and techniques of network models in operations research. There is an equal emphasis on all three aspects of understanding, algorithms and applications. The course serves, together with a course on linear programming, to provide essential concept and background for more advanced studies in operations research.

Course Contents & 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.

Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : N Examination Dec

Grade Descriptors (A+ to F)

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</table>
### MATH3999 Directed studies in mathematics (6 credits)

**Offering Department:** Mathematics  
**Course Co-ordinator:** Prof X Yuan, Mathematics (xmyuan@hku.hk)

**Course Objectives:** This course is designed for students who would like to have early experiences on research related independent studies.

**Course Contents & Topics:** The subject matter of the project will be determined by consultation between the student and the supervisor. The student must achieve good standing and get the approval from both the prospective supervisor and the course coordinator to take this course.

**Course Learning Outcomes:** On successful completion of this course, students should be able to:
- CLO 1: study independently a topic that is not available in the regular curriculum
- CLO 2: gain understanding how mathematical theories are applied and/or extended in problem-solving
- CLO 3: experience in project writing and oral presentation

**Pre-requisites and Impermissible combinations:** 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 2022 - 2023:** Y  
**Academic Year:** 2022  
**Quota:** ---

**Communication-intensive Course**  
**Course Type:** Project-based course  
**Course Teaching & Learning Activities:**  
- **Activities:** Reading / Self study  
- **Details:** independent work & to attend meetings & seminars  
- **No. of Hours:** 120

**Assessment Methods and Weighting:**

<table>
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<tr>
<th>Methods</th>
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<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Dissertations</td>
<td>Written report plus oral presentation</td>
<td>100</td>
<td>CLO 1.2.3</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**  
**Course Type:** Lecture-based course  
**Course Teaching & Learning Activities:**  
- **Activities:** Lectures
- **Details:**  
- **No. of Hours:** 36
- **Tutorials:**  
- **Details:**  
- **No. of Hours:** 12
- **Reading / Self study:**  
- **Details:** Students are expected to watch videos online before classes.  
- **No. of Hours:** 100

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**Course Website:** [http://moodle.hku.hk/](http://moodle.hku.hk/)

**Additional Course Information:**  
**Timetable:** https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf

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### MATH4302 Algebra II (6 credits)

**Offering Department:** Mathematics  
**Academic Year:** 2023  
**Quota:** ---

**Communication-intensive Course**  
**Course Type:** Lecture-based course  
**Course Teaching & Learning Activities:**  
- **Activities:** Lectures
- **Details:**  
- **No. of Hours:** 36
- **Tutorials:**  
- **Details:**  
- **No. of Hours:** 12
- **Reading / Self study:**  
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- **No. of Hours:** 100

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</table>
Course Co-ordinator
Dr Z Hua, Mathematics (huazheng@maths.hku.hk)

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 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : 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 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 identify the 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.

Communication-intensive Course
N

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures
Tutorials
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

Course Website
http://moodle.hku.hk/

Additional Course Information
Timetable:
https://hkumath.hku.hk/~math/Timetable/Timetable2223_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 $\mathbb{R}^n$, method of Lagrange multipliers.
- Integration in $\mathbb{R}^n$: 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 apply knowledge and 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 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : Y Examination May
### MATH4404 Functional analysis (6 credits)

**Offering Department**: Mathematics  
**Quota**: ---  
**Course Co-ordinator**: Dr C Y Hui, Mathematics (chhui@maths.hku.hk)  
**Teachers Involved**: (Dr C Y Hui, Mathematics)  
**Academic Year**: 2022

#### 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
Pass in MATH2101, MATH2102, MATH2211, MATH2241 and MATH3401

#### Offer in 2022 - 2023
**Y**  
**Offer in 2023 - 2024**: **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 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, 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.  
- **C**: Demonstrate an acceptable 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.  
- **D**: Demonstrate poor and inadequate understanding of key concepts and ideas 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.

**Communication-intensive Course**: N

#### Course Type
Lecture-based course

### Assessment Methods and Weighting
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<td>Test</td>
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<td></td>
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**Required/recommended reading and online materials**
- Apostol: Mathematical Analysis  
- Munkres: Analysis on Manifolds  
- Rudin: Principles of Mathematical Analysis  
- Spivak: Calculus on Manifolds

**Course Website**
http://moodle.hku.hk/  
**Additional Course Information**
Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf
### MATH4406
#### Introduction to partial differential equations (6 credits)

**Offering Department:** Mathematics  
**Quota:** ---  
**Selection:**  
**Course Co-ordinator:** Dr T K Wong, Mathematics (takkwong@maths.hku.hk)  
**Course Website:** http://moodle.hku.hk/  
**Pre-requisites:**  
- Pass in MATH3405, or already enrolled in this course.  

**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  

**Course Contents & 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.  

**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 Mappings</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>Test</td>
<td>30</td>
<td></td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Grade Descriptors:**  
<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>CLO Mapping</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>
<td>CLO 1,2,3,4</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>
<td>CLO 1,2,3,4</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>
<td>CLO 1,2,3,4</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>
<td>CLO 1,2,3,4</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>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Communication-intensive Course:** N

**Course Type:** Lecture-based course

#### Additional Course Information
- **Course Website:** http://moodle.hku.hk/
- **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.
- Riemannian Geometry of surfaces; applications.
- Some applications, e.g. to Maxwell theory of electromagnetism.

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

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 and MATH3405.

Offer in 2022 - 2023
N Offer in 2023 - 2024 : 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 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.

Communication-intensive Course
N

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>
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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>100</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting
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<tr>
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</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Course Website
http://moodle.hku.hk/
Additional Course Information
Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf

MATH4511 Introduction to differentiable manifolds (6 credits)
Offering Department Mathematics
Quota 2022

Course Co-ordinator
Prof J H Lu, Mathematics (jhlu@maths.hku.hk)

Teachers Involved
(Prof J H Lu, Mathematics)

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.
- Further topics.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 speak the language of differentiable manifolds such as that of vector fields, differential forms, vector bundles, and integration on manifolds
CLO 2 present a number of examples of differentiable manifolds and carry out explicit calculations on such examples

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in MATH3401 or MATH3541. It would be helpful if students have also taken or are concurrently taking MATH4402.

Offer in 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : N 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 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.
Communication-intensive Course

<table>
<thead>
<tr>
<th>Course Type</th>
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<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
</tr>
<tr>
<td></td>
<td>Lectures</td>
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<tr>
<td></td>
<td>Tutorials</td>
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Assessment Methods and Weighting

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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td>CLO 1.2</td>
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</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1.2</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>40</td>
<td>CLO 1.2</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk/

Additional Course Information

Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf

MATH4602

**Scientific computing (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Mathematics</th>
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</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof W K Ching, Mathematics (<a href="mailto:wching@hku.hk">wching@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Prof W K Ching, Mathematics)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To learn some basic theoretical and computational techniques for solving scientific computing problems.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>This course covers matrix computation problems, least squares problems, numerical methods in differential equations and partial differential equations, etc. The contents may slightly vary from year to year.</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 apply direct methods to solve linear systems</td>
</tr>
<tr>
<td></td>
<td>CLO 2 apply iterative methods to solve linear systems</td>
</tr>
<tr>
<td></td>
<td>CLO 3 apply basic numerical methods to compute eigenvalues and eigenvectors of a matrix</td>
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<td></td>
<td>CLO 4 implement singular value decomposition and understand its applications</td>
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<tr>
<td></td>
<td>CLO 5 understand basic theory and numerical methods for least squares problems</td>
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<tr>
<td></td>
<td>CLO 6 apply numerical methods to solve differential equations and partial differential equations</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in MATH3601</td>
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</tbody>
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**Offer in 2022 - 2023**

<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></td>
<td>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.</td>
<td>Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and numerical algorithms and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems and numerical algorithms or their applications and presentation or with some minor computational errors.</td>
<td>Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems and numerical algorithms, but with some inadequacies in applying them through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
<td>Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems and numerical algorithms, but with substantial inadequacies in applying them through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
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<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
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<tr>
<td></td>
<td>Lectures</td>
</tr>
<tr>
<td></td>
<td>Tutorials</td>
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<td>Reading / Self study</td>
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Assessment Methods and Weighting

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<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td>CLO 1.2, 3, 4, 5, 6</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1.2, 3, 4, 5, 6</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>40</td>
<td>CLO 1.2, 3, 4, 5, 6</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk/

Additional Course Information

Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf
MATH4902  Operations research II (6 credits)  Academic Year 2022

Offering Department  Mathematics  Quota  ---
Course Co-ordinator  Dr G Han, Mathematics (ghan@maths.hku.hk)

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, queuing theory and simulation
CLO 2 explain the typical techniques employed in dynamic programming, Markov decision process, queuing 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 2022 - 2023  N  Offer in 2023 - 2024 : 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 identity 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.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate a good understanding of key concepts and ideas by being able to identify basic principles, appropriate algorithms and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate algorithms 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 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.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate some understanding of key concepts and ideas by being able to identify basic principles, appropriate 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.</td>
</tr>
<tr>
<td>F</td>
<td>Fail</td>
</tr>
</tbody>
</table>

Communication-intensive Course  N

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
P. Thie: Markov Decision Processes (COMAP, Inc. 1983)

Course Website  http://moodle.hku.hk/

MATH4907  Numerical methods for financial calculus (6 credits)  Academic Year 2022

Offering Department  Mathematics  Quota  ---
Course Co-ordinator  Dr G Li, Mathematics (lotusli@maths.hku.hk)

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.

Course Contents & Topics
- Introduction to the mathematical theory of vanilla and exotic options, both the PDE and the Martingale approach.
- Lattice methods, Monte Carlo simulations and their performance analyses.
- Neural networks for option pricing & hedging.

Course Learning Outcomes
On successful completion of this course, students should be able to:
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 MATH3906 or equivalent.

Offer in 2022 - 2023  Y  1st sem  Offer in 2023 - 2024 : Y  Examination  Dec
This seminar style capstone course aims to provide students with the experience of intense reading of journal articles and book chapters, followed by group discussions through which knowledge acquisition and synthesis will be attained. Students will look at particular mathematical topics in depth, and will master the topics through reading, listening, discussing and writing.

Course Contents & Topics
This seminar course may be in the form of research seminar, reading seminar, or a combination of both. Research seminar provides first-hand research experience to students, who will discuss the advancement of knowledge brought about by the readings, and the difficulties they encounter in the research process. Reading seminar involves discussions on arguments delivered by the authors of books or articles, and how convincing the arguments are. Participants will experience the process of argumentation in the construction of knowledge and development of research ideas. Student performance is manifested in their preparedness, quality of comments, responsiveness to comments and overall engagement in the seminar. The end product is a research paper or written report and oral presentations. Topics will be chosen by the instructors, including journal articles and book chapters.

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)
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. 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, and subject to approval by the Department.

Offer in 2022 - 2023
Grade Descriptors (A+ to F)
A Demonstrate an excellent understanding of the material by lucid exposition. Engage constructively by providing insightful analyses and raising critical points in group discussion. Demonstrate mostly clear and effective analysis, synthesis, and application of the knowledge through writing and oral presentation using mathematical language.
B Demonstrate a good understanding of the material by mostly clear and effective presentation. Engage actively in group discussion most of the time by providing helpful points and asking questions that advance the discussion. Demonstrate mostly clear and effective analysis, synthesis, and application of the knowledge through writing and oral presentation using mathematical language.
C 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.
D Demonstrate a basic but limited understanding of the material by partially effective presentation. Plays a passive role, or gives limited useful contribution to group discussion. Demonstrate limited or barely effective analysis, synthesis, and application of the knowledge through writing and oral presentation using mathematical language.
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.

Communication-intensive Course
N
Examination
Department of Mathematics

Course Teaching & Learning Activities
Activities | Details | No. of Hours
--- | --- | ---
Meeting with supervisor | Seminars: Students take turns to give presentations to the whole class; group discussions. | 36
Reading / Self study | Reading material and preparation for presentations and discussions; writing of reports/research papers. | 100

Assessment Methods and Weighting
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Oral presentation | Based on seminar presentations, class participations and group discussions. | 60 | CLO 1,2,3
Research report | Written report / research paper: Individual and/or group reports/research papers totally no more than 10,000 words. | 40 | CLO 1,2,3

Required/recommended reading and online materials
Course Website: http://moodle.hku.hk/
Additional Course Information: http://hkumath.hku.hk/~math/Timetable/timetable2122_S2.pdf

MATH4911 Mathematics capstone project (6 credits) | Academic Year: 2022
Offering Department: Mathematics
Course Co-ordinator: Prof T W Ng, Mathematics (ntw@maths.hku.hk)
Course Objectives: Students will work collaboratively in small groups on a project under the guidance of their supervisor(s). This capstone project is on the integration and/or application of mathematical knowledge acquired by the students. The project topic is not limited to academic context, but can also be extended to a community or corporate outreach project. Projects may take the form of a combination of literature research, survey, data analysis, creation of artifacts or media contents, exhibition, public talks, development of solution plan for the problem under study, etc. Assessment may take the form of written report, oral presentation, promotion, portfolio, and/or peer evaluation, etc. Topics are either chosen by the supervisor(s), or proposed by the students and approved by their supervisor(s).

Course Contents & Topics: This course aims to provide students an experience of engaging in a project which requires integration and/or application of the mathematical knowledge they have acquired. On successful completion of this course, students should be able to:
- CLO 1 integrate and apply mathematical knowledge they have previously acquired
- CLO 2 work collaboratively with others
- CLO 3 communicate their project topic to experts and/or lay audiences through suitable media using appropriate mathematical terms and language

Pre-requisites (and Co-requisites and Impermissible combinations): This capstone course is for Mathematics / Mathematics (Intensive), and Mathematics/Physics Majors students only. This course is for third and fourth year students only. The earliest that a student is allowed to take this capstone course is their year 3 study. 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; and subject to approval by the Department.

Offer in 2022 - 2023: N
Grade Descriptors (A+ to F):
- A Demonstrate excellent and creative integration and/or application of the mathematical knowledge previously acquired. Take initiative in, and collaborate highly effectively on, the project. Communicate effectively through suitable media using appropriate mathematical terms and language.
- B Demonstrate good integration and/or application of the mathematical knowledge previously acquired. Participate actively in, and collaborate mostly effectively on, the project. Communicate mostly effectively through suitable media using appropriate mathematical terms and language.
- C Demonstrate a general level of integration and/or application of the mathematical knowledge previously acquired. Demonstrate moderately effective collaboration on the project. Moderately effective communication using mathematical terms and language.
- D Demonstrate some partial integration and/or application of the mathematical knowledge previously acquired. Demonstrate barely effective collaboration on the project. Show limited ability to effectively communicate using mathematical terms and language.
- Fail Demonstrate weak or poor integration and/or application of the mathematical knowledge previously acquired. Show passive participation in, and ineffective collaboration on, the project. Communicate ineffectively using mathematical terms and language.

Communication-intensive Course: N

Course Teaching & Learning Activities
Activities | Details | No. of Hours
--- | --- | ---
Meeting with supervisor | Students meet with their supervisor(s) to present results or to discuss their progress. | 20
Assessment | Project work: Students work on their project | 130

Assessment Methods and Weighting
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Dissertation | Coursework assessment: Based on participation and collaboration throughout the whole project. | 20 | CLO 1,2,3
Oral presentation | Oral presentation components of the project may include seminars, lectures, oral reports, audio recordings, etc. | 30 | CLO 1,2,3
Research report | Written report / media production: This part may include written reports, booklets, exhibition | 50 | CLO 1,2,3

Additional Course Information:
Course Website: http://moodle.hku.hk/
Additional Course Information:
http://hkumath.hku.hk/~math/Timetable/timetable2122_S2.pdf
### MATH4999 Mathematics project (12 credits)

**Offering Department**
Mathematics

**Course Co-ordinator**
Prof X Yuan, Mathematics (xmyuan@hku.hk)

**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 Contents & Topics**
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 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**

<table>
<thead>
<tr>
<th>CLO</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>study independently and in depth an advanced topic</td>
</tr>
<tr>
<td>2</td>
<td>analyze and synthesize information gathered from different sources</td>
</tr>
<tr>
<td>3</td>
<td>articulate their findings and conclusions</td>
</tr>
<tr>
<td>4</td>
<td>give an exposition of their work in a written report</td>
</tr>
</tbody>
</table>

**Assessment Weighting**

<table>
<thead>
<tr>
<th>CLO</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>50</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
TBC

**Course Website**
http://moodle.hku.hk/

**Additional Course Information**
The offered topics and application procedure are released by email from the Department. Sophomore or above students who have declared Major in Mathematics/Mathematics (Intensive) will receive emails in June. The application results will be announced in late July or early August. For enquiry, please contact the Department. The final report must be submitted by the end of the semester. The deadline for submission will be announced in the due course.

**Offering Department**
Mathematics

**Course Co-ordinator**
Dr T K Wong, Mathematics (internship@maths.hku.hk)

**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 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 department.

**Course Contents & Topics**
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.

**Communication-intensive 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 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.

**Department of Mathematics**

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2022
<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>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. 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; and subject to approval by the Department.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer in 2022 - 2023 Grade Descriptors (A+ to F)</td>
<td>Y Year long Offer in 2022 - 2024 : Y Examination No Exam</td>
</tr>
<tr>
<td>A</td>
<td>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.</td>
</tr>
<tr>
<td>B</td>
<td>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 moderately effective organizational and presentation skills.</td>
</tr>
<tr>
<td>C</td>
<td>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.</td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate poor and inadequate understanding by not being able to identify 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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Type</td>
<td>Project-based course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities Details No. of Hours</td>
</tr>
<tr>
<td>Reading / Self study &amp; to attend meetings &amp; seminars</td>
<td>independent work &amp; to attend meetings &amp; seminars</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Activities Details Weighting in final course grade (%) Assessment Methods to CLO Mapping</td>
</tr>
<tr>
<td>Dissertation</td>
<td>Written report plus oral presentation</td>
</tr>
</tbody>
</table>

| Additional Course Information | The offered topics and application procedure are released by email from the Department. Sophomore or above students who have declared Major in Mathematics/Mathematics (Intensive) will receive emails in June. The application results will be announced in late July or early August. For enquiry, please contact the Department. The final report must be submitted by the end of the 2nd semester. The deadline for submission will be announced in the due course. |

<table>
<thead>
<tr>
<th>MATH7101 Intermediate complex analysis (6 credits)</th>
<th>Academic Year 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Mathematics</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof N Mok, Mathematics (<a href="mailto:nmok@hku.hk">nmok@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Prof N Mok,Mathematics)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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, elliptic functions, Poicare series, the Mittag-Leffler Problem and the Weierstrass Problem on compact Riemann surfaces and on open Riemann surfaces.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>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</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Pass in a first course in Complex Analysis such as MATH3403, and approval by the course coordinator.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer in 2022 - 2023 Grade Descriptors (A+ to F)</td>
<td>Y 1st sem Offer in 2023 - 2024 : Y Examination No Exam</td>
</tr>
<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>

<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities Details No. of Hours</td>
</tr>
<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Test</strong></td>
<td>Written midterm test and written/oral assessment</td>
</tr>
</tbody>
</table>

**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)
- K.G. Krantz, Geometric Function Theory (Birkhauser, 2006)

**Course Website**
http://moodle.hku.hk/

**Additional Course Information**
Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S1.pdf

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### MATH7201

**Topics in geometry (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Co-ordinator</strong></td>
<td>TBC, Mathematics</td>
</tr>
</tbody>
</table>

**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.

**Course Contents & Topics**
- 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 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 able to learn other topics in Geometry
- Pass in (MATH4402 or MATH4501) and (MATH4511 or the approval of the course coordinator)

**Pre-requisites and Co-requisites**

- The course concludes with a choice of topics on analytic and geometric aspects of the theory of complex

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade Descriptors (A+ to F)</strong></td>
<td></td>
</tr>
<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>

**Communication-intensive Course**
N

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Teaching &amp; Learning Activities</strong></td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Lectures</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><strong>Assignments</strong></td>
<td>50</td>
<td></td>
<td>CLO 1.2</td>
<td></td>
</tr>
<tr>
<td><strong>Examination</strong></td>
<td>50</td>
<td></td>
<td>CLO 1.2</td>
<td></td>
</tr>
</tbody>
</table>

| Required/recommended reading and online materials | TBC |

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### MATH7202

**Complex manifolds (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Co-ordinator</strong></td>
<td>Prof N Mok, Mathematics (<a href="mailto:nmok@hku.hk">nmok@hku.hk</a>)</td>
</tr>
</tbody>
</table>

**Teachers Involved**
(Prof N Mok, 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.

**Course Contents & Topics**
- 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
Department of Mathematics

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.

Course Learning Outcomes

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 identify the key elements in the theoretical foundation of various additional topics covered in the course and to make use of them in solving problems.

Pre-requisites

Pass in MATH3403 or MATH4501 or MATH7101.

Offer in 2022 - 2023

N Offer in 2023 - 2024 : Y Examination ---

Grade Descriptors

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.

Communication-intensive Course

N

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>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>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>

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)

Course Website

http://moodle.hku.hk/

Additional Course Information

Timetable: https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf

MATH7217

Topics in financial mathematics (6 credits) Academic Year 2022

Offering Department Mathematics Quota ---

Course Co-ordinator TBC, Mathematics ()

Teachers Involved

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 2022 - 2023

N Offer in 2023 - 2024 : 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 with some innovative approaches to solving problems.
This is a graduate to advanced undergraduate university level course on applied functional analysis, which aims at introducing to students the basic knowledge of using functional analysis on various applied topics in mathematics. This course would lay a foundation for students in studying more advanced mathematical courses.

Course Contents & Topics
- Generalized functions (also called distributions), delta function, generalized Fourier Transform. Applications to differential equations, Fundamental solution, Green's function.
- Sobolev spaces, Sobolev Embedding Theorem, Trace.
- Hilbert space linear operator theory (bounded operators, compact operators, closed unbounded operators), spectral theory. Applications to differential equations (infinitesimal generator, semigroup of linear operators).
- Applications to optimization problems.

Wherever needed, we shall also review techniques for Metric spaces (Category Theorem), Banach spaces (Hahn-Banach Theorem, Opening Mapping Theorem, Closed Graph Theorem and Uniform Boundedness Principle) and Hilbert spaces (Orthogonality and best approximation, Fourier isometry).

Course Objectives
- CLO 1 apply generalized functions and their Fourier transform to practical problems
- CLO 2 understand Sobolev spaces and how to apply them in the process of solving differential equations
- CLO 3 understand Hilbert space linear operator theory and apply it in solving differential equations
- CLO 4 apply these results to optimization problems

Communication-intensive Course
N

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>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>50</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>
</tbody>
</table>

Required/recommended reading and online materials
TBC

MATH7219

Topics in applied functional analysis (6 credits)

Offering Department
Mathematics

Course Co-ordinator
TBC, Mathematics

Teachers Involved

Academic Year
2022

Quota
---

Course Objectives
On successful completion of this course, students should be able to:

- CLO 1 apply generalized functions and their Fourier transform to practical problems
- CLO 2 understand Sobolev spaces and how to apply them in the process of solving differential equations
- CLO 3 understand Hilbert space linear operator theory and apply it in solving differential equations
- CLO 4 apply these results to optimization problems

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in MATH3401 and MATH4404, or approval of the course coordinator.

Offer in 2022 - 2023
N

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors</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, 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>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 identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or 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>

Communication-intensive Course
N

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>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>50</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>
</tbody>
</table>

Required/recommended reading and online materials
TBC
### 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>TB, Mathematics</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Measure theory, law of large numbers, central limit theorems, random walks, martingales, Markov chains, ergodic theorems, Brownian motion.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>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 CLO 2 understand and apply the fundamental theorems for further problem solving in theory or practice, the learning outcomes are subject to the topics chosen that year</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in MATH3603 and MATH4402, and approval of the course coordinator.</td>
</tr>
<tr>
<td>Offer in 2022 - 2023</td>
<td>N Off in 2023 - 2024 : N</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td>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 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>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Assignments 50 CLO 1.2 Examination 50 CLO 1.2</td>
</tr>
<tr>
<td>Communication-intensive Course</td>
<td>N</td>
</tr>
<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities Details No. of Hours</td>
</tr>
<tr>
<td>Lectures</td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
</tr>
<tr>
<td>Assessment Methods</td>
<td>Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping</td>
</tr>
<tr>
<td>Assignments</td>
<td>50 CLO 1.2</td>
</tr>
<tr>
<td>Examination</td>
<td>50 CLO 1.2</td>
</tr>
<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
</tr>
</tbody>
</table>

### MATH7501
**Topics in algebra (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr Z Hua, Mathematics (<a href="mailto:huazheng@maths.hku.hk">huazheng@maths.hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr Z Hua, Mathematics</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To provide students specializing in mathematics with the opportunity to study some topics in algebra in greater depth.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>- 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.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to: CLO 1 acquire knowledge in the covered topics to considerable depth CLO 2 if he/she wishes, pursue more advanced studies in areas of algebra</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in MATH4302</td>
</tr>
<tr>
<td>Offer in 2022 - 2023</td>
<td>Y 1st sem Offer in 2023 - 2024 : N</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td>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 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>
<tr>
<td>Communication-intensive Course</td>
<td>N</td>
</tr>
<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
</tr>
<tr>
<td>--------------------------------------</td>
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</tr>
<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
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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>
<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>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>Written / Oral</td>
<td>50</td>
<td>CLO 1.2</td>
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<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
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<tbody>
<tr>
<td>To be decided by the course instructor.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Website</th>
<th>Additional Course Information</th>
</tr>
</thead>
</table>

MATH7502 Topics in applied discrete mathematics (6 credits) Academic Year 2022
Offering Department: Mathematics
Teachers Involved: Prof W Zang, Mathematics (wzang@maths.hku.hk)

Course Objectives: This is a follow-up of the course 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 2022 - 2023: 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.

Communication-intensive Course: N

Timetable:

Course Type: Lecture-based course

MATH7503 Topics in advanced optimization (6 credits) Academic Year 2022
Offering Department: Mathematics
Teachers Involved: Prof X Yuan, Mathematics (xmyuan@hku.hk)

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: A deeper and wider study in some advanced topics related to optimization and its applications. This course covers a selection of topics including convex programming, nonconvex programming, saddle point problems, variational inequalities, optimization theory and algorithms suitable for contemporary applications in various areas such as machine learning, artificial intelligence, imaging processing, and computer vision. The selected topics may vary from year to year.
<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>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.</td>
</tr>
<tr>
<td>CLO 2</td>
<td>demonstrate knowledge and understanding of the underlying theory and techniques of the various formulations and algorithms plus their extensions</td>
</tr>
</tbody>
</table>

| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in MATH3901, MATH3904 and approval of the course coordinator. |

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023 Grade Descriptors (A+ to F)</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 2nd sem Offer in 2023 - 2024 : Y</td>
<td>To be confirmed</td>
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</table>

| Communication-intensive Course | N |

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities Activities</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>include presentations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting 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>One assignment</td>
<td>10 CLO 1.2</td>
<td></td>
</tr>
<tr>
<td>Essay</td>
<td>Two essays</td>
<td>20 CLO 1.2</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>Oral Presentation</td>
<td>20 CLO 1.2</td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td>Research Project Report</td>
<td>30 CLO 1.2</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>One written midterm</td>
<td>20 CLO 1.2</td>
<td></td>
</tr>
</tbody>
</table>

| Required/recommended reading and online materials | |


<table>
<thead>
<tr>
<th>Course Website Additional Course Information</th>
<th><a href="http://moodle.hku.hk/Change">http://moodle.hku.hk/Change</a> the course title from &quot;Topics in Mathematical Programming and Optimization&quot; to &quot;Topics in Advanced Optimization&quot;.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timetable Information</td>
<td><a href="https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf">https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MATH7504 Offering Department</th>
<th>Geometric topology (6 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Geometric topology (6 credits)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Geometric topology (6 credits)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Objectives</th>
<th>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.</th>
</tr>
</thead>
</table>

<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>understand basic ideas and constructions which are important both in pursuing the deeper theories as well as in many applications in algebraic topology</td>
</tr>
<tr>
<td>CLO 2</td>
<td>understand the ideas of attaching space, complexes, lifting and extension properties, and surgery on manifolds</td>
</tr>
</tbody>
</table>

| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in MATH3301 and MATH3401 |

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023 Grade Descriptors (A+ to F)</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>N  Offer in 2023 - 2024 : N</td>
<td>---</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Methods to CLO Mapping</th>
<th>CLO 1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate an excellent understanding of key concepts and ideas by being able to identify 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>
Communication-intensive Course
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 | | 50 | CLO 1,2

Required/recommended reading and online materials
M.A. Armstrong: Basic Topology (Springer-Verlag UTM)
J. Rotman: An Introduction to Algebraic Topology (Springer-Verlag GTM)

MATH7505
Real analysis (6 credits)
Academic Year
2022

Offering Department
Mathematics

Course Co-ordinator
Prof W S Cheung, Mathematics (wscheung@hku.hk)

Teachers Involved
(Prof W S Cheung, Mathematics)

Course Objectives
To introduce the basic ideas and techniques of measure theory and the Lebesgue integral.

Course Contents & Topics
- Lebesgue Measure on R: Measurable Sets and Lebesgue Measure, Measurable Functions.
- 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

Pre-requisites (and Co-requisites and Impermissible combinations)
A good grade in Math3401 and approval by the course coordinator.

Offer in 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : Y

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.

Communication-intensive Course
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 | Presentations and Term Paper | 25 | CLO 1,2,3
Examination | Written / Oral | 50 | CLO 1,2,3
Test | Written / Oral | 25 | CLO 1,2,3

Required/recommended reading and online materials
H.L. Royden: Real Analysis
W. Rudin: Real and Complex Analysis
S. Ovchinnikov: Measure, Integral, Derivative

Course Website
http://moodle.hku.hk/

Additional Course Information
Timetable:https://hkumath.hku.hk/~math/Timetable/Timetable2223_S2.pdf
**PHYS1000**

**Introduction to astronomy (6 credits)**

**Offering Department** Physics

**Course Co-ordinator** Dr J C S Pun, Physics (jcspun@hku.hk)

**Teachers Involved**

- **Course Co-ordinator** Dr J C S Pun, Physics

**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 2022 - 2023**

<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>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. Apply highly effective observation skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.</td>
<td></td>
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<tr>
<td></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 observation skills and techniques. Correct use of data of results to draw appropriate conclusions.</td>
<td></td>
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<tr>
<td></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>
<td></td>
<td></td>
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</tr>
<tr>
<td></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 observation skills and techniques. Limited ability to use data and results to draw appropriate conclusions.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></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 observation skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.</td>
<td></td>
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</table>

**Communication-intensive Course**

N

**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>32</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>82</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>40</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>10</td>
<td>CLO 1, 2, 3, 4, 5, 6</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

N

**Course Website**

http://moodle.hku.hk

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**PHYS1001**

**University physics (6 credits)**

**Offering Department** Physics

**Course Co-ordinator** Dr F K Chow, Physics (judychow@hku.hk)

**Teachers Involved**

- **Course Co-ordinator** Dr F K Chow, Physics

**Course Objectives**

This is an introductory, calculus-based physics course for the students who want to have an overview in physics at the university level.

**Course Contents & Topics**

It covers mechanics, gravitation, oscillations, waves and sound, heat and thermodynamics, electricity and magnetism, and physical optics. Conceptual ideas in physics are emphasized and the mathematical treatment is moderate.

**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.
This course offers a comprehensive training of physics for engineers. It covers the major physical laws and theories of physics, including mechanics, electricity, and magnetism. A calculus-based approach is adopted.

### Course Objectives
On successful completion of this course, students should be able to:
- Describe and explain the physical principles of mechanics, electricity, and magnetism
- Identify and analyze the physical principles of mechanics, electricity, and magnetism
- Apply the physical principles of mechanics, electricity, and magnetism to physical situations
- Solve basic problems using the calculus-based approach
- Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes.
- Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes.
- Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes.
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes.

### 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>35</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<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></td>
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<td>CLO 1,4</td>
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</table>

### Required/recommended readings 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
PHYS1055

**How things work (6 credits)**

**Offering Department:** Physics

**Course Co-ordinator:** Dr M K Yip, Physics (mankit@hku.hk)

This course is designed for students in all disciplines and all years who are curious about science in daily life. 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. Topics include: the science in the household and the science of driving, sports and amusement. Daily applications and the magnetic levitated trains in public transportation are introduced as examples of the modern technology.

On successful completion of this course, students should be able to:

- CLO 1: describe and discuss the physical principles that are behind the household appliances and the scientific issues in daily life
- CLO 2: demonstrate their knowledge to related topics qualitatively
- CLO 3: criticize and express views in logical and effective ways
- CLO 4: recognize the significance of science and technology

**Communication-intensive Course**

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>
<td>Lectures</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>
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**Assessment Methods and Weighting**

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<td>Assignments</td>
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<td>CLO 1,2,3</td>
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<td>Examination</td>
<td>2-hour written exam</td>
<td>70</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Laboratory reports</td>
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<td>CLO 1,4</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**

Lecture notes provided by Course Coordinator

R. D. Knight: Physics for Scientists and Engineers (Pearson, 2008, 2nd edition)


**Course Website**

http://moodle.hku.hk
PHYS1056  Weather, climate and climate change (6 credits)  Academic Year  2022
Offering Department  Physics  Quota  ---
Course Co-ordinator  Dr F C C Ling, Physics (ccling@hku.hk)
Teachers Involved  (Dr F C C Ling,Physics)  (Mr H W Tong,Hong Kong Observatory)  (Mr P Cheung,Hong Kong Observatory)  (Mr W K Wong,Hong Kong Observatory)
Course Objectives  Weather and climate play an important role in human activities and history. In this course, we shall introduce to students the fundamentals of weather, climate and climate changes, to arouse their interests in the scientific and technological advancements.
Course Contents & Topics  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 2022 - 2023  Y  1st sem  Offer in 2023 - 2024 : Y  Examination  Dec
Grade Descriptors  A  B  C  D  Fail
Communication-intensive Course  N  Lecture-based course
Course Type
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  25  CLO 1,2,3,4,5
Examination  50  CLO 1,3,4,5
Test  25  CLO 1,3,4,5
Required/recommended reading and online materials  Lecture notes provided by Course Coordinator
Frederick Lutgens and Edward Tarbuck: The Atmosphere (Pearson Prentice Hall, 2013)
Course Website  http://moodle.hku.hk

PHYS1057  Kitchen science (6 credits)  Academic Year  2022
Offering Department  Physics  Quota  ---
Course Co-ordinator  Prof A B Djurisic, Physics (dalek@hku.hk)
Teachers Involved  (Prof A B Djurisic,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.
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
Course Contents & Topics

732
Problem solving in physics (6 credits)

Offering Department: Physics
Quota: ---

Course Co-ordinator: Dr M K Yip (mankit@hku.hk)

Pre-requisites: Level 3 or above in HKDSE Physics or equivalent, or Pass in PHYS1240

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

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments essay & student presentations 70 CLO 1,2,3,4
Examination 30 CLO 1,2,3,4

Communication-intensive Course
N

Course Type: Lecture-based course

Assessment Methods and Weighting
Activities Details No. of Hours
Lectures including demonstration (12 hours) 36
Tutorials 24
Reading / Self study 72

Communication-intensive Course
N

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator
T. Lister and H. Blumenthal: Kitchen Chemistry (Royal Society of Chemistry, 2005)
Peter Barham: The Science of Cooking (Springer-Verlag, Berlin, 2001)

PHYS1150
Problem solving in physics (6 credits)

Academic Year 2022

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 analyze common methods of food preparation and understand scientific reasons for performing procedures in certain ways

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

Grade Descriptors
A
B
C
D
Fail

Courses involved

Dec    May

Examination

Offer in 2022 - 2023

Y 1st sem 2nd sem Offer in 2023 - 2024 : Y Examination Dec May

Pre-requisites
Level 3 or above in HKDSE Physics or equivalent, or Pass in PHYS1240

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.
**Offering Department:**
- Department of Physics

**Course Co-ordinator:**
- Dr F K Chow, Physics (judychow@hku.hk)

**Course Objectives:**
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 Contents & Topics**
The course has a general coverage in most physics topics and is conducted with no descriptions in differential and integral calculus. Emphasis will be stressed on the understanding of various physical phenomena in daily life through qualitative and simple quantitative analysis. The course contents cover: Mechanics, Heat, Optics, Waves, Electricity and Magnetism.

**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

**Offer in 2022 - 2023**
- Y: 2nd sem

**Grade Descriptors (A+ to F)**
- 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 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 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: 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. Apply moderately effective organizational and presentational skills.
- D: 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.
- 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.

**Communication-intensive Course**
- N

**Course Teaching & Learning Activities**
- **Activities**
  - Lectures: 36
  - Tutorials: 12
  - Reading / Self study: 80

**Assessment Methods and Weighting**
- **Methods**
  - Including assignments: 25% CLO 1,2,3,4,5,6
  - 2-hour written exam: 50% CLO 1,2,3,4,5
  - Test: 25% CLO 1,2,3,4,5

**Required/recommended reading and online materials**
- Lecture notes provided by Course Coordinator

**Course Website**
- http://moodle.hku.hk
### PHYS1250
**Fundamental physics (6 credits)**

**Offering Department:** Physics

**Course Co-ordinator:** Dr J H C Lee, Physics (jleehc@hku.hk)

**Teachers Involved:** (Dr J H C Lee, Physics)

**Course Objectives:** This is the first physics course for those who want to minor in physics or astronomy as well as for those who want to have an overview in physics. It covers the fundamental blocks in physics in one semester. Conceptual ideas in physics are emphasized and the mathematical treatment is moderate. Those who enter HKU before 2018 may also take this course as one of their astronomy, math/physics or physics major requirements.

**Course Contents & Topics:** Topics include: Mechanics, Wave Motions, Physical Optics, Thermodynamics, and Electromagnetism.

**Pre-requisites:** 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.

**Offer in 2022 - 2023:** 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 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 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>
<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 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>
</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>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. 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:**

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<th>Weighting in final course grade (%)</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td>CLO 1,2,3,4</td>
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<td>Examination</td>
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<td>CLO 1,2,3</td>
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<td>Laboratory reports</td>
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<td>Test</td>
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<td>CLO 1,2,3</td>
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**Communication-intensive Course:**

N

**Course Type:** Lecture with laboratory component 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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<tbody>
<tr>
<td>Lectures</td>
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<td>36</td>
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<tr>
<td>Laboratory</td>
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<tr>
<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
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<td>Test</td>
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<td>CLO 1,2,3</td>
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</table>

**Course Website:** http://moodle.hku.hk

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### PHYS1650
**Nature of the universe (6 credits)**

**Offering Department:** Physics

**Course Co-ordinator:** Dr K M Lee, Physics (kmlee1@hku.hk)

**Teachers Involved:** (Dr K M Lee, Physics)

**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 astronomy knowledge, methods and recent advances for astronomy minor. No prior knowledge in astronomy, physics, and higher mathematics is required, but will help. After completing this course, interested students may take the second course in this series, namely, PHYS2650.
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, blackholes, and cosmology. It also provides students with a basic understanding of the relationship of astronomy to life and how our nature works on the macroscopic level. Students are expected to participate actively in the night sky observations.

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 2022 - 2023
Year 1st sem 2nd sem Offer in 2023 - 2024: 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. Apply highly effective observation 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 observation skills and techniques. Correct use of data and 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 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 ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective observation skills and techniques. Limited ability to use data and results to draw appropriate conclusions.
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. Apply minimally effective or ineffective observation skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Communication-intensive Course
Y

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
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<td>Test</td>
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<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk
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 skills 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 MATH1013 or MATH1821 or MATH1851 or PHYS1150

Offer in 2022 - 2023
Y 1st 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 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.

Communication-intensive Course
N

Course Type
Lecture-based course

Activities
Lectures
No. of Hours
36

Tutorials
12

Reading / Self study
80

Assessment Methods and Weighting
Methods
Assignments
Examination
Test
Details
2-hour written exam
2-hour written exam
2-hour written exam
Weighting in final course grade (%) 20
50
80
Assessment Methods to CLO Mapping
CLO 2.4
CLO 1.2,3,4,5
CLO 1.2,3,4,5

Communication-intensive Course
N

Course Type
Lecture-based course

Activities
Lectures
No. of Hours
36

Tutorials
12

Reading / Self study
80

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator

Assessment
Methods
Lectures 36
Examination 50
Test 30

Academic Year
2022

Y 1st sem
Offer in 2023 - 2024 : Y

Course Website
http://moodle.hku.hk
PHYS2155 Methods in physics II (6 credits)  Academic Year 2022
Offering Department Physics
Course Co-ordinator Dr Y J Tu, Physics (yanjuntu@hku.hk)
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 PHYS2150 and/or PHYS2160 or the third level course in this series PHYS3150. 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 Contents & Topics
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 MATH1013 or MATH1821 or MATH1851 or PHYS1150

Offer in 2022 - 2023: Y

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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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>
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Communication-intensive Course
N

Course Teaching & Learning Activities
Activities | Details | No. of Hours |
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<td>36</td>
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<tr>
<td>Tutorials</td>
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<td>12</td>
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<tr>
<td>Reading / Self study</td>
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Assessment Methods and Weighting
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
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<tr>
<td>Assignments</td>
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<td>2-hour written exam</td>
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<td>CLO 2,3,4</td>
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<td>Test</td>
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Required/recommended reading and online materials
Lecture notes provided by Course Coordinator
Allen B. Downey: Physical Modeling in MATLAB (Green Tea Press, 2008)

Course Website http://moodle.hku.hk
PHYS2160 Introductory computational physics (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. 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.

Course Contents & Topics: Topics include: basics of computer programming; Python programming for physicists; 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 in quantum physics; Calculus and numerical methods with relevant examples in physics; numerical solution of ordinary differential equations with application to pendulum motion.

Course Learning Outcomes: On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge in basic computational techniques and methods in physics
- CLO 2 apply Python programming language and relevant packages to solve simple physical problems
- CLO 3 employ appropriate numerical methods for solving ordinary differential equations that commonly arise in physics
- CLO 4 review the numerical methods for simulation of various physical systems

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in MATH1013 or MATH1821 or MATH1851 or PHYS1150

Offer in 2022 - 2023: Y  
Academic Year: 2022  
Quota: 30  

Communication-intensive Course: N  
Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:

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<th>Activities</th>
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<td>Project work</td>
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Assessment Methods and Weighting:

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<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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<tbody>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Laboratory reports</td>
<td></td>
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<td>CLO 1,2</td>
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<td>Presentation</td>
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<td>10</td>
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</tr>
<tr>
<td>Project report</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
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Required/recommended reading and online materials:

- 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)  

Offering Department: Physics  
Course Co-ordinator: Dr M K Yip, Physics (mankit@hku.hk)  
Teachers Involved: (Dr M K Yip,Physics) (Dr Y Yang,Physics)  

Academic Year: 2022  
Quota: 30  

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

Course Website
http://moodle.hku.hk

Communication-intensive Course
N

Offer in 2022 - 2023
Y 1st sem 2nd sem Offer in 2023 - 2024 : Y

Grade Descriptors
(A+ to F)

Communication-intensive Course
N

Assessment Methods & Details
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Including computational assignments 10 CLO 1,2,3,4
Examination 2-hour written exam 50 CLO 1,2,3
Laboratory reports 15 CLO 1,4
Test 25 CLO 1,2,3

Required/recommended reading and online materials
P.A Tipler and G. Mosca: Physics for Scientists and Engineers (Freeman, 2008, 6th edition)

Course Website
http://moodle.hku.hk

Tutorials 12
Lectures 36
Laboratory 6
Reading / Self study 80

Activities Details No. of Hours
Lectures
Laboratory
Tutorials
Reading / Self study

Academic Year
2022

Quota
---

Pre-requisites
Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENGG1300

Course Website
http://moodle.hku.hk

Advertisement
### Pre-requisites (and Co-requisites and Impermissible combinations)

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<td>(A+ to F)</td>
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| Examination | May |

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<td>(A+ to F)</td>
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| Examination | --- |

### Communication-intensive Course

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
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### Assessment Methods and Weighting

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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Including computational assignments</td>
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</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
</tr>
<tr>
<td>Laboratory reports</td>
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<td>15</td>
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<tr>
<td>Test</td>
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### Assessment Methods to CLO Mapping

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<th>Assessment Method</th>
<th>CLO 1,2,3,4</th>
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### 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

### PHYS2260

**Heat and waves (6 credits)**

### Offering Department

Physics

### Course Co-ordinator

Dr M Su, Physics (mengsu84@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, 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 PHYS1150 or PHYS1250 or ENGG1310

### Offer in 2022 - 2023

<table>
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<tr>
<th>Grade Descriptors</th>
<th>Offer in 2023 - 2024</th>
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<tbody>
<tr>
<td>(A+ to F)</td>
<td>N Offer in 2023 - 2024 : N</td>
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</tbody>
</table>

| 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. 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.

- **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. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

### Communication-intensive Course

**N**

### Course Type

Lecture with laboratory component course

### Course Co-ordinator

Dr M Su, Physics (mengsu84@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, 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 PHYS1150 or PHYS1250 or ENGG1310

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Offer in 2023 - 2024</th>
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<tbody>
<tr>
<td>(A+ to F)</td>
<td>N Offer in 2023 - 2024 : N</td>
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| 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. 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.

- **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. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.
PHYS2261 Introductory heat and thermodynamics (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 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 Nernst 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 combinations)
Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENGG1350

Examination
Dec

Offer in 2022 - 2023 Y 1st sem Y 2022 - 2023 : Y

Grade Descriptors (A+ to F)

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<th>Description</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 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 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>
</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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Communication-intensive Course
N

Course Type
Lecture with laboratory component course

Communication-intensive Course
N

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>36</td>
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</tr>
<tr>
<td>Laboratory</td>
<td>6</td>
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<tr>
<td>Tutorials</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>
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<tr>
<td>Assignments</td>
<td>10</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<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>15</td>
<td>CLO 1,4</td>
<td></td>
</tr>
<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
P. A. Tipler and G. Mosca: Physics for Scientists and Engineers (Freeman, 2008, 6th edition)
<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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<tbody>
<tr>
<td>Assignments</td>
<td>Including computational assignments</td>
<td>10</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Laboratory reports</td>
<td>15</td>
<td>CLO 3</td>
<td></td>
<td></td>
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<tr>
<td>Test</td>
<td>25</td>
<td>CLO 1,2,3,4</td>
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<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
<th>Lecture notes provided by Course Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stephen J. Blundell and Katherine M. Blundell, Concepts in Thermal Physics, Oxford University Press, 2010</td>
<td></td>
</tr>
<tr>
<td>Herbert B. Callen, Thermodynamics and an Introduction to Thermostatistics, John Willey &amp; Sons, Inc. (1985)</td>
<td></td>
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</table>

| Course Website | http://moodle.hku.hk |

<table>
<thead>
<tr>
<th>PHYS2265</th>
<th>Introductory quantum physics (6 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Physics</td>
</tr>
<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) (Prof G Chen,Physics)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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.</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 and explain the fundamental physical principles</td>
</tr>
<tr>
<td>CLO 2</td>
<td>apply these principles, together with logical and mathematical reasoning, to situations of the physical world</td>
</tr>
<tr>
<td>CLO 3</td>
<td>analyse and solve problems with the aids of mathematics</td>
</tr>
<tr>
<td>CLO 4</td>
<td>acquire and interpret experimental data to examine the physical laws</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and impermissible combinations)</td>
<td>Pass in PHYS1050 or PHYS1150 or PHYS1250 or ENGG1300</td>
</tr>
<tr>
<td>Offer in 2022 - 2023</td>
<td>Y 1st sem 2nd sem Offer in 2023 - 2024 : Y</td>
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<tr>
<td>Grade Descriptors (A+ to F)</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>Fail</td>
</tr>
<tr>
<td>Communication-intensive Course</td>
<td>N</td>
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<tr>
<td>Course Type</td>
<td>Lecture with laboratory component course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
</tr>
<tr>
<td>Lectures</td>
<td>36</td>
</tr>
<tr>
<td>Laboratory</td>
<td>6</td>
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<tr>
<td>Tutorials</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>80</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
</tr>
<tr>
<td>Assignments</td>
<td>Including computational assignments</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>15</td>
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<tr>
<td>Test</td>
<td>25</td>
</tr>
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<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
<th>Lecture notes provided by Course Coordinator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randy Harris: Modern Physics (Pearson, 2014, 2nd edition)</td>
<td></td>
</tr>
</tbody>
</table>
### PHYS2650 Modern astronomy (6 credits)  
**Academic Year**: 2022  
**Offering Department**: Physics  
**Quota**: ---  
**Course Co-ordinator**: Dr J J L Lim, Physics (jjlim@hku.hk)  
**Teachers Involved**: (Dr J J L Lim, Physics)  
**Course Objectives**:  
This course takes you from the beginnings to the forefronts of contemporary astronomical research - in a journey from the Solar System to the Big Bang - with an emphasis on the most important methodologies and discoveries in astronomy. Advanced physical concepts are explained with a minimum of mathematics: you will only be required to know and manipulate simple algebra. An intermediate astronomy course for students in all disciplines and all years, it also is the second course in our series of two compulsory courses to introduce basic astronomy knowledge, methods, and recent advances for astronomy minors. This primary aim of this course is to take students to the cutting-edge of contemporary astronomy. After completing this course, interested students may take PHYS3850, PHYS3863 and/or PHYS3860, which are core or discipline elective courses for astronomy minor and astrophysics theme of physics major.

#### Course Contents & Topics  
Scale of the Solar and Exo-planetary Systems, Astrometry and Scale of the Galaxy, Scale of the Universe, Expansion and Accelerated Expansion of the Universe, Hubble Parameter, Dark Matter and Dark Energy, Cosmology, Critical Density, Cosmic Structure, Cosmic Microwave Background, Inflation, Neutrino Astrophysics

#### Course Learning Outcomes  
On successful completion of this course, students should be able to:  
- CLO 1 describe the methodologies used to determine the scale of the Solar System, Galaxy, and the Universe  
- CLO 2 explain how astronomical observations imply that the Universe is expanding at an accelerated rate  
- CLO 3 discuss critically why Dark Matter and Dark Energy is required to explain astronomical observations  
- CLO 4 describe the importance of precise measurements of the Hubble parameter  
- CLO 5 perform computations and provide reasoned explanations to demonstrate competence on and understanding of the concepts learnt

#### Pre-requisites (and Co-requisites and Impermissible combinations)  
Pass in PHYS1650

#### Offer in 2022 - 2023  
<table>
<thead>
<tr>
<th>Y</th>
<th>2nd sem</th>
<th>Offer in 2023 - 2024</th>
<th>Y</th>
<th>Examination</th>
<th>May</th>
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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 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.

#### Communication-intensive Course  
N

**Course Type**  
Lecture-based course

**Course Teaching & Learning Activities**  
<table>
<thead>
<tr>
<th>Activities &amp; Self Study</th>
<th>Details</th>
<th>No. of Hours</th>
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<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
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<tr>
<td>Tutorials</td>
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<td>12</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>
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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>25</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
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<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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### PHYS2850 Atomic and nuclear physics (6 credits)  
**Academic Year**: 2022  
**Offering Department**: Physics  
**Quota**: ---  
**Course Co-ordinator**: Dr S Z Zhang, Physics (shizhong@hku.hk)  
**Teachers Involved**: (Dr S Z Zhang, Physics)  
**Course Objectives**:  
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:

---

474
PHYS3150 Theoretical physics (6 credits)

Offering Department
Physics

Course Co-ordinators
Dr C J Wang, Physics (cjwang@hku.hk)

Course Objectives
This is the third level course 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. We focus on the analytical and algebraic techniques in solving physics problems. It is one of the core electives for physics major and an elective course for the computational physics and theoretical physics themes. This is also an essential course for those who plan to pursue postgraduate studies in mathematical and theoretical physics.

Course Contents & Topics
This course will introduce and address the following topics: (i) Functions of a complex variable and their applications (Cauchy's integral formula, Laurent expansion, calculus of residues, etc.); (ii) Advanced methods in solving and classifying differential equations commonly appears in physics (such as series solution, second solution, and singular points); (iii) Properties of special functions widely used in Physics (Gamma functions, Beta functions, Bessel functions, etc.), (iv) Integral transforms (Fourier transforms and Laplace transforms); (v) The use of Mathematica/Matlab in solving simple analytical problems appearing in topics (i)-(iv).

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 analyse and examine the analytical properties of complex functions
CLO 2 calculate various definite integrals using the method of residues
CLO 3 analyse and solve the first and second order ordinary equations, and typical partial differential equations
CLO 4 apply the special functions in handling various physical problems
CLO 5 use the Fourier series and Fourier transform in analysing periodic functions and waves, and understand the basics of Laplace transforms
CLO 6 use Mathematica to solve simple analytical problems in physics

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in MATH2211 or PHYS2150 or PHYS2155

Offer in 2022 - 2023
Y 1st 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. 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.
Examination May

Department of Physics

online materials reading and

Course Website

http://moodle.hku.hk

Course Type
Lecture-based course

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
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<th>Details</th>
<th>No. of Hours</th>
</tr>
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<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Tutorials</td>
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<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
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Assessment Methods and Weighting

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<td>Assignments</td>
<td>including assignments</td>
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<td>CLO 1,2,3,4,5</td>
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<td>computational</td>
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<tr>
<td>Examination</td>
<td>3-hour written exam</td>
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<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Test</td>
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<td>30</td>
<td>CLO 1,2,3,4,5</td>
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</table>

Required/recommended reading and online materials

Lecture notes provided by Course Coordinator


Course Contents & Topics

Machine learning software packages in Python, Supervised and Unsupervised learning, Regression, Classification, Principal component analysis, Singular value decomposition, Support vector machines, Clustering, K-Nearest Neighbors, Neural Networks, Deep Learning, Application of machine learning in physics research with examples drawing from fields such as condensed matter physics, quantum material, 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 MATH2101 or MATH2211 or PHYS2155 or PHYS2160.

Working knowledge of Python is needed (please talk to the course instructor in case of doubt).

Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
<th>Examination</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. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.</td>
<td>Y 2nd sem Offer in 2023 - 2024 : Y</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>
<td></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 lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.</td>
<td></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 partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.</td>
<td></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>
<td></td>
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</table>

Communication-intensive Course

N

Course Type
Lecture with laboratory component 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></td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Laboratory</td>
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</tr>
<tr>
<td>Tutorials</td>
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</tbody>
</table>
Examination

Department of Physics

Academic Year: 2022

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

This course covers Lagrangian mechanics in the advanced undergraduate level with rigorous mathematical treatment. It is one of the core electives for physics major and an elective course for the theoretical physics theme. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines. Problem solving and analytical skills will be extensively used. They are supplemented by numerical skills occasionally.

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 connection between classical mechanics and other mechanics.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS2150 and PHYS2250

Offer in 2022 - 2023: 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 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.
- F: 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.

Communication-intensive Course

N

Course Type

Lecture-based course

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments 30 CLO 1,2,3,4
Examination 2-hour written exam 30 CLO 1,2,3
Presentation 20 CLO 1,2,3,4
Project report 20 CLO 1,2,3,4

Teacher Notes

Lecture notes provided by Course Coordinator


Course Website

http://moodle.hku.hk

PHYS3351

Quantum mechanics (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 course covers the basics of quantum mechanics in the advanced undergraduate level with rigorous mathematical treatment. It is one of the core electives for physics major and an elective course for the theoretical
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 eigenvalues; 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

Pre-requisites

Pass in PHYS2150 and PHYS2265, knowledge of PHYS2155 will be advantageous

Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>1st sem Offer in 2023 - 2024 : Y</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>
</tbody>
</table>

Communication-intensive Course

N

Communication-intensive Course

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 computational assignments</td>
<td>20</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>30</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

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

This course covers the basics of electromagnetism at the advanced undergraduate level with vigorous mathematical treatment. It is one of the core electives for physics major and an elective course for the theoretical physics theme. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines. Problem solving and analytical skills will be extensively used. They are supplemented by numerical skills occasionally. Upon completion, interested students may take the sequel course PHYS4450 to further their studies in electromagnetism.

Course Contents & Topics

Topics include introduction to vectors, 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

Pre-requisites

Pass in PHYS2150 and PHYS2255, knowledge of PHYS2155 will be advantageous
And Impermissible combinations

Offer in 2022 - 2023

Y 2nd sem Offer in 2023 - 2024: Y

Examination May

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 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>
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Communication-intensive Course

N

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>80</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
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<th>Assessment Methods to CLO Mapping</th>
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<td>Including computational assignments</td>
<td>20</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Examination</td>
<td>3-hour written exam</td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5</td>
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<tr>
<td>Test</td>
<td></td>
<td>30</td>
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</tbody>
</table>

Required/recommended reading and online materials

Lecture notes provided by Course Coordinator


Course Website

http://moodle.hku.hk

PHYS3550

Statistical mechanics & thermodynamics (6 credits)

Offering Department

Physics

Course Co-ordinator

Dr S Z Zhang, Physics (shizhong@hku.hk)

Teachers Involved

(Or S Z Zhang, Physics)

Course Objectives

This course covers statistical mechanics in the advanced undergraduate level with rigorous mathematical treatment. It is one of the core electives for physics major and an elective course for the theoretical physics theme. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines. Problem solving and analytical skills will be extensively used. They are supplemented by numerical skills occasionally. Upon completion, interested and able students may take PHYS7550 to study graduate level statistical mechanics.

Course Contents & Topics

This course includes the following topics: statistical description of macroscopic systems in terms of its microscopic constituents; canonical distribution and its applications in simple systems; classical and quantum statistical mechanics: Bose and Fermi distributions; Bose and Fermi gas; condensation; photon gas and Planck radiation law; theory of Brownian motion; theory of fluctuation, first order and continuous phase transition.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand the logical structure of statistical mechanics
CLO 2 apply Gibbs-Boltzmann distribution and partition function in various simple situations
CLO 3 understand the Bose and Fermi distributions and apply them in correct situations
CLO 4 describe the classification of phase transitions and understand the use of mean field theory in second order phase transition

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS2150 and (PHYS2260 or PHYS2261)

Offer in 2022 - 2023

Y 1st sem Offer in 2023 - 2024: Y

Examination Dec

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
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<td>Fail</td>
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</table>

Communication-intensive Course

N

Course Type

Lecture-based course

Course Teaching & Learning Activities

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<tr>
<th>Activities</th>
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<td>Methods</td>
<td>Details</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Assignments</td>
<td>Including assignments computational</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
</tr>
<tr>
<td>Test</td>
<td>30</td>
<td>CLO 1,2,3,4</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 |

<table>
<thead>
<tr>
<th>PHYS351</th>
<th>Introductory solid state physics (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Physics</td>
<td>Quota</td>
<td>---</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof J Gao, Physics (<a href="mailto:jugao@hku.hk">jugao@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To provides 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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.</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 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</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in PHYS2260 and PHYS2265</td>
<td></td>
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</tr>
<tr>
<td>Grade Descriptors</td>
<td>N Offer in 2022 - 2023 : N Examination ---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication-intensive Course</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Type</td>
<td>Lecture with laboratory component course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
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</tr>
<tr>
<td>Lectures</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>6</td>
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<tr>
<td>Tutorials</td>
<td>8</td>
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<tr>
<td>Reading / Self study</td>
<td>80</td>
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<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
<td>Weighting in final course grade (%)</td>
</tr>
<tr>
<td>Assignments</td>
<td>15</td>
<td>CLO 1,2,3,5</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>10</td>
<td>CLO 4,5</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PHYS3650</th>
<th>Observational astronomy (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Physics</td>
<td>Quota</td>
<td>---</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr J J L Lim, Physics (<a href="mailto:jjlim@hku.hk">jjlim@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr J J L Lim,Physics)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course introduced tools of contemporary observational astronomy, with a focus on those used at optical wavelengths. Practical applications of these tools in both amateur astronomy as well as astronomical research will</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Course Contents & Topics
Topics include: properties and workings of optical telescopes and astronomical detectors (e.g., CCDs); properties of light, effects of Earth's atmosphere and interstellar medium on astronomical observations; astronomical imaging and magnitude system; astronomical photometry and 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 detectors at optical wavelengths
- CLO 2 describe how the inherent properties of light, the Earth's atmosphere, and the interstellar medium affect astronomical observations
- CLO 3 explain how astronomical photometry and spectroscopy are conducted
- CLO 4 perform computations to demonstrate competence on and understanding of the concepts learnt

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS2255 or PHYS2650

Grade Descriptors (A+ to F)

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<tbody>
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<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 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 familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills 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. 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>
</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>
</tr>
</tbody>
</table>

Communication-intensive Course
N

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
| Lectures | 8 chapters | 36 |
| Laboratory | 4 |
| Tutorials | 7 sessions | 12 |
| Reading / Self study | 80 |

Assessment Methods and Weighting

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<tr>
<td>Examination</td>
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<td>CLO 1,2,3,4</td>
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<td>Laboratory reports</td>
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<tr>
<td>Test</td>
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<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
To Measure the Sky by Frederick R. Chromey
An Introduction to Modern Astrophysics by Bradley Carroll & Dale A. Ostlie

Course Website
http://moodle.hku.hk

PHYS3651 The physical universe (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
To introduce basic physical principles of astronomy and build a foundation in modern astrophysics.

Course Contents & Topics
Topics include: the sky and celestial coordinates, spherical geometry, optics and telescopes, basic celestial mechanics, two-body problem, radiative transfer, and blackbody radiation.

Course Learning Outcomes
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

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS1650 and (PHYS2250 or PHYS2265)

Offer in 2022 - 2023
N

Grade Descriptors (A+ to F)

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Examination
---
Course Objectives
To introduce or review a number of basic physical principles, and explain how these principles are applied in astronomy to gain knowledge of the Universe.

Course Contents & Topics
Topics include: special relativity, Doppler effect; interaction of light and matter, spectral lines; single-dish telescopes and interferometers; binary stars and stellar parameters, exoplanets; classification 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 discussed
- CLO 2: associate the correct physical principles with the observed properties of certain astronomical objects
- CLO 3: apply their understanding of the physical principle discussed to explain or compute the observed properties of select astronomical objects

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator
George B. Rybicki and Alan P. Lightman, Radiative Processes in Astrophysics (Wiley-Interscience, 1985)
F. Mandl, Statistical Physics, 2nd ed. (John Wiley & Sons, 1988)

Course Website
http://www.physics.hku.hk/~phys3651/

PHYS3652
Principles of astronomy (6 credits)

Offering Department
Physics

Course Co-ordinator
Dr L X Dai, Physics (lxidai@hku.hk)

Teachers Involved
(Dr L X Dai, Physics)

Course Objectives
To introduce or review a number of basic physical principles, and explain how these principles are applied in astronomy to gain knowledge of the Universe.

Course Contents & Topics
Topics include: special relativity, Doppler effect; interaction of light and matter, spectral lines; single-dish telescopes and interferometers; binary stars and stellar parameters, exoplanets; classification 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 discussed
- CLO 2: associate the correct physical principles with the observed properties of certain astronomical objects
- CLO 3: apply their understanding of the physical principle discussed to explain or compute the observed properties of select astronomical objects

Pre-requisites
Pass in PHYS1650 and (PHYS2250 or PHYS2265)

ACADEMIC YEAR: 2022-2023
NO. OF HOURS
LECTURES
36
TUTORIALS
12
READING / SELF STUDY
80

Assessment Methods and Weighting

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<td>Presentation</td>
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<td>Test</td>
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<td>15</td>
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Communication-intensive Course
N

Grade Descriptors
(A+ to F)

A
Demonstrate thorough mastery of the knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities, clear logical thinking, evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar, and unfamiliar situations using highly effective organizational and presentation 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, reasoned 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, 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.

Communication-intensive Course
N

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></td>
<td>35</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>15</td>
<td>CLO 2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator

PHYS3653
Astrophysics (6 credits)

Offering Department
Physics

Course Co-ordinator
Dr L X Dai, Physics (lxidai@hku.hk)

Teachers Involved
(Dr L X Dai, Physics)

Course Objectives
To introduce or review a number of basic physical principles, and explain how these principles are applied in astronomy to gain knowledge of the Universe.

Course Contents & Topics
Topics include: special relativity, Doppler effect; interaction of light and matter, spectral lines; single-dish telescopes and interferometers; binary stars and stellar parameters, exoplanets; classification 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 discussed
- CLO 2: associate the correct physical principles with the observed properties of certain astronomical objects
- CLO 3: apply their understanding of the physical principle discussed to explain or compute the observed properties of select astronomical objects

Pre-requisites
Pass in PHYS1650 and (PHYS2250 or PHYS2265)

ACADEMIC YEAR: 2022-2023
NO. OF HOURS
LECTURES
36
TUTORIALS
12
READING / SELF STUDY
80

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
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</tr>
</thead>
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<tr>
<td>Assignments</td>
<td></td>
<td>12</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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<td>Presentation</td>
<td></td>
<td>13</td>
<td>CLO 2,4</td>
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<tr>
<td>Test</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Communication-intensive Course
N

Grade Descriptors
(A+ to F)

A
Demonstrate thorough mastery of the knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities, clear logical thinking, evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar, and unfamiliar situations using highly effective organizational and presentation 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, reasoned 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, 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.

Communication-intensive Course
N

Course Type
Lecture-based course

Assessment Methods and Weighting

<table>
<thead>
<tr>
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</tr>
<tr>
<td>Test</td>
<td></td>
<td>15</td>
<td>CLO 2,3</td>
</tr>
</tbody>
</table>
Course Co-ordinator: Dr L X Dai, Physics (lixindai@hku.hk)

Teachers Involved: 
- Dr L X Dai, Physics

Course Objectives:
This course is a beginner course in astrophysics - we will introduce the most basic and direct connection between astronomy and physics, which will help you gain a better understanding of various astronomical objects and phenomena from first principles. This course will also aim to develop skills in approaching problems in astrophysics, which will set the stage for taking more advanced astrophysics courses and conducting scientific research.

It is one of the core electives for astronomy minor and an elective course for the astrophysics theme. Upon completion, interested student may take PHYS4653 and PHYS4656 to further their studies in theoretical astrophysics.

Course Contents & Topics:
Topics include: gravity, binary systems, N-body problem; hydrostatic equilibrium; radiative processes (blackbody radiation, emission, absorption, opacity); atomic structure and spectral lines; order-of-magnitude calculations in astronomy and other selected topics

Course Learning Outcomes:
On successful completion of this course, students should be able to:

CLO 1 describe the fundamental physics underlying a wide range of astronomical phenomena
CLO 2 apply the physical formulae learnt through the course to study astrophysical problems and perform calculations
CLO 3 develop skills to simplify, analyze and solve problems in astrophysics

Pre-requisites (and Co-requisites and Impermissible combinations):
Pass in PHYS2250 or PHYS2265 or PHYS2650

Offer in 2022 - 2023:
- Y 2nd sem Offer in 2023 - 2024 : Y

Examination:
- 2-hour written exam 50

Methods Details Weighting in final course grade (%)
CLO 1 use of effective written and verbal communication skills through written laboratory reports and oral presentations
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

Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>30</td>
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<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
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</tbody>
</table>

CLO Mapping:
CLO 1,2,3

Communication-intensive Course:
N

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>
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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>80</td>
</tr>
</tbody>
</table>

Course Learning Outcomes:
On successful completion of this course, students should be able to:

CLO 1 describe the fundamental physics underlying a wide range of astronomical phenomena
CLO 2 apply the physical formulae learnt through the course to study astrophysical problems and perform calculations
CLO 3 develop skills to simplify, analyze and solve problems in astrophysics

Assessment Methods and Weighting:

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</tbody>
</table>

CLO Mapping:
CLO 1,2,3

Required/recommended reading and online materials:
An Introduction to Modern Astrophysics, by Bradley Carroll & Dale A. Ostlie

Course Website:
http://moodle.hku.hk

PHYS3660:
Astronomy laboratory (6 credits)

Offering Department:
Physics

Course Co-ordinator:
Dr S C Y Ng, Physics (ncy@astro.physics.hku.hk)

Teachers Involved:
Dr S C Y Ng, Physics

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; 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 (PHYS2265 or PHYS2650); and Pass in PHYS3650, or already enrolled in this course.

Offer in 2022 - 2023:
- Y 1st sem Offer in 2023 - 2024 : 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 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.

Communication-intensive Course

N
Lecture with laboratory component course

Course Teaching & Learning Activities

Activities
Lectures
Laboratory
Project work
Reading / Self study

Details
Working principle of telescopes, error analysis, data analysis skills
Conduct astronomy observational and data analysis laboratories
Presentation and preparation

No. of Hours
8
28
20

Assessment Methods and Weighting

Methods
Laboratory reports
Presentation
Test

Details
About 10 reports
1 oral presentation
1 in-class test

Weighting in final course grade (%)
65
15
20

Assessment Methods to CLO Mapping
CLO 1,2,3,4
CLO 1,2,3,4
CLO 1,3,4

Required/recommended reading and online materials


Course Website
http://moodle.hku.hk

PHYS3750 Foundations of laser and spectroscopy (6 credits)

Offering Department
Physics

Course Co-ordinator
Dr T T Luu, Physics (ttluu@hku.hk)

Teachers Involved
(Dr T T Luu,Physics)

Course Objectives
The course covers major types of lasers and laser spectroscopy in the advanced undergraduate level. It is an elective course for the experimental physics theme. This is also an essential course for those who plan to pursue postgraduate studies or work in areas closely related to laser and its applications such as physics, chemistry, and engineering.

Course Contents & Topics

Course Learning Outcomes
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 lasers
- CLO 3 identify main components of optical spectroscopic instruments
- CLO 4 comprehend/formulate a broad overview of spectroscopic techniques
- CLO 5 perform one typical experiment and data analysis, provide physical reasoning that leads to dependence of observed results on input parameters

Pre-requisites (and Co-requisites and impermissible combinations)
Pass in PHYS2255 and PHYS2265

Offer in 2022 - 2023
Y 1st 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. 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.

Academic Year
2022

Quota
---
### PHYS3751: Physics of nanomaterials (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>
</tbody>
</table>

#### 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.

#### 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
- Pass in PHYS3351; and Pass in PHYS3551, or already enrolled in this course.

#### Offer in 2022 - 2023
- N  Offer in 2023 - 2024 : N

#### 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>Laboratory</td>
<td></td>
<td>10</td>
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<tr>
<td>Tutorials</td>
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<td>8</td>
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<tr>
<td>Reading / Self study</td>
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<tr>
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<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Laboratory reports</td>
<td></td>
<td>15</td>
<td>CLO 5</td>
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<tr>
<td>Test</td>
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<td>20</td>
<td>CLO 1,2,3,4</td>
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</table>

#### Communication-intensive Course
- N

#### Course Type
- Lecture-based course

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
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### PHYS3760: Physics laboratory (6 credits)

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<thead>
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<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr T T Luu (<a href="mailto:ttluu@hku.hk">ttluu@hku.hk</a>)</td>
</tr>
</tbody>
</table>

#### 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 skills and techniques, including data analysis and presentation.
**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 2022 - 2023**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2024</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>No Exam</td>
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</table>

**Communcation-intensive Course**

| N |

**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></td>
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**Assessment Methods and Weighting**

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</thead>
<tbody>
<tr>
<td>Laboratory</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</td>
</tr>
<tr>
<td>Project report</td>
<td>1 full project report</td>
<td>15</td>
<td>CLO 1,2,3</td>
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<tr>
<td></td>
<td></td>
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<td>CLO 2,3,4</td>
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**Required/recommended reading and online materials**

Lab manuals provided by Course Coordinator


Python tutorial at https://www.python.org/about/gettingstarted/

**Course Website**

http://moodle.hku.hk

**PHYS3850 Physical Optics (6 credits)**

<table>
<thead>
<tr>
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<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>2022</td>
</tr>
</tbody>
</table>

**Course Co-ordinator**

Dr D K Ki, Physics (dkki@hku.hk)

**Teachers Involved**

(Prof D K Ki, Physics)

**Course Objectives**

This course covers the development of modern physical optics, with particular attention to the physical properties and applications of light in the advanced undergraduate level. It is an elective course for the experimental physics theme.

**Course Contents & Topics**

Wave theory of electromagnetic radiations and light; Review of geometric optics; The propagation and superposition of light waves; Interference, Diffraction and Coherence of light; Fourier optics; Some topics of modern optics.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 explain and calculate the fundamental properties including propagation, reflection, refraction, polarization, interference and diffraction of light waves by using the theory of waves
- CLO 2 apply the theory of optics to design optical arrangements for measuring optical properties of materials, such as refractive index
- CLO 3 apply essential theories to design various optical components or devices, such as anti-reflection and reflection-enhancement films

**Pre-requisites (and Co-requisites)**

Pass in PHYS2250 and PHYS2255
<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Y</th>
<th>Examination</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade Descriptors (A+ to F)</strong>&lt;br&gt;A&lt;br&gt;Demontstrate 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 organisational and presenational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.</td>
<td></td>
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<td>B&lt;br&gt;Demontstrate 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 organisational and presenational skills. Apply effictive lab skills and techniques. Correct use of data of results to draw appropriate conclusions.</td>
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<td>D&lt;br&gt;Demontstrate 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 organisational and presenational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Fail&lt;br&gt;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.</td>
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</table>

| Communication-intensive Course<br>N |
| **Course Type**<br>Lecture with laboratory component course |
| **Course Teaching & Learning Activities**<br><b>Activities</b> <br>Lectures <br>Completing the relevant laboratory experiment and problem-solving skills <br>Tutorials <br>Reading / Self study |
| **Details**<br>12 chapters <br>Assessment methods and weighting methods |
| **No. of Hours**<br>36 <br>80 |
| **Assessment Methods and Weighting**<br><b>Methods</b> <br>Assignments <br>Examination <br>Laboatory reports <br>Test |
| **Details**<br>4 assignments <br>2-hour written exam <br>Two experiments <br>Mid-term test |
| **Weighting in final course grade (%)**<br>20 <br>40 <br>15 <br>25 |
| **Assessment Methods to CLO Mapping**<br>CLO 1 <br>CLO 2 <br>CLO 3 <br>CLO 4 <br>CLO 5 |
| **Required/recommended reading and online materials**<br>Lecture Notes prepared by Course Coordinator E. Hecht: Optics (Addison-Wesley, 2017, 5th edition) |
| **Course Website**<br>http://moodle.hku.hk |
| **PHYS3851** | Atomic and nuclear physics (6 credits) | Academic Year 2022 |
| **Offering Department** | Physics | Quota --- |
| **Course Co-ordinator** | Dr J H C Lee, Physics (jleehc@hku.hk) | |
| **Teachers Involved** | (Dr J H C Lee,Physics) | |
| **Course Objectives**<br>This course covers the fundamentals of atomic physics and nuclear physics and their applications in astrophysics and atomic and nuclear science in the advanced undergraduate level. Experimental topics will also be included, such as detection methods and principles of experiments with hand-on experience. It is an elective course for the experimental physics theme. This is also an essential course for those who plan to pursue postgraduate studies or work in atomic and nuclear physics and related disciplines. |
| **Course Contents & Topics**<br>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**<br>On successful completion of this course, students should be able to:<br>CLO 1 describe and explain the basic features of atoms and nuclei<br>CLO 2 apply general considerations of quantum mechanics to atomic and nuclear system<br>CLO 3 make general orders of magnitude in estimation of physical effects in atoms and nuclei<br>CLO 4 describe nuclear decay processes and nuclear reactions in nucleosynthesis<br>CLO 5 apply basic experimental skill for radiation detection |
| **Pre-requisites**<br>Pass in PHYS2285; and Pass in PHYS3351, or already enrolled in this course. |
| **Offer in 2022 - 2023**<br>N | Examination --- |
| **Grade Descriptors (A+ to F)**<br>A<br>Demontstrate 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 organisational and presenational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. |
| B<br>Demontstrate 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 organisational and presenational skills. Apply effictive lab skills and techniques. Correct use of data of results to draw appropriate conclusions. |
| C<br>Demontstrate 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 organisational and presenational skills. Apply moderately effective observation skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. |
| D<br>Demontstrate 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 organisational and presenational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. |
Course Type
Lecture with laboratory component course

Assessment Methods and Weighing
<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>2-hour written exam</td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Laboratory reports</td>
<td>20</td>
<td>CLO 1,2,3,5</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
Lecture notes from the Course Coordinator
- K. Krane: Introductory nuclear physics (John Wiley & Sons, 1988)

Course Website
http://moodle.hku.hk

PHYS3999
Directed studies in physics (6 credits)

Offering Department
Physics

Course Co-ordinator
Dr F C C Ling, Physics (cling@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 should be taken normally in their final year of study. Students investigate a small problem, either theoretical, experimental or numerical, under the supervision of an academic staff using the subject materials they have learned in all years of their major studies. The available projects range from small scale research, critical literature review and comment, and to development of university-level physics teaching tools. Passing a pre-approved directed studies is recognized as having completed an elective in one of the four themes.

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.

Course Learning Outcomes
- CLO 1 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
- CLO 2 criticize existing approaches for solving the selected physics or astronomy problem
- CLO 3 describe and explain connections between the physical principles and the study problem
- CLO 4 (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
- CLO 5 (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
- CLO 6 (for projects involving team work) collaborate and communicate effectively in the team, which may comprise of people of different 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.

Offer in 2022 - 2023
Y 1st sem 2nd sem Summer Offer in 2023 - 2024 : Y Examination No Exam

Grade Descriptors (A+ to F)
- A Demonstrate thorough grasp of the subject. Show evidence of strong logical and independent thinking. 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. Show evidence of logical and independent 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. Show some evidence of logical and independent 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. 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.
- F Fail Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Show little or no evidence of logical and independent 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.

Department of Physics
### Course Objectives
This course shows the power of computational approach to solving physics and related problems, which is complimentary to the traditional experimental and theoretical approaches. Students are expected to spend a significant fraction of time in actual programming. This is an elective course for the computational physics theme. This is also an essential course for those who plan to pursue postgraduate studies in fields like computational physics, condensed matter physics, chemistry and engineering or work in related areas.

### Course Contents & Topics
Topics include: Introduction to computational physics; ordinary differential equation for classical physical problems; partial differential equation for classical and quantum problems; matrix method and exactly diagonalization for classical and quantum problems; Monte Carlo methods for statistical physics and quantum many-body physics; numerical methods for phase transitions and machine learning approaches to physics problems.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge in essential methods and techniques for numerical computation in physics
- CLO 2 apply matrix method and other simulation methods to solve deterministic as well as probabilistic classical and quantum physical problems
- CLO 3 use appropriate numerical method to solve the differential equations governing the dynamics of physical systems

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in (MATH3301 or MATH3401 or MATH3403 or MATH3405 or PHYS2160 or PHYS3151) and (PHYS3350 or PHYS3351 or PHYS3450 or PHYS3550)

### Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : 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. 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.

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
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<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
PHYS4151 Data analysis and modeling in physics (6 credits) | Academic Year: 2022
Offering Department: Physics
Course Co-ordinator: Prof H F Chau, Physics (hfchau@hku.hk)
Course Objectives: This course covers commonly used data analysis and computational modeling techniques in physics and related subjects with special emphasis on their uses in complex systems, nonlinear systems and adaptive systems. The focus is on the basic principles rather than blind usage of computer packages and apps although we do use packages in the course. This is an elective course for the computational physics and experimental physics themes. This is also an essential course for who plan to pursue postgraduate studies in computational physics and complex systems and work in related areas.

Course Contents & Topics: Basic data analysis techniques such as linear and non-linear fittings, determination of the goodness of the fit, commonly used hypothesis testing techniques in physics; modeling physics and related systems via continuous, discrete and agent-based approaches; introduction to complex systems, complex adaptive systems and non-linear dynamics; basic numerical integration and ordinary differential equation techniques including adaptive techniques; the use of computer packages such as Matlab and Mathematica in modeling and data analysis although the emphasis is on the basic principles and concepts behind rather than features and usage of those packages; depending on mutual interests of the course coordinator and students, illustrative examples will be drawn from conventional fields such as classical mechanics, electromagnetism and quantum mechanics as well as more recent fields like biophysics, econophysics and sociophysics.

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
- CLO 4 critically interpret experimental data from physics experiments

Pre-requisites: Pass in (MATH3301 or MATH3401 or MATH3403 or MATH3405 or PHYS2160 or PHYS3150); and (PHYS3350 or PHYS3351 or PHYS3450 or PHYS3550)

Offer in 2022 - 2023 | Y 2nd sem | Offer in 2023 - 2024: 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 strikingly advanced and highly original thinking, good command of knowledge and skills and effective organizational and presentational skills. Misuse of data and results and/or inability to draw appropriate conclusions.
- B: Demonstrate substantial command of the knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some 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.
- 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, reasoned logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations using effective organizational and presentational skills. Correct use of data of 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 and skills to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective computer modeling skills and techniques. Limited ability to use data and results to draw appropriate conclusions.
- E: 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 computer modeling skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Communication-intensive Course: N

Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:
- Activities: Details | No. of Hours
  - Lectures: 36
  - Laboratory: 12
  - 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: 2-hour written exam | 50 | CLO 1,2,4
  - Presentation: 20 | CLO 1,4
  - Project report: 20 | CLO 1,2,3,4

Required/recommended reading and online materials:
- Lecture notes provided by Course Coordinator

Course Website: http://moodle.hku.hk
## Course Co-ordinator
Prof S Q Shen, Physics (sshen@hku.hk)

## Teachers Involved
(Profs S Q Shen, Physics)

## Course Objectives
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.

## Course Learning Outcomes
On successful completion of this course, students should be able to:
- 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 and quantum mechanics from Hamiltonian formalism
- CLO 4 apply the variational principle to real physical situations

## Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS3350

## Offer in 2022 - 2023
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.
- **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 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 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.

## Communication-intensive Course
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>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
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<td>12</td>
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<tr>
<td>Reading / Self study</td>
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<td>80</td>
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## Assessment Methods and Weighting

<table>
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<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>3-hour written exam</td>
<td>60</td>
<td>CLO 1,2,3,4</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
Lecture notes provided by Course Coordinator
H. Goldstein, C. Poole, and J. Safko, Classical Mechanics, (Pearson Education Inc, 2004)

## Course Website
http://moodle.hku.hk

## PHYS4351
Advanced quantum mechanics (6 credits)

### Offering Department
Physics

### Course Co-ordinator
Dr C Xiao, Physics (congxiao@hku.hk)

### Teachers Involved
(Dr C Xiao, Physics)

### Course Objectives
Build on the advanced undergraduate level course PHYS4351, this course further discusses concepts and mathematical techniques in quantum mechanics through special topics and applications. This is an elective course for the theoretical physics theme. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines.

### Course Contents & Topics
- Identical particles; Pauli exclusion principle; fermion and bosons; WKB approximation; time-independent, non-degenerate and degenerate perturbation theory; time dependent perturbation theory; scattering, cross section, partial waves and Born approximation; variational method.

### 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 (PHYS2155 or PHYS3150) and PHYS3351

### Offer in 2022 - 2023
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 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 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.

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761
## PHYS4450

**Advanced electromagnetism (6 credits)**

**Offering Department**: Physics

**Course Co-ordinator**: Prof X D Cui, Physics (xdcui@hku.hk)

**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. This is an elective course for the theoretical physics theme. This is also an essential course for those who plan to pursue postgraduate studies in physics and related disciplines.

**Course Contents & Topics**: Topics include Maxwell's Equations, Poynting 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 (PHYS2155 or PHYS3150) and PHYS3450

**Offer in 2022 - 2023**: 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 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 effective organizational and presentational skills.</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.</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>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>

**Communication-intensive Course**: N

**Course Type**: Lecture-based course

### Assessment Methods and Weighting

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<tbody>
<tr>
<td>Assignments</td>
<td>36</td>
<td>20 CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>40 CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>30</td>
<td>30 CLO 1,2,3</td>
<td></td>
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</table>

**Communication-intensive Course**: N

**Course Type**: Lecture-based course

### Assessment Methods and Weighting

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</tr>
<tr>
<td>Test</td>
<td>30</td>
<td>30 CLO 1,2,3</td>
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</tr>
</tbody>
</table>

**Communication-intensive Course**: N

**Course Type**: Lecture-based course

### Assessment Methods and Weighting

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<tr>
<td>Test</td>
<td>30</td>
<td>30 CLO 1,2,3</td>
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</tbody>
</table>

**Communication-intensive Course**: N

**Course Type**: Lecture-based course

### Assessment Methods and Weighting

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<tr>
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<tr>
<td>Test</td>
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**Communication-intensive Course**: N

**Course Type**: Lecture-based course

### Assessment Methods and Weighting

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**Communication-intensive Course**: N

**Course Type**: Lecture-based course

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**Communication-intensive Course**: N

**Course Type**: Lecture-based course

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**Communication-intensive Course**: N

**Course Type**: Lecture-based course

### Assessment Methods and Weighting

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</table>
Course Co-ordinator
Dr Y J Tu, Physics (yunjuntu@hku.hk)

Teachers Involved
(Or 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 (and Co-requisites and Impermissible combinations)
Pass in PHYS3550

Offer in 2022 - 2023
N

Grade Descriptors (A+ to F)
A
B
C
D
F

Assessment Methods
Examination 3-hour written exam 50
Assignments 20

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 20 CLO 1,2,3
Examination 3-hour written exam 50 CLO 1,2,3
Test 30 CLO 1,2,3

Communication-intensive Course
N

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 50 CLO 1,2,3
Test 30 CLO 1,2,3

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator

PHYS4551
Solid state physics (6 credits)

Offering Department
Physics

Course Co-ordinator
Dr S Z Zhang, Physics (shizhong@hku.hk)

Teachers Involved
(Or S Z Zhang (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
Topics include: 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 approximations; semi-classical model of electron dynamics; Boltzmann equation; transport and optical properties of metals and semiconductors; interaction and collective excitations. If time permits, magnetism and 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 of metals and semiconductors; interaction and collective excitations. If time permits, magnetism and superconductivity will also be covered.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in (PHYS2255 or PHYS2261) and PHYS3551

Offer in 2022 - 2023
Y

Grade Descriptors (A+ to F)
A
B
C

Assessment Methods
Examination 3-hour written exam 50
Assignments 20

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 20 CLO 1,2,3
Examination 3-hour written exam 50 CLO 1,2,3
Test 30 CLO 1,2,3

Required/recommended reading and online materials
### Department of Physics

**PHYS4650 Stellar physics (6 credits)**

**Offering Department**  
Physics

**Course Co-ordinator**  
Dr S C Y Ng, Physics ([ncy@astro.physics.hku.hk](mailto:ncy@astro.physics.hku.hk))

**Course Objective**

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 Content & Topics**


**Pre-requisites and Co-requisites**

Pass in PHYS3351 and PHYS3651

**Offer in 2022 - 2023**

N

**Course Type**

Lecture-based course

**Grade Descriptors (A+ to F)**

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<thead>
<tr>
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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 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>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>60</td>
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<td>Project reports</td>
<td>10</td>
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<tr>
<td>Test</td>
<td>20</td>
<td>CLO 1,2,3</td>
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**Course Website**

http://moodle.hku.hk

**Required/recommended reading and online materials**

Lecture notes provided by course coordinator.


### Communication-intensive Course

N

**Communication-intensive Course**

N

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
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<td>CLO 1,2,3</td>
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**Required/recommended reading and online materials**

Lecture notes provided by Course Coordinator.

Course Website  
http://www.physics.hku.hk/~phys4650/

**PHYS4651**  
Selected topics in astrophysics (6 credits)  
**Academic Year:** 2022  
**Offering Department:** Physics  
**Course Co-ordinator:** Prof K S Cheng, Physics (hrspksc@hku.hk)  
**Teachers Involved:** (Dr M H Lee, Physics)  

**Course Objectives:**  
To introduce students some current topics in astrophysics. It may be taken as a self-contained course or as background to research work in astrophysics.

**Course Contents & Topics:**  
Topics include: Brief review of thermodynamical equilibrium, radiation mechanisms and general relativity. Physics of shock wave. Properties of Cosmic rays, Physics of compact stellar objects including black holes, white dwarfs, neutron stars and quark stars. Elements of cosmology: classical and relativistic dynamical theories, observational parameters.

**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 2022 - 2023:** N  
**Examination:** ---  
**Quota:** ---

**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.

**Communication-intensive Course:** N

**Course Type:** Lecture with laboratory component course

**Course Teaching & Learning Activities:**  
- **Activities**: Lectures, Laboratory, Tutorials, Reading / Self study  
- **Details**: No. of Hours  
  - Lectures: 36  
  - Laboratory: 8  
  - Tutorials: 8  
  - Reading / Self study: 80

**Assessment Methods and Weighting:**  
- **Methods**: Assignments, Examination, Laboratory reports, Presentation, Test  
- **Details**: Weighting in final course grade (%)  
  - Assignments: 8 CLO 1,2,3  
  - Examination: 50 CLO 1,2,3  
  - Laboratory reports: 7 CLO 1,2,3  
  - Presentation: 15 CLO 1,2,3  
  - Test: 20 CLO 1,2,3

**Required/recommended reading and online materials:**  
Lecture notes provided by Course Coordinator  

**Course Website:** http://moodle.hku.hk

**PHYS4652**  
Planetary science (6 credits)  
**Academic Year:** 2022  
**Offering Department:** Physics  
**Course Co-ordinator:** Dr M H Lee, Physics (mhlee@hku.hk)  
**Teachers Involved:** (Dr M H Lee, Physics)

**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. This is an elective course for the astrophysics theme. This is also an essential course for those who plan to pursue postgraduate studies in planetary science.

**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):**  
Pass in PHYS3651 or PHYS3653 or (PHYS3350 and PHYS3550)
PHYS4653

Selected topics in astrophysics and cosmology (6 credits)

Offering Department
Physics

Quota
---

Teachers Involved
Dr L X Dai, Physics (lxindai@hku.hk)

Course Objectives
The aim of the course is to offer an advanced introduction to cosmology as well as some current topics in astrophysics. It may be taken as a self-contained course or as background to research work in astrophysics / cosmology.

Course Contents & Topics
Topics include: 1) astrophysics: review of thermodynamical equilibrium and radiation mechanisms in astrophysics; physics of compact objects including black holes: gravitational waves; 2) cosmology: the big bang and inflationary models, expansion of the universe, the metric of the universe, galaxy structure and formation; etc. 3) recent hot topics in astrophysics and cosmology research

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 and observational aspects of cosmology

CLO 2 explain the observed phenomena of cosmology and some selected astrophysical objects

CLO 3 demonstrate knowledge and discuss the underlying physical concepts associated with some astrophysical systems and the cosmological evolution of the universe

Pre-requisites
Pass in PHYS3653 or (PHYS2055 and PHYS2650 and PHYS3450)

Offer in 2022 - 2023
Y

1st sem

Offer in 2023 - 2024 : Y

Communication-intensive Course
N

Course Type
Lecture-based course

Course Teaching & Learning Activities

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Required/recommended reading and online materials
Lecture notes provided by Course Coordinator

Course Website
http://moodle.hku.hk
### PHYS4654

**General relativity (6 credits)**

**Offering Department:** Physics  
**Teachers Involved:** (Dr M H Lee, Physics)

**Course Co-ordinator:** Dr K M Lee, Physics (kmlee1@hku.hk)

**Course Objectives:**
This is an introductory course on general relativity. It provides conceptual skills and analytical tools necessary for astrophysical and cosmological applications of the theory. This is an elective course for the astrophysics and theoretical physics themes. This is also an essential course for those who plan to pursue postgraduate studies in astrophysics or theoretical physics.

**Course Contents & Topics:**
Topics include: The principle of equivalence; inertial observers in a curved space-time; vectors and tensors; parallel transport and covariant differentiation; the Riemann tensor; the stress-energy tensor; the Einstein gravitational field equations; the Schwarzschild solution; black holes; gravitational waves detected by LIGO, and Freidmann equation.

**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 2022 - 2023:**
Y 1st sem  Offer in 2023 - 2024 : 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.

**Communication-intensive Course:**
N

**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: 30  CLO 1,2,3
  - Examination: 2-hour written exam: 50  CLO 1,2,3
  - Test: 20  CLO 1,2,3

**Required/recommended reading and online materials:**
- Lecture notes provided by Course Coordinator
- B. Schutz: A First Course in General Relativity (Cambridge University Press, 2009)
- B. Schutz: A First Course in General Relativity (Cambridge University Press, 2009)

**Course Website:**
http://moodle.hku.hk

### PHYS4655

**Interstellar medium (6 credits)**

**Offering Department:** Physics  
**Quota:** ---

**Teachers Involved:** Dr M H Lee, Earth Sciences (mthlee@hku.hk)

**Course Co-ordinator:** Dr K M Lee, Physics

**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. This is an elective course for the astrophysics theme. This is also an essential course for those who plan to pursue postgraduate studies in astronomy and astrophysics.

### Course Contents & Topics
Gas, dust, atoms, molecules, radiation; physical and radiative properties of hydrogen, helium and heavier elements; hydrogen clouds, molecular clouds; HII 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 PHYS3653 or (PHYS3351 and PHY3550)

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>Examination</td>
<td>May</td>
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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 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.

### Communication-intensive Course
N

### Course Type
Lecture-based course

### Course Teaching & Learning Activities

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<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>15</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
Lecture notes provided by Course Coordinator

### Course Website
http://moodle.hku.hk

### PHYS4656
Advanced astrophysics (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>2022</td>
<td></td>
</tr>
</tbody>
</table>

### Course Co-ordinator
Dr S C Y Ng, Physics (ncy@astro.physics.hku.hk)

### Teachers Involved
(Dr S C Y Ng,Physics)

### Course Objectives
Built on PHYS3653, this course covers selected astrophysics topics at the advanced undergraduate level. Foci include high energy processes, basic theory of stellar structure and evolution, and introduction to compact objects. It follows a vigorous mathematical treatment that stresses on the underlying physical processes. This is an elective course for the astrophysics theme. This is also an essential course for those who plan to pursue postgraduate studies in astrophysics.

### Course Contents & Topics
Topics include: Radiation mechanisms; stellar structure equations; polytropic model; elementary stellar radiation processes; simple stellar nuclear processes; stellar formation; late stage of stellar evolution; supernova explosion; compact stellar; cosmic rays; if time permits, additional selected topics will be covered.

### 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 apply physics principles to describe the physical properties of various astrophysical systems
- CLO 5 demonstrate knowledge and discuss the underlying physical concepts associated with the astrophysical systems and their dynamic interactive processes
- CLO 6 assess selected research papers in the field of stellar astrophysics

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS3651 or PHYS3653 or (PHYS3351 and PHY3550)

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>Examination</td>
<td>May</td>
</tr>
</tbody>
</table>

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.
### Department of Physics

<table>
<thead>
<tr>
<th>Course</th>
<th>Experimental physics (6 credits)</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
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<tbody>
<tr>
<td>Offering Department</td>
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<td>2022</td>
<td>---</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Physics (TBC,Physics)</td>
<td></td>
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</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr Y J Tu, Physics (<a href="mailto:yanjuntu@hku.hk">yanjuntu@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>TBC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>On successful completion of this course, students should be able to:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
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<td>Offer in 2022 - 2023</td>
<td>N</td>
<td>Offer in 2023 - 2024 : N</td>
<td>Examination</td>
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<tr>
<td>Grade Descriptors (A+ to F)</td>
<td>Examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
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<td></td>
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<tr>
<td></td>
<td>Fail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication-intensive Course</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Type</td>
<td>Lecture with laboratory component course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
<td>Details</td>
<td>No. of Hours</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
<td>Weighting in final course grade (%)</td>
</tr>
<tr>
<td></td>
<td>Assignments</td>
<td></td>
<td>10</td>
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<tr>
<td></td>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Presentation</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Test</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

### PHYS4850

<table>
<thead>
<tr>
<th>Course</th>
<th>Particle physics (6 credits)</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Physics</td>
<td>2022</td>
<td>---</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr Y J Tu, Physics (<a href="mailto:yanjuntu@hku.hk">yanjuntu@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr Y J Tu,Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course covers both theoretical and experimental aspects of particle physics at the advanced undergraduate level. This is an elective course for the theoretical physics and experimental physics themes. This is also an essential course for those who plan to pursue postgraduate studies or work in high energy particle physics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Topics include: Fundamental particles; symmetry and conservation law; Feynman diagrams; electromagnetic interaction; weak interaction; strong interaction; particle accelerator and detector.</td>
<td></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>
<td></td>
</tr>
<tr>
<td>CLO 1</td>
<td>Describe and explain the fundamental physical principles for the standard model of particle physics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLO 2</td>
<td>Apply these principles, together with logical and mathematical reasoning, to analyze particle physics processes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLO 3</td>
<td>Capture the frontier and progress of particle physics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLO 4</td>
<td>Apply basic experimental skill in particle physics</td>
<td></td>
<td></td>
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<tr>
<td>Communication-intensive Course</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Type</td>
<td>Lecture with laboratory component course</td>
<td></td>
<td></td>
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</tbody>
</table>
**Offer in 2022 - 2023**

**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. 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.

**Assessment Methods**

- **Assignments** 10 CLO 1,2,3
- **Examination** 3-hour written exam 50 CLO 1,2,3
- **Laboratory reports** 20 CLO 1,2,4
- **Test** 20 CLO 1,2,3

**Communication-intensive Course**

**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>9</td>
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<tr>
<td>Tutorials</td>
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<td>8</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>80</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>10</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>Laboratory reports</td>
<td></td>
<td>20</td>
<td>CLO 1,2,4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Pre-requisites (and Co-requisites and Impermissible combinations)**

- Pass in PHYS3351
- 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.

**Course Co-ordinator**

Dr F C C Ling, Physics (ccling@hku.hk)

**Academic Year**

2022

**Offering Department**

Physics

**Course Website**

http://moodle.hku.hk

**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”**

**Offer in 2022 - 2023**

**Grade Descriptors Distinction/Pas/Fail**

- **Distinction**
  - Demonstrates excellent ability in applying knowledge to solve problems in the workplace. Demonstrates excellent performance in handling and carrying out the work required in the job or assigned by supervisor(s). Establishes highly 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, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.

- **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
<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Type</td>
<td>Internship</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
</tr>
<tr>
<td></td>
<td>Internship work</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
</tr>
<tr>
<td></td>
<td>Written report</td>
</tr>
<tr>
<td>Additional Course Information</td>
<td>To be provided by individual project supervisor</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>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 &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>
</tbody>
</table>

**PHY4999**
- **Offering Department**: Physics project (12 credits)
- **Academic Year**: 2022
- **Offer in 2022 - 2023**: Y
- **Quota**: ---
- **Offer in 2023 - 2024**: Y

**Course Co-ordinator**: Dr F C C Ling, Physics (ccling@hku.hk)
- (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. Students investigate a specific problem, either theoretical, experimental or numerical, under the supervision of an academic staff using the knowledge the student gained in all years of their major studies. The available projects are close to postgraduate level research in physics and/or astronomy. Passing a pre-approved project is recognized as having completed an elective in one of the four themes.

**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 and originality in experimental design are expected.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- **CLO 1**: plan and execute a theoretical, numerical or experimental research project on a topic in physics or astronomy
- **CLO 2**: 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
- **CLO 3**: criticize existing approaches for solving the selected physics or astronomy problem
- **CLO 4**: describe and explain connections between the physical principles and the study problem
- **CLO 5**: (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
- **CLO 6**: (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
- **CLO 7**: (for projects involving team work) collaborate and communicate effectively in the team, which may comprise of people of different 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 2022 - 2023**

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Year long</th>
<th>Offer in 2023 - 2024 : Y</th>
<th>Examination</th>
<th>No Exam</th>
</tr>
</thead>
</table>

**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.
Course Objectives

This graduate level course covers the theory and advanced techniques in quantum mechanics, and their applications to selected topics in condensed matter physics. This is an elective course for the theoretical physics theme.

Course Contents & Topics

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.

Course Learning Outcomes

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

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.

Assessment Methods & Weights

<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>Including supervisor's comments (10%)</td>
<td>30</td>
<td>CLO 2,4,5,6</td>
</tr>
<tr>
<td>Research report</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3,4,5,6,7</td>
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</tbody>
</table>

Required/recommended reading and online materials

To be provided by individual project supervisor.

Pre-requisites

Pass in PHYS4350

Offer in 2022 - 2023

N: Offer in 2023 - 2024: N

Examination

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### Examination

<table>
<thead>
<tr>
<th>Pre-requisites and Impermissible combinations</th>
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</thead>
<tbody>
<tr>
<td>Pass in PHYS3150 and PHYS4351</td>
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<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer 2022 - 2023</th>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer 2023 - 2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 5 analyse physical system in a quantum mechanical way</td>
<td>Y 1st sem, Offer in 2023 - 2024</td>
<td>CLO 6 recognise the connection between relativity and quantum mechanics</td>
<td>Dec</td>
</tr>
</tbody>
</table>

### Course Learning & 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</td>
<td></td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>3-hour written exam</td>
<td>50</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

Lecture notes provided by Course Coordinator
J. J. Sakurai: Modern Quantum Mechanics (Addison-Wesley, 1994)

### Course Website

http://moodle.hku.hk

### PHYS7450

Graduate electromagnetic field theory (6 credits)  
Academic Year: 2022

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof Z D Wang, Physics (<a href="mailto:zwang@hku.hk">zwang@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof Z D Wang, Physics</td>
</tr>
</tbody>
</table>

### Course Objectives

This graduate level course covers the theory of classical electromagnetic field, enabling them to master key analytical tools for solving real physics problems. This is an elective course for the theoretical physics theme.

### Course Contents & Topics

This course introduces and discusses the following topics: Boundary-value problems in electrostatics and Green's Function method; electrostatics of media; magnetostatics; Maxwell's equations and conservation laws; gauge transformations; electromagnetic waves and wave guides.

### Course Learning Outcomes

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

### Pre-requisites and Impermissible combinations

Pass in PHYS3150 and PHYS4450

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer 2022 - 2023</th>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer 2023 - 2024</th>
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</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>
<td></td>
<td></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>
<td></td>
<td></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></td>
<td></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>
<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>
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</table>

### Communication-intensive Course

N

### 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>
<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
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</table>
Department of Physics

**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>
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<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>3-hour written exam</td>
<td>50</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**

- J.D. Jackson: Classical Electrodynamics (John Wiley & Sons, 1999)

**Course Website**

http://moodle.hku.hk

**PHYS7550**

**Graduate statistical mechanics (6 credits)**

**Offering Department**

Physics

**Course Co-ordinator**

Dr G Chen, Physics (gangchen@hku.hk)

**Teachers Involved**

- Dr G Chen, Physics

**Course Objectives**

This graduate level course covers advanced topics in equilibrium statistical physics. This is an elective course for the theoretical physics theme.

**Course Contents & Topics**

Topics include: Ensemble theory; theory of simple gases, ideal Bose systems, ideal Fermi systems; statistical mechanics of interacting systems; statistical field theory; some topics in the theory of phase transition may be selected.

**Course Learning Outcomes**

- On successful completion of this course, students should be able to:
  - CLO 1 discuss the various classical ensembles and quantum ensembles
  - CLO 2 solve the statistical mechanics problems using ensemble theory
  - CLO 3 explain the connection between classical statistical mechanics and quantum statistical mechanics
  - CLO 4 understand the phase transition, criticality, symmetry breaking, renormalization

**Pre-requisites (and Co-requisites and Impermissible combinations)**

- Pass in (PHYS3550 and PHYS4351) or PHYS4550

**Offer in 2022 - 2023**

- Y 1st sem
- Offer in 2023 - 2024 : 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.

**Communication-intensive Course**

N

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

- **Activities**
  - Lectures: Details | No. of Hours
  - Tutorials: Details | 12
- **Assessment Methods and Weighting**
  - **Methods**
    - Assignments: Details | 50
    - Examination: 3-hour written exam | 50
  - **Weighting in final course grade (%)**
    - CLO 1,2,3,4
  - **Assessment Methods to CLO Mapping**
    - CLO 1,2,3,4

**Required/recommended reading and online materials**

- Lecture notes provided by Course Coordinator
- R.K. Pathria: Statistical Mechanics
- M. Plischke and B. Bergersen: Equilibrium Statistical Physics
- Kardar: Statistical Physics of fields
- Parisi: Statistical field theory

**Course Website**

http://moodle.hku.hk

**PHYS7551**

**Graduate solid state physics (6 credits)**

**Offering Department**

Physics

**Course Co-ordinator**

Prof J Wang, Physics (jianwang@hku.hk)

**Teachers Involved**

- (and Co-requisites and Impermissible combinations)

**Course Objectives**

To provide students with an understanding of more advanced topics in selected areas of solid state physics.

**Course Contents & Topics**

- Bloch theory. Nearly free electrons and tight binding model. Band structure calculations for realistic systems. The semi-classical model of electron dynamics. Ab initio total energy calculations and other advanced topics.

**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

**Assessment Methods & Learning Activities**

- **Details**
  - CLO 1: 50
  - CLO 2: 50
  - CLO 3: 50
  - CLO 4: 50

**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.
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**Communication-intensive Course**

N

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

- **Activities**
  - Lectures: Details | 36
  - Tutorials: Details | 12
- **Assessment Methods and Weighting**
  - **Methods**
    - Assignments: Details | 50
    - Examination: 3-hour written exam | 50
  - **Weighting in final course grade (%)**
    - CLO 1,2,3,4
  - **Assessment Methods to CLO Mapping**
    - CLO 1,2,3,4

**Required/recommended reading and online materials**

- Lecture notes provided by Course Coordinator
- R.K. Pathria: Statistical Mechanics
- M. Plischke and B. Bergersen: Equilibrium Statistical Physics
- Kardar: Statistical Physics of fields
- Parisi: Statistical field theory

**Course Website**

http://moodle.hku.hk

**PHYS7552**

**Graduate classical mechanics (6 credits)**

**Offering Department**

Physics

**Course Co-ordinator**

Prof J Wang, Physics (jianwang@hku.hk)

**Teachers Involved**

- (and Co-requisites and Impermissible combinations)

**Course Objectives**

To provide students with an understanding of more advanced topics in selected areas of solid state physics.

**Course Contents & Topics**

- Bloch theory. Nearly free electrons and tight binding model. Band structure calculations for realistic systems. The semi-classical model of electron dynamics. Ab initio total energy calculations and other advanced topics.

**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

**Assessment Methods & Learning Activities**

- **Details**
  - CLO 1: 50
  - CLO 2: 50
  - CLO 3: 50
  - CLO 4: 50

**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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**Communication-intensive Course**

N

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

- **Activities**
  - Lectures: Details | 36
  - Tutorials: Details | 12
- **Assessment Methods and Weighting**
  - **Methods**
    - Assignments: Details | 50
    - Examination: 3-hour written exam | 50
  - **Weighting in final course grade (%)**
    - CLO 1,2,3,4
  - **Assessment Methods to CLO Mapping**
    - CLO 1,2,3,4

**Required/recommended reading and online materials**

- Lecture notes provided by Course Coordinator
- R.K. Pathria: Statistical Mechanics
- M. Plischke and B. Bergersen: Equilibrium Statistical Physics
- Kardar: Statistical Physics of fields
- Parisi: Statistical field theory

**Course Website**

http://moodle.hku.hk
### PHYS7650
**Stellar atmospheres (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>
</tbody>
</table>

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

**Pre-requisites (and Co-requisites and Impermissible combinations)**

| TBC |

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>N</th>
<th>Offer in 2023 - 2024 : N</th>
<th>Examination</th>
</tr>
</thead>
</table>

**Grade Descriptors (A+ to F)**

- **A**: Demonstrate thorough mastership 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 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. Apply moderately effective observation skills and techniques.

- **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.

**Assessment Methods and Weighting**

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<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>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Lecture notes provided by Course Coordinator


### PHYS7750
**Nanophysics (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
</table>

**Course Co-ordinator**


**Pre-requisites**

Pass in PHYS3551 and PHYS4351

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>N</th>
<th>Offer in 2023 - 2024 : N</th>
<th>Examination</th>
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**Grade Descriptors (A+ to F)**

- **A**: Demonstrate thorough mastership 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 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 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.

**Assessment Methods and Weighting**

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<td>CLO 1,2,3,4</td>
<td></td>
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<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
<td></td>
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</table>

**Required/recommended reading and online materials**

TBC
Course Co-ordinator: Dr D K Ki, Physics (dki@hku.hk)

Teachers Involved: (Dr D K Ki, Physics)

Course Objectives:
This course is designed to deliver fundamental concepts and principles of nano physics to fresh postgraduate students, mostly focusing on the transport properties of the low-dimensional electronic systems under external electric and/or magnetic fields.

Course Contents & Topics:
The course will cover various topics in nano physics, such as zero-, one-, and two-dimensional electronic gas systems, quantum dots, graphene and 2D materials, semiconductor heterostructures, quantum Hall effects, Coulomb blockade effects, single electron effects, field effect transistors, phase-coherent interference effects, and more. While most discussions will be based on experimental findings, the basics of the relevant theories will also be covered using the tight-binding model, basic quantum mechanics, and Landauer-Büttiker formula. The principles and applications of nano fabrication and low-temperature measurement techniques will also be discussed.

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 various transport phenomena occurring at low energy and low dimensions, such as quantum Hall effect, single electron tunnelling, and Aharonov-Bohm effects.
- CLO 3: Understand the physics and applications of low-dimensional electron systems and can explain them effectively to colleagues.

Pre-requisites (and Co-requisites and Impermissible combinations):
Pass in PHYS3351 and PHYS4551

Offer in 2022 - 2023:
Y 1st sem Offer in 2023 - 2024: 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.
- 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.

Assessment Methods and Weighting:

- Assignments: 40% CLO 1,2,3
- Examination: 40% CLO 1,2,3
- Mid-term test: 20% CLO 1,2,3

Communication-intensive Course:
N

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 Details: Weighting in final course grade (%): Assessment Methods to CLO Mapping
Assignments: 40% CLO 1,2,3
Examination: 2-hour written exam: 40% CLO 1,2,3
Mid-term test: 20% CLO 1,2,3

Required/recommended reading and online materials:
Lecture notes provided by Course Coordinator
Y. Imry, Introduction to mesoscopic physics, Oxford, 1997
J.J. Sakurai, Modern Quantum Mechanics, Addison-Wesley, 1994

Course Website:
http://moodle.hku.hk

ENVS3006
Environmental radiation (6 credits)

Offering Department:
Physics

Course Co-ordinator:
Dr J K C Leung, Physics (jkcleung@hku.hk)

Teachers Involved:
(Prof J K C Leung, Physics)

Course Objectives:
In this course, students will learn about various kinds of radiations in the environment, the experimental techniques to detect them, the methods to trace them and to assess their hazard to the environment, and the ways to reduce the hazard in events of nuclear accidents or incidents.

Course Contents & Topics:
The course will cover naturally occurring radiation sources and man-made radiation sources including nuclear power plants; transport models for radionuclides in the environment; nuclear accidents and its impact to the environment; radiation risk assessment and emergency preparedness; techniques for measuring low level radioactivities; nuclear techniques in ecology; concept of radiation protection to human species and non-human species.

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 (and Co-requisites):
Pass in CHEM2041 or ENVS2001 or ENVS2002 or PHYS2265
ENVS3010 Sustainable energy and environment (6 credits)

Offering Department  Physics
Course Co-ordinator  Prof A B Djuricic, Physics (dalek@hku.hk)
Teachers Involved (Prof A B Djuricic, 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.
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  Pass in CHEM2041 or ENVS2001 or ENVS2002 or PHYS2260

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Descriptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</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.</td>
</tr>
<tr>
<td>F</td>
<td>Fail</td>
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</tbody>
</table>

Examination

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Assessment Methods

<table>
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<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>20</td>
<td>CLO 1.2, 4, 5</td>
</tr>
<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1.2, 4, 5</td>
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<td>Laboratory reports</td>
<td>10</td>
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<td>Presentation</td>
<td>10</td>
<td>CLO 2.4, 5</td>
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Communication-intensive Course

Lecture with laboratory component course

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>
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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>
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<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1, 2, 3</td>
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<tr>
<td>Presentation</td>
<td></td>
<td>40</td>
<td>CLO 2, 3</td>
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<thead>
<tr>
<th>Required/recommended reading and online materials</th>
<th>Lecture notes provided by Course Coordinator</th>
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</thead>
</table>

| Course Website | http://moodle.hku.hk |
### ENTR2001

**Professional and leadership development (6 credits)**

**Offering Department**
Faculty

**Course Co-ordinator**
Dr R Law, Faculty (rockylaw@hku.hk)

**Teachers Involved**
Dr R Law, Faculty of Science (Ms J Lloyd, CEDARS)

**Course Objectives**
This course is to provide opportunity for:
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 skills 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 2022 - 2023**
Y 1st sem

**Grade Descriptors (Distinction/Pass/Fail)**
- **Distinction**
  - Demonstrate excellence in applying knowledge to solve problems in the course work. Demonstrate excellence in handling and carrying out the work assigned by teacher(s) and external professional trainer(s). Establishes highly effective collaboration and communication with supervisor(s) and team members in the course. Successfully fulfills the requirements set out in the Course Description regarding attendance, assignments, reports, and evaluation by teacher(s), external trainer(s), etc.
- **Pass**
  - Able to apply knowledge to solve problems in the course work. Successfully handles and carries out the work assigned by teacher(s) and external professional trainers. Establishes effective collaboration and communication with teacher(s) and team members in the course. Successfully fulfills the requirements set out in the Course Description regarding attendance, assignments, reports, and evaluation by teacher(s) and external professional trainer(s), etc.
- **Fail**
  - Very limited or no ability to solve problems in the course work. Fails to handle or carry out the work assigned by teacher(s) and external professional trainer(s). Fails to establish effective collaboration or communication with supervisor(s) and team members. Fails to satisfy the requirements set out in the Course Description regarding attendance, assignments, reports, or evaluation by teacher(s) and external professional trainer(s), etc.

**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>

**Communication-intensive Course**
N

**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>

**Additional Course Information**
This course is opened up for year 2 students or beyond. However, priority will be given to year 3 students.

### ENTR3001

**Science-based innovation development (6 credits)**

**Offering Department**
Faculty

**Course Co-ordinator**
Dr M Kotaka, Biomedical Sciences (masayo@hku.hk)

**Teachers Involved**
Dr M Kotaka, Biomedical Sciences (Dr B H Yuen, 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

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in IMT1611 and ENTR2001, or already enrolled in these courses

### 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.

### Course Objectives

- 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 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

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
<th>Offer in 2022 - 2023: Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>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.</td>
<td></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. S/he has shown the ability to apply knowledge to familiar and unfamiliar situations. S/he has demonstrated effective organizational and presentation skills.</td>
<td></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. S/he has demonstrated moderately effective organizational and presentation skills.</td>
<td></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. S/he has demonstrated limited or barely effective organizational and presentation skills.</td>
<td></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>
<td></td>
</tr>
</tbody>
</table>

### 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.

### ENTR3002

Customer analysis and strategic marketing (6 credits)  

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Quota</th>
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</thead>
<tbody>
<tr>
<td>Faculty</td>
<td>24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Teachers Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr R Law, Faculty</td>
<td><a href="mailto:rockylaw@hku.hk">rockylaw@hku.hk</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Contents &amp; Topics</th>
<th>Course Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

- Winning at New Products: Creating Value Through Innovation by Robert G. Cooper
- Regulatory Affairs for Biomaterials and Medical Devices edited by Stephen F. Amato and Robert M. Ezzell Jr
- Online Articles: Design Thinking by Tim Brown, Harvard Business Review, June 2008

### Assessment Methods

<table>
<thead>
<tr>
<th>Assessment Methods to CLO Mapping</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1,2,3,4,5,6</td>
<td>Assignments, Project report, Presentations, Discussions and student performance in tutorials</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

| Activities Details No. of Hours |
|---------------------------------|-------------------------------|
| Lectures                        | 36                            |
| Project work                    | 40                            |
| Reading / Self study            | 45                            |

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
<th>Examination</th>
<th>Offer in 2022 - 2023: Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO 1</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>CLO 2</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>CLO 3</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. S/he has demonstrated moderately effective organizational and presentation skills.</td>
<td></td>
</tr>
<tr>
<td>CLO 4</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. S/he has demonstrated limited or barely effective organizational and presentation skills.</td>
<td></td>
</tr>
<tr>
<td>CLO 5</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>
<td></td>
</tr>
</tbody>
</table>

### Communication-intensive Course

N

<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture-based course</td>
</tr>
</tbody>
</table>
### ENTR4066 Entrepreneurship internship (6 credits)

**Offering Department**
Faculty

**Course Co-ordinator**
Dr R Law, Faculty (rockylaw@hku.hk)

**Teachers Involved**
(All academic staff in Faculty of Science.)

**Course Objectives**
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.

**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 (preferably 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).

**Course Learning Outcomes**

<table>
<thead>
<tr>
<th>CLO</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CLO 1 to integrate and apply knowledge gained in coursework in a real-life setting</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>CLO 2 to experience the culture of a real organization and challenges encountered in entrepreneurship</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>CLO 3 to further improve problem-solving and collaborative skills in a real-life setting</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>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>
<td>50</td>
</tr>
</tbody>
</table>

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in ENTR3001 and ENTR3002

**Offer in 2022 - 2023**
Summer

<table>
<thead>
<tr>
<th>Grade/Pass/Fail</th>
<th>Distinction</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Details</td>
<td>Demonstrates excellent ability in applying knowledge to solve problems in the workplace. Demonstrates excellent performance in handling and carrying out the work required in the job or assigned by supervisor(s). Establishes highly 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, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.</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. Fails to fulfill the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc.</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>
</tr>
</tbody>
</table>

**Communication-intensive Course**
N

### 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 report</td>
<td>50</td>
<td>CLO 1,2,3,4,5,6</td>
<td></td>
</tr>
</tbody>
</table>

**Assessment**
Examination

**Exam**
No Exam

**Course Website**
http://moodle.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 (and Co-requisites and Impermissible combinations)

Pass in ENTR3001 and ENTR3002

Students must be in their Year 3 study or beyond, as well as minoring in Science Entrepreneurship.

### Course Teaching & Learning Activities

#### Internship work

- **Details**: it is expected that students are to work at least 160 hours (or the equivalent of 4 weeks fulltime)
- **No. of Hours**: 160

#### Reading / Self study

- **Details**: Students will be working on their projects with guidance from the supervisor to build a business proposal
- **No. of Hours**: 120

#### Assessment

- **Details**: Presentation
- **No. of Hours**: 5

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral presentation</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Supervisor's feedback</td>
<td>A Standardized evaluation form will be provided to internal/external supervisor</td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Written report</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

Students will be briefed with materials appropriate to the individual internship assignment by the internship supervisor(s) and/or the corresponding Faculty members.

### Course Website

http://moodle.hku.hk

### Additional Course Information

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.

### 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.

### Communication-intensive Course

- **N**: Project-based course

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course (%)</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>

### Required/recommended reading and online materials

Students will be briefed with materials appropriate to the project by the project supervisor(s).
INRE6033 Research ethics for graduate students (Faculty of Science) (3 credits)

Offering Department Faculty
Course Co-ordinator Prof T C Bonebrake, Biological Sciences (tbone@hku.hk)

Teachers Involved (Various teachers, Graduate School, Faculty of Law, Centre for Medical Ethics and Law, Centre for Comparative Medicine Research, Civil Engineering, Biomedical Sciences)

Course Objectives The aims of this course are to reinforce the importance that the University places on the preservation of the values and principles of research integrity in all research conducted at the university; and to provide opportunities for students to further examine and discuss responsible conduct of research in their own disciplines, thereby enabling them to apply the principles and practices in their research field.

Course Contents & Topics The first half of this course equips students with essential vocabulary, principles, and practices conducive to the promotion of responsible conduct of research in general and in their relevant disciplines. The students will also encounter terminology, texts, and tenets that relate to good conduct in the teaching and research professions.

The second half of this course addresses responsible conduct of research in a number of topics germane to different disciplines, and students are required to complete one of the following sub-modules:

- Working with Human Participants (Humanities)
- Working with Human Participants (Medicine)
- Working with Animals (Medicine)
- Lab Safety
- Working on Big Data

Course Learning Outcomes On successful completion of this course, students should be able to:

- CLO 1 apply principles of responsible conduct to research project design
- CLO 2 demonstrate the features of ethical authorship and publication practice in their own writing
- CLO 3 differentiate between conflicts of interest and conflicts of commitment
- CLO 4 critically evaluate their own and others' research practices in terms of potential risks and benefits
- CLO 5 explain the values and conventions of research integrity during data collection appropriate to their discipline
- CLO 6 design independent plans for ethical use, sharing, storage and security of research material and data
- CLO 7 synthesise current principles and practices of ethical research in their disciplines to fit related emerging areas and innovations

Pre-requisites (and Co-requisites and Impermissible combinations) For Year 2 or above BSc&MRes (Science Master Class) students only.

Offer in 2022 - 2023 Y 1st sem 2nd sem Offer in 2023 - 2024 : Y

Grade Descriptors Pass Demonstrate general to thorough command of a broad range of knowledge and skills required for attaining most to all of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and unfamiliar situations. Apply 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.

Communication-intensive Course N

Course Type Lecture-based course

Course Teaching & Learning Activities Activities Details No. of Hours
Lectures 6
Reading / Self study 54

Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework assessment (based on attendance and the reflective report of about 500 words) 50 CLO 5,6,7
Test Web-based learning modules (Including module quizzes and three completion reports) 50 CLO 1,2,3,4

Additional Course Information Students complete this course by fulfilling the course requirements in GRSC6101 Responsible Conduct of Research: https://gradsch.hku.hk/gradsch/f/page/600/GRSC6101.pdf, and GRSC6102 Stream-based Responsible Conduct of Research: https://gradsch.hku.hk/gradsch/f/page/600/GRSC6102.pdf in the same semester.

Students are expected to take GRSC6101 before taking the course GRSC6102. Enrolment of these 2 courses are not conducted via the online course selection system and should be made through the Faculty office. Students may check the course details from the Faculty

INRE7999 Research Project (42 credits)

Offering Department Faculty
Course Co-ordinator Prof T C Bonebrake, Biological Sciences (tbone@hku.hk)
This course aims at providing students with an opportunity to pursue their own research interest under the supervision of a staff member. The project report will be written in the form of a literature review paper and an original research paper in the relevant field. The research topic is flexible but should be related to the fields of Biological Sciences, Chemistry, Ecology & Biodiversity, Geology, Mathematics, Molecular Biology & Biotechnology or Physics. Students should seek approval from a prospective supervisor prior to selecting this course. After enrolment of the course is approved by the course coordinator, students will work under the guidance of their supervisor to complete the research project. The supervisor normally meets with the student regularly to discuss project progress. The period of the research project will last for the 1st semester, 2nd semester until the summer semester.

On successful completion of this course, students should be able to:

- Plan and execute 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.

- 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. Communicates the findings to a broader audience with reasonable clarity and responds to most questions. Acceptable time-management skills.

- 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.

To be provided by individual project supervisor

Enrolment of this course is not conducted via the online course selection system and should be made through the Faculty office after approval has been obtained from both the supervisor and the course coordinator.

For BSc&MRes (Science Master Class) students only.
Pass in INRE6033.
The earliest that a student is allowed to take this course is their year 4 study.

Campaign-intensive Course

Turn-based course

Activities Details No. of Hours
Reading / Self study Students are expected to carry out no less than 840 hours of hands-on work for their project. 840

Assessment Method 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>Each student gives a 10-minute presentation with a 5-minute Q&amp;A.</td>
<td>20</td>
<td>CLO 3,4</td>
</tr>
<tr>
<td>Research report</td>
<td>The project report of no more than 20,000 is in the form of a literature review paper and an original research paper in the relevant field.</td>
<td>80</td>
<td>CLO 1,3,4,5</td>
</tr>
</tbody>
</table>

SCNC1111
Scientific method and reasoning (6 credits)

Offering Department
Faculty

Course Co-ordinator
Dr R K W Lui, Faculty (lui2012@hku.hk)

Teachers Involved
(Dr R K W Lui,Faculty of Science)

Course Objectives
The objectives are to give students a holistic view of the science discipline in terms of its nature, concepts and impact on civilization and society; to equip students with basic skills of logical and quantitative reasoning; and to introduce students mathematical and statistical methods for science studies and research.

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
Topics selected from the following ones, which are grouped under three categories:
- Mathematics
- Foundation of mathematics
- Mathematics and advancement of science - an introduction
**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, to interpret their solutions, and to present this in visual, oral and written format

**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, except those who are eligible for exemption. Students should take this course in their first year.)

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>Year</th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Offer in 2023 - 2024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td></td>
<td></td>
<td>Y</td>
</tr>
</tbody>
</table>

**Examination**

- 2-hour examination

**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>course work includes group projects (project plans, presentations and essays)</td>
<td>50</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour examination</td>
<td>50</td>
<td>CLO 1, 2, 4</td>
</tr>
</tbody>
</table>

**Communication-intensive Course**

Y

**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>

**Additional Course Information**

Candidates who have been admitted to Year 1 in 2020-21 (and thereafter) and have achieved any one of the following qualifications are exempted from taking SCNC1111. It is optional for them to take this course. Those who do not take this course should take a 6-credit disciplinary elective course of the science major in lieu:

- Level 4 or above in Mathematics Extended Part Module 1 or 2 in the Hong Kong Diploma of Secondary Education (HKDSE)
- Level 5 or above in Mathematics Higher Level in International Baccalaureate (IB)
- Grade B or above in Mathematics and Further Mathematics in General Certificate of Education Advanced Level (GCEAL)
- Mathematics qualification in Gao Kao will be considered on a case-by-case basis

**SCNC1112**

Fundamentals of modern science (6 credits)

**Offering Department**

Faculty

**Course Co-ordinator**

Dr J C S Pun, Physics (jcspun@hku.hk)

**Teachers Involved**

- Dr C Zheng, Biological Sciences
- Dr E K M Leung, Faculty of Science
- Dr H Y Au Yeung, Chemistry
- Dr J C S Pun, Physics

Science Faculty
### Course Objectives
This course aims to provide students an overview of the giant 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 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. This course is also designed as a Communication-intensive Course which includes activities to enhance the oral and written literacy of students in effective communication of contemporary developments of science.

### Course Contents & Topics
<table>
<thead>
<tr>
<th>(1) Universal principles and unifying concepts of science</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Motion, force and gravity</td>
</tr>
<tr>
<td>- Energy and Heat</td>
</tr>
<tr>
<td>- Entropy and Order</td>
</tr>
<tr>
<td>(2) Important reactions for the physical and the living world</td>
</tr>
<tr>
<td>- Atoms and Molecules</td>
</tr>
<tr>
<td>- Electronic configuration</td>
</tr>
<tr>
<td>- Chemical bonds</td>
</tr>
<tr>
<td>- Chemical reactions: acid-base, and redox</td>
</tr>
<tr>
<td>- Chemical kinetics and thermodynamics</td>
</tr>
<tr>
<td>(3) The living world</td>
</tr>
<tr>
<td>- Definition and origin of life</td>
</tr>
<tr>
<td>- Molecules of life</td>
</tr>
<tr>
<td>- Genomics and DNA; Genetics and inheritance</td>
</tr>
<tr>
<td>- Cells and systems</td>
</tr>
<tr>
<td>- Evolution</td>
</tr>
<tr>
<td>- Ecology and environment</td>
</tr>
<tr>
<td>(4) Evolution in the physical world</td>
</tr>
<tr>
<td>- Solid Earth, Earth's atmosphere and hydrosphere</td>
</tr>
<tr>
<td>- Earth's motion in space</td>
</tr>
<tr>
<td>- Planets and the solar system</td>
</tr>
<tr>
<td>- Stars and the Sun, and the solar system</td>
</tr>
<tr>
<td>- Cosmology</td>
</tr>
</tbody>
</table>

### Course Learning Outcomes
- 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 the diversity of different scientific disciplines and develop multidisciplinary and interdiscipliary perspectives on scientific issues
- CLO 4 critically and creatively appraise received ideas and established knowledge through writing
- CLO 5 develop curiosity in science and an appreciation of sciences as related to different Science Majors and as a form of life-long learning
- CLO 6 describe the contemporary developments of a topic in science through group presentations

### 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, except those who are eligible for exemption. Students should take this course in their first year.)

### Offer in 2022 - 2023
<table>
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<td>Fail</td>
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<table>
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<tr>
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<tbody>
<tr>
<td>Assignments</td>
<td>tutorials and homework</td>
<td>20</td>
</tr>
<tr>
<td>Examination</td>
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<td>45</td>
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<tr>
<td>Test</td>
<td>3 quizzes</td>
<td>15</td>
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### Communication-intensive Course
Lecture-based course

### Course Teaching & Learning Activities
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</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
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<tr>
<td>Assessment</td>
<td>3 hour in-class quiz</td>
<td>3</td>
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### Course Type
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</tr>
</tbody>
</table>
### SCNC1113

**The big history of our planet: a scientific perspective on everything that has ever happened (6 credits)**

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quota</td>
<td>50</td>
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</tbody>
</table>

**Offering Department**
Faculty

**Course Co-ordinator**
Dr W M Y Cheung, Faculty (willmyc@hku.hk)

**Teachers Involved**
(HDr H F Yu, Physics)
(Dr W M Y Cheung, Faculty of Science)
(Prof Q A Parker, Physics)

**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 nanotechnology, climate change, energy crisis, bioethics and artificial intelligence.

**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)**

- **Pre-requisites**:
  - Level 3 or above in at least one science subject at the pre-university level (HKDSE, Chemistry, Physics, Biology, GCEAL)
  - Grade B or above in Biology, Chemistry, and Physics Higher Level in International Baccalaureate (IB)
  - Grade B or above in Biology, Chemistry, and Physics in General Certificate of Education Advanced Level (GCEAL)
  - Biology, Chemistry, and Physics qualification in Gao Kao will be considered on a case-by-case basis

<table>
<thead>
<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>Description</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, and ability to apply knowledge to a wide range of familiar and unfamiliar situations. Carry out computations carefully and correctly. 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. Carry out computations mostly in a careful and correct way, but commit some minor computational errors. 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. Commit a number of minor computational errors. 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. Commit some substantial computational errors. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>N</th>
<th><strong>Offer in 2023 - 2024 : Y</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Science Faculty
SCNC2121 Sustainable food production (6 credits)  

**Offering Department**  
Faculty  

**Course Co-ordinator**  
Dr H S El-Nezami, Biological Sciences  
(elnazami@hku.hk)  

**Teachers Involved**  
(DeLisa Lewis, UBC Faculty of Land and Food Systems)  
(DeLisa Lewis, 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 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 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 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 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 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.

**Communication-intensive Course**  
N

**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>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.</td>
<td>40</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Presentation</td>
<td>Tutorial participation</td>
<td>10</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td>30</td>
<td>CLO 1,3,4,5,6</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4,6</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**  
Steven Weinberg: The First Three Minutes: A Modern View of the Origin of the Universe (Basic Books)  
Charles Darwin: The Origin of Species  
Eric R. Kandel: In Search of Memory: The Emergence of a New Science of Mind (W. W. Norton & Company)  
Fred Spier: Big history and the future of humanity (Willey-Blackwell)  
David Christian, Cynthia Brown and Craig Benjamin: Big History: Between Nothing and Everything (McGraw-Hill Humanities/Social Sciences/Languages)  
The Big History Project website: https://www.bighistoryproject.com/
Course Type: Field camps
Course Teaching & Learning Activities
- Activities: Details: No. of Hours
  - Lectures: 20
  - Field work: 50
  - Presentation: Group discussion / Project: 10
  - Reading / Self study: 50
  - Assessment: End of trip report: 30

Assessment Methods and Weighting
- Methods: Details: Weighting in final course grade (%): Assessment Methods to CLO Mapping
  - Assignments: To be announced by UBC Faculty of Land and Food Systems: 40: CLO 1,2,4,5
  - Report: Students will divided 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.: 60: CLO 3,5,6

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.
- 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 is taught by staff in UBC and the end of trip report is graded by Dr H S El-Nezami.

Remarks:
- Students will divided into groups of 3-4. Each group will submit a 7-10 pages report (not including the references). Please use Times New Roman (12 points), single space and 2 cm margins from all sides. The report should summarize the group HACCP plan, issues, problems and approaches and suggestions to address any farm related food safety issues. The marking criteria are the scientific quality and clear identification of the issues listed above. In addition each group will be presenting 12-15 minutes on the topic of their report.

SCNC2122
- Marine life science: a North East Pacific perspective (6 credits)
- Academic Year: 2022
- Quota: 32

Offering Department
- Faculty

Course Co-ordinator
- Dr T Vengatesen, Biological Sciences (rajan@hku.hk)
  - (Dr T Vengatesen,Biological Sciences)
  - (Prof G A Williams,Biological Sciences)
  - (Prof R S S Wu,Biological Sciences)
  - (Prof S Kwok,Earth Sciences)

Course Co-ordinator
- Dr T Vengatesen, Biological Sciences (rajan@hku.hk)
  - (Dr T Vengatesen,Biological Sciences)
  - (Prof G A Williams,Biological Sciences)
  - (Prof R S S Wu,Biological Sciences)
  - (Prof S Kwok,Earth Sciences)

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.

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 vising the Marina (Reed point marina) 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. Marine biodiversity survey techniques and methods of studying marine life in the field will be emphasized. 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 Ocean to focus on the diversity, dynamic interactions and threats to marine life.

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.

Offer in 2022 - 2023
- N

Grade Descriptors (A+ to F)
- A
  - Demonstrate through knowledge in basics of marine science and clearly understand why and how coastal biodiversity in sub-tropical Hong Kong is different from the North Pacific coastal areas. Ability to explain how marine organisms have adapted to their particular environments. Showing strong abilities, and logical thinking, with evidence of original thought, to examine reasons why the diversity of marine life and their habitats are so important to human society. Independent critique on how human induced threats such as climate change, pollution and habitat change will affect marine life, its diversity and their ecosystem services.
# SCNC3111 Frontiers of science honours seminar course (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Faculty</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr R K W Lui, Faculty (<a href="mailto:lui2012@hkbu.hk">lui2012@hkbu.hk</a>)</td>
<td>120</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr C Zheng, Biological Sciences)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Dr D Yu, Faculty of Science)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Dr E K M Leung, Faculty of Science)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Dr R K W Lui, Faculty of Science)</td>
<td></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:

1. **CLO 1** Describe and discuss in an informed manner the fields of research of some of our research professors
2. **CLO 2** Identify how professors with different scientific training solve their research problems
3. **CLO 3** Apply literature search skills to identify and develop a research topic
4. **CLO 4** Practice and master scientific writing and presentation skills
5. **CLO 5** Demonstrate interpersonal skills in collaborating with their peers in a scientific setting
6. **CLO 6** Devise a research proposal and evaluate their peers' works

## Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in a level 2 science course.
- The course is for Science students only.
- Students who participated or will participate in ORF/SRF must take this course.

## Offer in 2022 - 2023
- **Y** 1st sem
- **Offer in 2023 - 2024 : 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>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. 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>
</tbody>
</table>

## Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>10 sessions x 2.5 hours</td>
<td>25 CLO 2</td>
<td></td>
</tr>
<tr>
<td>Field work</td>
<td>Group project work (30-mins presentation)</td>
<td>25 CLO 1, 3, 4</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>Group discussion / Project: 1 group project with presentation</td>
<td>25 CLO 1, 3, 4</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>70 CLO 1, 3, 4</td>
<td></td>
</tr>
</tbody>
</table>

Please note: Students have to cover their own travel costs and course fees charged by the hosting institution (prices to be announced).

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.

Reference reading materials will be put on Moodle.

### SCNC4988: Science research internship I (12 credits)

**Offering Department**
Faculty

**Course Co-ordinator**
Prof T C Bonebrake, Biological Sciences (tbone@hku.hk)

**Teachers Involved**
Various teachers in the Departments, Faculty; all academic staff in Biochemistry Major, Biomedical S,

**Course Objectives**
To provide a stimulating experience for students under the Cambridge-track to integrate and apply their knowledge

**Course Contents & Topics**
Students will undertake a research project in the form of an undergraduate dissertation under the supervision of a member of staff.

**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.
- **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 critically discuss their research findings and place them into a holistic scientific context.
- **CLO 8**: Submit their work following a specified journal format, present their work as a scientific conference talk.

**Pre-requisites**
For Year 3 or Year 4 Cambridge-track students only.

**Offer in 2022 - 2023**
Y Summer

**Grade Descriptors (A* to F)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>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.</td>
<td>40</td>
<td>CLO 1, 2, 4</td>
</tr>
<tr>
<td>B</td>
<td>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.</td>
<td>40</td>
<td>CLO 3, 4, 5, 6</td>
</tr>
<tr>
<td>C</td>
<td>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. Communicates the findings to a broader audience with reasonable clarity and responds to most questions. Acceptable time-management skills.</td>
<td>20</td>
<td>CLO 1, 2, 4, 5</td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Communication-intensive Course**
N

**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>Student is expected to spend at least 240 hours on the project.</td>
<td>240</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>To be provided by individual project supervisor</td>
<td></td>
</tr>
<tr>
<td>Additional Course Information</td>
<td>Enrolment of this course is not conducted via the online course selection system and should be made through the Faculty office after approval has been obtained from both the supervisor and the course coordinator.</td>
<td></td>
</tr>
</tbody>
</table>

**SCNC4999 Science research internship II (12 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof T C Bonebrake, Biological Sciences (<a href="mailto:tbone@hku.hk">tbone@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Various teachers in the Departments, Faculty; all academic staff in Biochemistry Major, Biomedical S,</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To provide a stimulating experience for students under the Cambridge-track to integrate and apply their knowledge and skills obtained from their undergraduate studies at HKU and Cambridge through planning and carrying out a research project under the supervision of a member of staff.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Students will undertake a research project in the form of an undergraduate dissertation under the supervision of a staff member. The dissertation will be written in the style of a scientific paper. The research topic is flexible but should be related to the fields of Biochemistry, Biological Sciences, Chemistry, Earth System Science, Ecology &amp; Biodiversity, Environmental Science, Geology, Molecular Biology &amp; Biotechnology or Physics. Students should seek approval from a prospective supervisor prior to selecting this course. After enrolment of the course is approved by the course coordinator, students will work under the guidance of their supervisor to complete the research project.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>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 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 critically discuss their research findings and place them into a holistic scientific context CLO 8 submit their work following a specified journal format, present their work as a scientific conference talk</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td>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. Communicates the findings to a broader audience with reasonable clarity and responds to most questions. Acceptable time-management skills. 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.</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>For Year 4 Cambridge-track students only.</td>
</tr>
<tr>
<td>Offer in 2022 - 2023</td>
<td>N Offer in 2023 - 2024 : Y</td>
</tr>
<tr>
<td>Examination</td>
<td>---</td>
</tr>
<tr>
<td>CLO 1,2,3,4,5,6,7,8</td>
<td></td>
</tr>
<tr>
<td>Communication-intensive Course</td>
<td>N</td>
</tr>
<tr>
<td>Course Type</td>
<td>Project-based course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Details</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Student is expected to spend at least 240 hours on the project.</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
</tr>
<tr>
<td>Dissertation</td>
<td>including a written report (9,000 - 12,000 words) and an oral presentation</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>To be provided by individual project supervisor</td>
</tr>
<tr>
<td>Additional Course Information</td>
<td>Enrolment of this course is not conducted via the online course selection system and should be made through the Faculty office after approval has been obtained from both the supervisor and the course coordinator.</td>
</tr>
</tbody>
</table>
The course introduces basic concepts and methodology of data science to junior undergraduate students. The teaching is designed at a level appropriate for all undergraduate students with various backgrounds and without pre-requisites. Students will engage in a full data work-flow including collaborative data science projects. They will study a full spectrum of data science topics, from initial investigation and data acquisition to the communication of final results. Specifically, the course provides exposure to different data types and sources, and the process of data curating for the purpose of transforming them to a format suitable for analysis. It introduces elementary notions in estimation, prediction and inference. Case studies involving less-manicured data are discussed to enhance the computational and analytical abilities of the students.

### Course Contents & Topics
- General introduction to data science
  - Overview with selected case studies. General discussion on origins and forms of data, associated questions and types of tools for their analysis.
  - Data management and exploration
    * Data sources, data collection and its impact on visualization, modeling and generalizability of results; data cleaning/extraction; Quick introduction to high level programming language and Integrated Development Environment (IDE) (Python, R); Exploratory Data Analysis (EDA); Summaries, aggregation, smoothing, distributions of data; Data visualization
  - Data analytics
    * Complements on programming;
    * Statistics (1): model for randomness, random variables, distributions, histograms, correlations.
    * Statistics (2): independent sample, estimation of mean and variance, confidence interval, hypothesis testing with p-value.
- Data management and exploration
- Data analytics
- Communication-intensive Course

### Course Objectives
On successful completion of this course, students should be able to:
- CLO 1 Explore and wrangle over data; summarize and visualize data
- CLO 2 Formulate problems and bring elementary concepts in estimation, prediction, and inference to bear
- CLO 3 Write basic functions and simple data analysis codes using state-of-art computing software

### Course Contents & Topics
- Communication-intensive Course
- Course Objectives
- Course Learning Outcomes
- Grade Descriptors (A+ to F)
- Communication-intensive Course
- Course Type
- Course Teaching & Learning Activities
- Assessment Methods and Weighting
- Course Website

### 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. Demonstrate 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.

### Communication-intensive Course
N

### 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>36</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>40</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

### 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>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Written / programming; class discussions; quizzes</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Project report</td>
<td>In small groups of 5 students</td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Course Website
http://moodle.hku.hk

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**STAT1015**

**Introduction to data science (6 credits)**

**Offering Department**
Statistics & Actuarial Science

**Course Co-ordinator**
TBC, Statistics & Actuarial Science (ug_enquiry@saas.hku.hk)

**Academic Year** 2022

**Quota** 40

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**STAT1005**

**Essential skills for undergraduates: foundations of data science (6 credits)**

**Offering Department**
Statistics & Actuarial Science

**Course Co-ordinator**
Dr A S M Lau, Statistics & Actuarial Science (adelalau@hku.hk)

**Teachers Involved**
(Dr A S M Lau, Statistics & Actuarial Science)
(Dr T Yu, Computer Science)

**Academic Year** 2022

**Quota** 210
Teachers Involved  
(Prof J J F Yao, Statistics & Actuarial Science)  
(Prof C Lam, Computer Science)  
(Dr A S M Lau, Statistics & Actuarial Science)

Course Objectives  
The course introduces basic concepts and methodology of data science to junior undergraduate students. The teaching is designed at a level appropriate for all undergraduate students with various backgrounds and without pre-requisites. Students will engage in a full data work-flow including collaborative data science projects. They will study a full spectrum of data science topics, from initial investigation and data acquisition to the communication of final results. Specifically, the course provides exposure to different data types and sources, and the process of data curation for the purpose of transforming them to a format suitable for analysis. It introduces elementary notions in estimation, prediction and inference. Case studies involving less-manicured data are discussed to enhance the computational and analytical abilities of the students.

Course Contents & Topics  
- General introduction to data science  
  * Overview with selected case studies. General discussion on origins and forms of data, associated questions and types of tools for their analysis.

- Data management and exploration  
  * Data sources, data collection and its impact on visualization, modeling and generalizability of results; data cleaning/extraction; Quick introduction to high level programming language and Integrated Development Environment (IDE) (Python, R); Exploratory Data Analysis (EDA); Summaries, aggregation, smoothing, distributions of data; Data visualization

- Data analytics  
  * Complements on programming;  
  * Statistics (1): model for randomness, random variables, distributions, histograms, correlations.  
  * Statistics (2): independent samples, estimation of mean and variance, confidence interval, hypothesis testing with p-value.  

- STAT1015 Workshops: these workshops cover a few selected topics on advanced knowledge of the contents above. Potential topics include advanced data visualization, advanced hypothesis testing and automated variable selection in regression models.

Course Learning Outcomes  
On successful completion of this course, students should be able to:  
CLO 1 Explore and wrangle over data; summarize and visualize data  
CLO 2 Formulate problems and bring elementary concepts in estimation, prediction, and inference to bear  
CLO 3 Write basic functions and simple data analysis codes using state-of-art computing software  
CLO 4 Complete a real data analysis project using advanced methods

Pre-requisites (and Co-requisites and Impermissible combinations)  
Not for students who have passed in STAT1005, or already enrolled in this course; and This course is exclusive for BSc(AppliedAI) and BASC(FinTech) students.

Offer in 2022 - 2023  
N  Offer in 2023 - 2024 : 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 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. 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 presentional skills are minimally effective or ineffective.

Communication-intensive Course  
N

Course Type  
Lecture with laboratory component course

Course Teaching & Learning Activities  
<table>
<thead>
<tr>
<th>Activities</th>
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</thead>
<tbody>
<tr>
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<td></td>
<td>36</td>
</tr>
<tr>
<td>Project work</td>
<td></td>
<td>40</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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<tr>
<td>Assessment</td>
<td></td>
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</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>Written / programming; class discussions; quizzes</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Project report</td>
<td>In small groups of 4 students</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Course Website  
http://moodle.hku.hk

STAT1600 Statistics: ideas and concepts (6 credits)  
Academic Year 2022  
Quota ---
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.

- 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.

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

Not for students who have passed in any of the following courses: MATH1853, STAT1602, STAT1603, STAT3902.
### Pre-requisites (and Co-requisites and Impermissible combinations)

Level 2 or above in HKDSE Mathematics or equivalent; and Not for students with Level 2 or above in HKDSE Mathematics Extended Module 1 or 2; and Not for students who have passed or already enrolled in any of the following courses: STAT2901, STAT1602, STAT2601, STAT1603, ECON1280

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2022 - 2023</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>N</td>
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</tr>
</tbody>
</table>

### 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

### 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.)

### Communication-intensive Course

N

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

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<tr>
<td>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>25</td>
<td>CLO 1,2,3,4,5,6</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>
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### 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

- 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, except students from Science or Engineering Faculty).

### 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 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 effectively 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 presenational 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.
- E: 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.

### 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.
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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 effectively organizational and presenational 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 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 presenational 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.
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Department of Statistics & Actuarial Science

B
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most 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 a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

C
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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
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Communication-intensive Course
N

Course Type
Lecture-based course

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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

STAT1603
Introductory statistics (6 credits)

Offering Department
Statistics & Actuarial Science

Course Co-ordinator
TBC, Statistics & Actuarial Science (ug_enquiry@saas.hku.hk)

Teachers Involved

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: STAT1602, STAT2601, STAT2901

Offer in 2022 - 2023
N Ofer in 2023 - 2024 : N

Examination
N

Grade Descriptors (A+ to F)

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Communication-intensive Course
N

Course Type
Lecture-based course

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</table>

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Department of Statistics & Actuarial Science

Required/recommended reading and online materials


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:

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 understand the basic concepts in probability theory
- CLO 2 gain some insights to statistics and inference
- CLO 3 solve real-world problems by using probability calculations
- CLO 4 pursue their further studies in statistics and quantitative analysis

Pre-requisites
Pass or already enrolled in MATH2014 or (MATH2101 and MATH2211); and
Not for students who have passed in ELEC2844, MATH3603, STAT1603, STAT2901 or already enrolled in these courses;
Not for BSc(ActuarSc) students.

Offer in 2022 - 2023
Y 1st sem 2nd sem Offer in 2023 - 2024 : 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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Communication-intensive Course
N

Course Type
Lecture-based course

Organisation and presentational skills are minimally effective or ineffective.

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures
Tutorials
Reading / Self study
36
12
100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework (participation, assignments, tutorials, and class test(s)) 40 CLO 1,2,3
Examination One 2-hour written examination 60 CLO 1,2,3

Required/recommended reading and online materials

Academic Year 2022
Quota ---

2023
Course Objectives
This course is designed for students who want to learn the statistical software (SAS) for data management and intensive Course. Through the disciplines of statistical modelling, 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 2022 - 2023
Y 1st sem 2nd sem Offer in 2023 - 2024 : Y

Communication-intensive Course
N

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 1,2,3,4
Examination One 2-hour written examination 75 CLO 1,2,3,4

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk
Course Contents & Topics

- Different data types, manipulate and transform data, perform random sampling and descriptive data analysis, and create summary reports and graphics.

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 (and Co-requisites and Impermissible combinations)

- Pass in STAT1600 or MATH1821, or already enrolled in this course

Offer in 2022 - 2023

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<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
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<td>E</td>
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<tr>
<td>F</td>
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Communication-intensive Course

- N

Course Type

- Lecture-based course

Course Teaching & Learning Activities

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Required/recommended reading and online materials


Course Website

http://moodle.hku.hk

Course Contents & Topics

1. Python basics: first steps; language essentials.
2. The Python environment and libraries such as pandas, numpy, scipy.stats, matplotlib, seaborn, etc.
3. Probability and distributions: random sampling; probability calculations and combinatorics; discrete distributions; continuous distributions.
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

- CLO 1 access online help and documents for python
- CLO 2 use python 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

Course Website

http://moodle.hku.hk

STAT2604

Introduction to R/Python programming and elementary data analysis (6 credits)

Offering Department

Statistics & Actuarial Science

Course Co-ordinator

Dr A S M Lau, Statistics & Actuarial Science (adelalau@hku.hk)

Teachers Involved

(Adel A M Lau, Statistics & Actuarial Science)

Course Objectives

- This course is designed to provide a first-level introduction to python programming for statistics. This course focuses on learning the basic programming skills in python 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. Python basics: first steps; language essentials.
2. The Python environment and libraries such as pandas, numpy, scipy.stats, matplotlib, seaborn, etc.
3. Probability and distributions: random sampling; probability calculations and combinatorics; discrete distributions; continuous distributions.
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

- CLO 1 access online help and documents for python
- CLO 2 use python 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
Course Website
http://moodle.hku.hk

Offering Department
Statistics & Actuarial Science (ug_enquiry@saas.hku.hk)

Pre-requisites
(2022 - 2023)
Pass or already enrolled in STAT1600 or MATH1821 or (MATH1851 and MATH1853).

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 the main 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>
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</table>

Communication-intensive Course
N

Course Type
Lecture-based course

CLO 5: be able to write functions, loops and control flows
CLO 6: perform data management in Python
CLO 7: perform Monte Carlo simulations to validate statistical concepts

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, tutorials, and class test(s))</td>
<td>50</td>
<td>CLO 1,2,3,4,5,6,7</td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5,6,7</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
- ISBN (pbk):978-1-4842-3912-4
- There are also many on-line learning materials that fit well the contents of this course (details provided by the course instructor).

Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Project reports 50

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
CLO 4 critically assess statistics reporting

Outcome Mapping to CLO

---
### STAT2901

**Course Title:** 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 (smslee@hku.hk)

**Course Website:** [http://moodle.hku.hk](http://moodle.hku.hk)

#### Course Contents & Topics

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
- CLO 4: 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

#### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Quota</th>
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#### Communication-intensive Course

**Course Type:** Lecture-based course

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<td>Assignments</td>
<td>Coursework (assignments, tutorials and a test)</td>
<td>35</td>
<td>CLO 1,2,3,4</td>
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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>65</td>
<td>CLO 1,2,3,4</td>
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#### Reading and online materials

- Annual Digest of Statistics (Census & Statistics Department, Hong Kong SAR, latest issue)
Assignment Coursework (assignments, tutorials, and a class test) 25 CLO 1,2,3
Examination One 3-hour written examination 75 CLO 1,2,3

Required/recommended reading and online materials
Thomson Brooks/Cole: California.

Course Website http://moodle.hku.hk

STAT2902 Financial mathematics (6 credits) Academic Year 2022
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 & Topics 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 (and Co-requisites and Impermissible combinations) Pass in STAT2901, or already enrolled in this course; and Not for students who have passed in STAT3615, or already enrolled in this course.
Offer in 2022 - 2023 Y 2nd sem Offer in 2023 - 2024 : 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.
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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.

Communication-intensive Course
Course Type Lecture-based course
Course Teaching & Learning Activities
Activities Lectures
Details 36
No. of Hours 12
Tutorials tutorials/example classes
Reading / Self study 100
Assessment Methods and Weighting
Methods Assignments Coursework (assignments, tutorials, class participation) 50 CLO 1,2,3,4,5
Weighting in final course grade (%) Examination One 3-hour written examination 50 CLO 1,2,3,4,5
Assessment Methods to CLO Mapping

Required/recommended reading and online materials
Course Website http://moodle.hku.hk

STAT3010 Image processing and computer vision (6 credits) Academic Year 2022
Offering Department Statistics & Actuarial Science
Course Co-ordinator Dr K Han, Statistics & Actuarial Science (khanx@hku.hk)
Teachers Involved Dr K Han, Statistics & Actuarial Science
Course Objectives The course introduces the fundamentals of image processing and computer vision, covering both theoretical and computational aspects of the subject. On the theoretical aspect, the course introduces mathematical foundations for image processing and computer vision including representation of digital images, image processing techniques, feature detection and extraction, imaging models, stereo vision, image recognition and beyond. On the computational side, algorithms and their implementation are emphasized during the lectures and exercised during tutorials.
Course Contents & Topics Course content includes the following topics
- Imaging systems and representation of digital images;
Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand the theoretical foundations of image formation, transformation, and filtering
- CLO 2 understand the theoretical foundations of feature extraction, camera projection, stereo vision, and image recognition
- CLO 3 design and implement various algorithms for digital image processing and computer vision
- CLO 4 achieve simple image processing and computer vision tasks on real-world visual data
- CLO 5 acquire hands-on experience in the use of image processing and computer vision tools

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in (MATH2014 or MATH2101 or STAT2602) and (COMP2113 or COMP2119 or COMP2396).

Offer in 2022 - 2023

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<td>12</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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Communication-intensive Course

N

Course Type

Lecture-based course

Course Teaching & Learning Activities

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<th>Activities</th>
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Assessment Methods and Weighting

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<td>Assignments</td>
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<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
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</tbody>
</table>

Required/recommended reading and online materials

Richard Hartley and Andrew Zisserman (2004), Multiple View Geometry in Computer Vision (2nd ed.), Cambridge University Press

Course Website

http://moodle.hku.hk

STAT3021

Modern biostatistics (6 credits)

Offering Department

Statistics & Actuarial Science

Course Co-ordinator

Dr E K F Lam, Statistics & Actuarial Science (hrntlkf@hku.hk)

Teachers Involved

(Dr E K F Lam,Statistics & Actuarial Science)

Course Objectives

This course is designed to introduce students to the state-of-the-art study designs and statistical analysis methods in biomedical studies including randomized and observational studies, high-throughput data from genetics/genomics.

Course Contents & Topics

The following topics will be covered in the course:
- study design techniques including randomized and observational designs
- continuous, categorical and person-time data analysis
- longitudinal and correlated data analysis
- meta-analysis methods
- measurement error methods
- missing data methods
- confounding and selection bias adjustment
- large-scale inference

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understanding the basic concepts of study designs
- CLO 2 learn statistical analysis for various types of biomedical data
- CLO 3 learn statistical methods for evidence synthesis
- CLO 4 learn statistical methods for handling various types of biases
- CLO 5 learn statistical methods for large-scale inference

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in STAT2602
<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Y 1st sem</th>
<th>Offer in 2023 - 2024 : Y</th>
<th>Examination</th>
<th>Dec</th>
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| Course Website | http://moodle.hku.hk |

<table>
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<tr>
<th>STAT3600</th>
<th>Linear statistical analysis (6 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof T W K Fung, Statistics &amp; Actuarial Science (<a href="mailto:wingfung@hku.hk">wingfung@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr C W Kwan, Statistics &amp; Actuarial Science)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>(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, studentized residual, influential observation, Cook's distance, multicollinearity, model transformation.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>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 linear regression model with categorical and continuous independent variables</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in STAT2602; and Not for students who have passed in STAT3907, or have already enrolled in this course.</td>
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</table>

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<tr>
<th>Offer in 2022 - 2023</th>
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<th>2nd sem</th>
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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
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</tbody>
</table>

**Required/recommended reading and online materials**

- Hill/Irwin; 5th edition)

**Course Website**

http://moodle.hku.hk
### STAT3603: Stochastic processes (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 C Wang, Statistics &amp; Actuarial Science (<a href="mailto:stacw@hku.hk">stacw@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr C Wang, Statistics &amp; Actuarial Science)</td>
</tr>
</tbody>
</table>

**Course Objectives**
This is an introductory course in stochastic processes. It will cover the basic concepts of the theory of stochastic processes and explore different types of stochastic processes including Markov chains, Poisson processes and Brownian motions.

**Course Contents & Topics**
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.

**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 2022 - 2023**
Y 1st sem Offer in 2023 - 2024 : 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.
- 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.

**Communication-intensive Course**
N

**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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**Assessment Methods and Weighting**

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</table>

**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)

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<td>TBC, Statistics &amp; Actuarial Science (<a href="mailto:ug_enquiry@saas.hku.hk">ug_enquiry@saas.hku.hk</a>)</td>
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<tr>
<td>Teachers Involved</td>
<td></td>
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</table>

**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. Fixed/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 2022 - 2023**
N Offer in 2023 - 2024 : 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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| 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 1,2,3,4 |
| Examination                     | One 2-hour written examination                   | 75 | CLO 1,2,3,4 |

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<tr>
<td>P. W. M. John: Statistical Design and Analysis of Experiments (Macmillan, 1971)</td>
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| Course Website | http://moodle.hku.hk |

<table>
<thead>
<tr>
<th>STAT3605</th>
<th>Quality control and management (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
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<td></td>
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<tr>
<td>Teachers Involved</td>
<td>Course Objectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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 frontier of today's quality control and management ideas.</td>
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<td>appreciate the practicality of statistical concepts and methods in general</td>
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<td>CLO 2</td>
<td>understand how certain specific statistical methods can benefit various production situations</td>
</tr>
<tr>
<td>CLO 3</td>
<td>know the traditional and modern systems of quality management</td>
</tr>
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| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in BIOL2102 or (ECO11280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2602 or (STAT1603 and any University level 2 course) or STAT3902 |

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<th>C</th>
<th>D</th>
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| Methods                          | Details                                         | Weighting in final course grade (%) Assessment Methods to CLO Mapping |
| Assignments                      | Coursework (assignments, tutorials, and a class test) | 25 | CLO 1,2,3,4 |
| Examination                     | One 2-hour written examination                   | 75 | CLO 1,2,3,4 |

808
Course Objectives

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. Modern business corporations are increasingly using logistics as a management tool, for example, in capital budgeting problems, production planning, scheduling, and deciding location for a new factory. This course addresses the business applications of logistics.

Course Content & 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. Modern business corporations are increasingly using logistics as a management tool, for example, in capital budgeting problems, production planning, scheduling, and deciding location for a new factory. This course addresses the business applications of logistics.

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

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.

Offer in 2022 - 2023

Y 1st sem Offer in 2023 - 2024 : Y Examination Dec

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.

Communication-intensive Course

N

Course Type

Lecture-based course

Assessment Methods

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<td>One 2-hour written examination</td>
<td>50</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
### 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

### Offer in 2023 - 2024: N

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### Grade Descriptors (A+ to F)

<table>
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### Communication-intensive Course

**N**

### Course Type
Lecture-based course

### Course Teaching & Learning Activities

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<tr>
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### Required/recommended reading and online materials

- http://moodle.hku.hk

### Course Website
Additional Course Information

**Other references:**


### STAT3608

<table>
<thead>
<tr>
<th>Statistical genetics (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
</thead>
</table>

### Course Co-ordinator
TBC, Statistics & Actuarial Science ([email_address]@saas.hku.hk)

### Teachers Involved

### Course Objectives
This course aims to provide students with a fundamental knowledge of DNA profiling in human identification and genetic epidemiology in gene mapping and to understand how statistical theory and methods are applied to solve 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 and Impermissible combinations)
Pass in STAT2602 or STAT3902
# STAT3609 The statistics of investment risk (6 credits)

<table>
<thead>
<tr>
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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.

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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.

## Communication-intensive Course

- **N**

## Course Type

- Lecture-based course

## Course Teaching & Learning Activities

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## Required/recommended reading and online materials


## Course Website

http://moodle.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,
- fundamental legal principles, and analysis of insurance contracts,
- life insurance, their contractual provisions,
- individual health insurance coverages.

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 (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.

(Not available to Actuarial Science students)

Offer in 2022 - 2023

N

Examination

---

Grade Descriptors (A* to F)

Communication-intensive Course

N

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>Tutorials</td>
<td></td>
<td>12</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>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>25</td>
<td>CLO 1.3</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

http://moodle.hku.hk

Course Website

http://moodle.hku.hk

Department of Statistics & Actuarial Science
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.

Data exploration, formulation of testable hypotheses, the evaluation of evidence and forecasting on the basis of past experience.

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

Pass in BIOL2102 or (ECOIII1280 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 in or have already enrolled in any of these courses: STAT2601, STAT2901, STAT3616

Course Contents & Topics

Machine learning is the study of computer algorithms that build models of observed data in order to make predictions or decisions. Statistical machine learning emphasizes the importance of statistical methodology in the algorithmic development. This course provides a comprehensive and practical coverage of essential machine learning concepts and a variety of learning algorithms under supervised and unsupervised settings.

Course Learning Outcomes

- CLO 1 get familiar with the workflow of a data science or machine learning project
- CLO 2 comprehend the algorithmic development of machine learning
- CLO 3 demonstrate knowledge of machine learning concepts

Information

Additional Course Information

CogSci or CompSci students having taken STAT1301 should obtain approval from the dept.

Other reference:
- J. T. McClave & F. H. Dietrich II: Statistics (Maxwell Macmillian, 5th ed.)
- M. R. Middleton: Data Analysis Using Microsoft EXCEL 5.0 (Duxbury)
- I. Olkin, L. J. Gleser, & C. Derman: Probability Models and Applications (Prentice-Hall, 2nd ed.)
- J. G. Peatman: Introduction to Applied Statistics (Harper)

Department of Statistics & Actuarial Science
### STAT3613 Marketing analytics (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Course Type</th>
<th>Pre-requisites and Co-requisites and Impermissible combinations</th>
<th>Offer in 2022 - 2023</th>
<th>Grade Descriptors (A+ to F)</th>
<th>Communication-intensive Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics &amp; Actuarial Science</td>
<td>Lecture-based course</td>
<td>Pass in STAT3600 or STAT3907, or already enrolled in this course; and Not for students who have passed in STAT4904, or already enrolled in this course; and Not for BSc(Actuarial Science) students. BSc(Actuarial Science) students are advised to take STAT4904 Statistical learning for risk modelling instead.</td>
<td>Y 1st sem</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>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
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<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>
<td></td>
</tr>
<tr>
<td></td>
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<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>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<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 limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Activities</td>
<td>Details</td>
<td>No. of Hours</td>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
</tr>
<tr>
<td></td>
<td>Lectures</td>
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<td>Tutorials</td>
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</tr>
<tr>
<td></td>
<td>Reading / Self study</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Assignments</td>
<td>Details</td>
<td>Weighting in final course grade (%)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Project reports</td>
<td>Details</td>
<td></td>
<td>30</td>
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<td></td>
<td>Test</td>
<td>Details</td>
<td></td>
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</table>

**Required/recommended reading and online materials**


**Course Website**

http://moodle.hku.hk
<table>
<thead>
<tr>
<th>Communication-intensive Course</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</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</td>
</tr>
<tr>
<td></td>
<td>Assignments</td>
</tr>
<tr>
<td></td>
<td>Examination</td>
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<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></td>
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<table>
<thead>
<tr>
<th>STAT3614</th>
<th>Business forecasting (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
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<tbody>
<tr>
<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
<td>Quota</td>
<td>---</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Statistics &amp; Actuarial Science (<a href="mailto:ug_enquiry@saas.hku.hk">ug_enquiry@saas.hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Course Objectives</td>
<td>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, EXCEL, in the teaching process.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
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</tr>
<tr>
<td></td>
<td>CLO 1 understand data patterns and choose a suitable forecasting techniques</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>CLO 2 understand forecasting methods: moving averages and smoothing methods, decomposition and winter's methods, simple and multiple linear regression</td>
<td></td>
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<tr>
<td></td>
<td>CLO 3 develop hands-on skills of analyzing business data with computer software, EXCEL, and its add-ins functions</td>
<td></td>
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<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</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 (STAT1803 and any University level 2 course); and</td>
<td></td>
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<tr>
<td></td>
<td>Not for students who have passed or already enrolled in any of these courses: STAT2601, STAT2901, STAT3907, STAT4601, ECON2280.</td>
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<tr>
<td>Offer in 2022 - 2023</td>
<td>N Offer in 2023 - 2024 : N</td>
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<tr>
<td>Examination</td>
<td>Examination</td>
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<tr>
<td>Grade Descriptors (A+ to F)</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>
<td></td>
<td></td>
</tr>
<tr>
<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>
<td></td>
<td></td>
</tr>
<tr>
<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>
<td></td>
<td></td>
</tr>
<tr>
<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>
<td></td>
<td></td>
</tr>
<tr>
<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>
<td></td>
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<tr>
<td>Communication-intensive Course</td>
<td>N</td>
<td></td>
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<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
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<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
<td>Details</td>
<td>No. of Hours</td>
</tr>
<tr>
<td></td>
<td>Lectures</td>
<td>36</td>
<td></td>
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<td></td>
<td>Tutorials</td>
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<td></td>
<td>Reading / Self study</td>
<td>100</td>
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<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
<td>Weighting in final course grade (%)</td>
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<td>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>40</td>
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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</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>Also available to CompSc students having taken STAT1301. Students should obtain approval from the course coordinator before choosing this course.</td>
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<table>
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<tr>
<th>STAT3615</th>
<th>Practical mathematics for investment (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
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<tbody>
<tr>
<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
<td>Quota</td>
<td>---</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Statistics &amp; Actuarial Science (<a href="mailto:ug_enquiry@saas.hku.hk">ug_enquiry@saas.hku.hk</a>)</td>
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<tr>
<td>Teachers Involved</td>
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<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</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 (STAT1803 and any University level 2 course); and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not for students who have passed or already enrolled in any of these courses: STAT2601, STAT2901, STAT3907, STAT4601, ECON2280.</td>
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<tr>
<td>Offer in 2022 - 2023</td>
<td>N Offer in 2023 - 2024 : N</td>
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<tr>
<td>Examination</td>
<td>Examination</td>
<td></td>
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<tr>
<td>Grade Descriptors (A+ to F)</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>
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<td></td>
</tr>
<tr>
<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>
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<td></td>
</tr>
<tr>
<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>
<td></td>
<td></td>
</tr>
<tr>
<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>
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<td></td>
</tr>
<tr>
<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>
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</tbody>
</table>
### 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 & Topics
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 (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 2022 - 2023
- **Y** 2nd sem Offer in 2023 - 2024 : Y  
- Examination May

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors</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>
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<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>

### 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>(assignments, tutorials, class participation)</td>
<td>50 CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>50 CLO 1,2,3,4,5</td>
<td></td>
</tr>
</tbody>
</table>

### Required/Recommended Reading and Online Materials

### Online Materials
- http://moodle.hku.hk

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### STAT3616
**Offering Department** Statistics & Actuarial Science  
**Course Co-ordinator** TBC, Statistics & Actuarial Science (ug_enquiry@saas.hku.hk)  
**Course Objectives** 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.

### Course Contents & Topics
Overview of SAS underlying parts. Macro programming. Advanced programming techniques including data simulation, advanced data look-up techniques, modifying transaction datasets and controlling I/O processing and memory.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- **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

**Pre-requisites**
Pass in STAT2601 or STAT2901 (Students are strongly recommended to take STAT2603 or STAT2604 prior to taking this course.)

**Offer in 2022 - 2023**
- **N** Offer in 2023 - 2024 : N  
- Examination ---

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade Descriptors</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>
</tbody>
</table>

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816
This course will cover design and implementation of sample surveys and analysis of statistical data thus obtained. Course Objectives: On successful completion of this course, students should be able to:

**CLO 1** demonstrate knowledge and understanding of the various steps to be taken in the planning and 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.

**CLO 2** design different sample schemes and select the most efficient and suitable one for adoption for a particular survey - make statistical inference on parameters based on a sample

**CLO 3** judge whether the statistics presented by other survey takers are trustworthy

**CLO 4** 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, 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.

**CLO 5** 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, 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.

**CLO 6** 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>Communication-intensive Course</th>
<th>N</th>
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<tr>
<td><strong>Course Type</strong></td>
<td>Lecture-based course</td>
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<td><strong>Course Teaching &amp; Learning Activities</strong></td>
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<td><strong>Assessment Methods and Weighting</strong></td>
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<td><strong>Methods</strong></td>
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<td>Examination</td>
<td>One 2-hour written examination</td>
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| Course Website | http://moodle.hku.hk |

| STAT3617 | Sample survey methods (6 credits) |
| Offering Department | Statistics & Actuarial Science |
| Course Co-ordinator | Dr O T K Choi, Statistics & Actuarial Science (choi@hku.hk) |
| Teachers Involved | Dr O T K Choi, Statistics & Actuarial Science; Prof F W H Ho, Statistics & Actuarial Science |
| **Course Objectives** | 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, sampling and non-sampling errors and biases, methods of estimation of parameters from survey data, imputation for missing data etc. |
| **Course Contents & Topics** | 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. |
| **Course Learning Outcomes** | On successful completion of this course, students should be able to: |
| **CLO 1** | demonstrate knowledge and understanding of the various steps to be taken in the planning and implementation of sample surveys |
| **CLO 2** | design different sample schemes and select the most efficient and suitable one for adoption for a particular survey - make statistical inference on parameters based on a sample |
| **CLO 3** | judge whether the statistics presented by other survey takers are trustworthy |
| **Pre-requisites (and Co-requisites and Impermissible combinations)** | Pass or already enrolled 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 2022 - 2023** | Y 2nd sem Offer in 2023 - 2024 : 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. |

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<td>Examination</td>
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Required/recommended reading and online materials

W. G. Cochran: Sampling Techniques (John Wiley & Sons Ltd., 1997)

Course Website
http://moodle.hku.hk

STAT3618 Derivatives and risk management (6 credits)

Offering Department
Statistics & Actuarial Science

Teachers Involved
Prof K C Cheung, Statistics & Actuarial Science (kccg@hku.hk)

Course Objectives
Nowadays all risk managers must be well versed in the use and valuation of derivatives. The two basic types of derivatives are forwards (having a linear payoff) and options (having a non-linear payoff). All other derivatives can be decomposed to these underlying payoffs or alternatively they are variations on these basic ideas. This course aims at demonstrating the practical use of financial derivatives in risk management. Emphases are on pricing and hedging strategies, and the no-arbitrage principle.

Course Contents & 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, option gaps, 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

Pre-requisites
Pass in STAT3618; and Not for students who have passed or already enrolled in any of the following courses: FINA2322, STAT3905, STAT3910; and Not for BSc(Actuarial Science) students.

Offer in 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : 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.

Communication-intensive Course
N

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 Weighing in final course grade (%) Assessment Methods to CLO Mapping
Assignments
Coursework (assignments, tutorials, and class test(s)) 40 CLO 1,3
Examination
One 2-hour written examination 60 CLO 1,2,3,4

Required/recommended reading and online materials
Course Website
http://moodle.hku.hk

STAT3620 Modern nonparametric statistics (6 credits)

Offering Department
Statistics & Actuarial Science

Teachers Involved
TBC, Statistics & Actuarial Science (ug_enquiry@saas.hku.hk)

Course Objectives
The course aims to acquaint students with the fundamentals, basic properties and use of classical and modern nonparametric statistical methods for data analysis.

Course Contents & Topics
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.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 identify appropriate nonparametric methods for analyzing data

Department of Statistics & Actuarial Science
Pre-requisites and Co-requisites
Pass in STAT2602 or STAT3902

Course Type
Lecture-based course

Assessment Methods and Weighting

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<td>One-hour written examination</td>
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<td>CLO 1,2,3</td>
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Required/recommended reading and online materials
Wasserman, L.: All of Nonparametric Statistics (Springer, 2016)

Course Website
http://moodle.hku.hk

Offering Department
Statistics & Actuarial Science

Course Co-ordinator
Dr Y Cao, Statistics & Actuarial Science (yuancao@hku.hk)

Teachers Involved
(Dr Y Cao, Statistics & Actuarial Science)

Course Objectives
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.

Course Contents & Topics
Descriptive statistics, presentation and visualization of data; Simple statistical analyses for the one-sample and two-sample case using parametric and nonparametric methods; Regression analyses: model fitting; variable selection and model diagnostic checking; Analysis of Variance (ANOVA): 1-way, two-way and higher-way ANOVA; Covariance analysis; Categorical and count data: binary logistic regression, Poisson regression.

Real data sets will be presented for modelling and analysis using statistical software for gaining hands-on experience.

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
Pass in STAT3602 or STAT3907

(Students are strongly recommended to take STAT2603 or STAT2604 prior to taking this course.)
This course will focus on how to work with statistical graphics, graphics that display statistical data, to communicate combinations and impermissible.

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

Assessment Methods

- Details
  - Assignments: Coursework (assignments and a class test)
  - Examination: One 3-hour written examination

- Weighting in final course grade (%)
  - Assignments: 50
  - Examination: 50

- Assessment Methods to CLO Mapping
  - CLO 1,2,3,4

Required/recommended reading and online materials

1. An Introduction to Statistical Learning, with Applications in R, by James, Witten, Hastie and Tibshirani (Springer, 2013)
2. The Statistical Sleuth: A Course in Methods of Data Analysis, by Fred Ramsey (Author), Daniel Schafer (Author)
3. Applied Regression Analysis and Other Multivariable Methods, by David G. Kleinbaum (Author), Lawrence L. Kupper (Author), Azhar Nizam (Author), Eli S. Rosenberg (Author)

Course Website

http://moodle.hku.hk
### STAT3655 Survival analysis (6 credits)

**Offering Department:** Statistics & Actuarial Science  
**Course Co-ordinator:** Dr E K F Lam, Statistics & Actuarial Science  
**Pre-requisites (and Co-requisites)**  
- Not for students who have passed in STAT3955, or already enrolled in this course.
- Pass in STAT3902, or already enrolled in this course; or
- Pass in STAT3600 or STAT3901; and
- Not for students who have already enrolled in STAT4799 in this academic year.

**Course Learning Outcomes:**
- 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

**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 Ramblau-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 Objectives:**
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

**Teachers Involved:** Dr E K F Lam, Statistics & Actuarial Science

**Assessment Methods and Weighting:**

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<tbody>
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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
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**Communication-intensive Course:**
- Lecture-based course

**Course Type:** Lecture-based course

**Course Teaching & Learning Activities:**

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<td>36</td>
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<td>Tutorials</td>
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<td>12</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</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.

**Required/recommended reading and online materials:**

**Course Website:** [http://moodle.hku.hk](http://moodle.hku.hk)
This capstone course is only for students majoring in Decision Analytics/Risk Management/Statistics; and subject to the condition 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 Objectives**

The major objectives of this course are to integrate life contingencies into a full probabilistic framework. The time-until-death random variable is the basic building block by which models for life insurances, designed to reduce the financial impact of the random event of untimely death, are developed. This course introduces the concepts of life contingencies and the basic mathematical skills for modelling life insurance products.

**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**

- CLO 1 calculate the expected values, variances, probabilities, and percentiles for survival-time random variables
- CLO 2 define the continuous survival-time random variable that arises from the discrete survival-time random variable using some assumptions for fractional ages
- CLO 3 define present-value-of-benefit random variables defined on survival-time random variables
- CLO 4 define and calculate the expected values, variances and probabilities for present-value-of-benefit random variables, present-value-of-loss-at-issue random variables, and present-value-of-loss random variables
- CLO 5 calculate benefit premiums for life insurances and annuities

Pre-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)

**Communication-intensive Course**

N

**Course Type**

Project-based course

**Course Teaching & Learning Activities**

**Activities**

- Reading / Self study discussion & meetings to be arranged by the student & the supervisor

**Assessment Methods and Weighting**

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<tr>
<td>Oral presentation</td>
<td>oral presentation &amp; in-class discussion</td>
<td>40</td>
<td>CLO 1,2,4</td>
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<tr>
<td>Research report</td>
<td>written report</td>
<td>60</td>
<td>CLO 1,2,3</td>
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**Course Website**

http://moodle.hku.hk

**STAT3901 Life contingencies I (6 credits)**

**Offering Department**

Statistics & Actuarial Science

**Teachers Involved**

Prof K C Yuen, Statistics & Actuarial Science (kcyuen@hku.hk)

**Pre-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 2022 - 2023**

Y 1st sem Offer in 2023 - 2024 : Y Examination Dec

**Course 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/referencing 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/referencing 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/referencing 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.

**Communication-intensive Course**

N

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

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This course is on the basis of 'STAT2901 Probability and Statistics: Foundation of Actuarial Science'. It will further study the concepts and methods of statistics. The course will lay emphasis on the estimation and hypothesis testing, the two major areas of statistical inference. Through the study of this course, students will be equipped with both quantitative skills and qualitative perceptions essential for making rigorous statistical analysis of data. This course is an approved course for VEE Mathematical Statistics from the Society of Actuaries.

**Pre-requisites**

Pass in STAT2901; and
Not for students who have passed in STAT2602, or already enrolled in this course; and
For BSc(Actuarial Science) students only.

**Offer in 2022 - 2023**

Y 1st sem Offer in 2023 - 2024 : Y

**Communication-intensive Course**

N

**Course Type**

Lecture-based course

**Assessment Methods and Weighting**

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<td>Examination</td>
<td>One 3-hour written examination</td>
<td>50</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
Department of Statistics & Actuarial Science

**Teachers Involved**
(Prof. K. Zhu, Statistics & Actuarial Science)

**Course Objectives**
This is an introductory course in stochastic processes. It will cover the basic concepts of the theory of stochastic processes and explore different types of stochastic processes including Markov chains, Poisson processes, Brownian motion, and 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 Contents & Topics**
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, Poisson process, Brownian motion, and 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**
Pass in STAT2901; and Not for students who have passed in MATH3603, or have already enrolled in this course; and Not for students who have passed in STAT3603, or have already enrolled in this course; and For BSc(Actuarial Science) students only.

**Offer in 2022 - 2023**
Y 2nd sem Offer in 2023 - 2024: Y Examination May

**Assessment Methods**
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<td>CLO 1,2,3</td>
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<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3</td>
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**Communication-intensive Course**
N

**Course Type**
Lecture-based course

**Course Teaching & Learning Activities**

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<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>CLO 1,2,3</td>
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**Required/recommended reading and online materials**
S. M. Ross: Introduction to Probability Models (9th edition)

**Course Website**
http://moodle.hku.hk

**STAT3904**
Corporate finance for actuarial science (6 credits)

<table>
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<th>Offering Department</th>
<th>Academic Year</th>
<th>Quota</th>
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<tbody>
<tr>
<td>Statistics &amp; Actuarial Science</td>
<td>2022</td>
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</tbody>
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**Course Co-ordinator**
Dr D Lee, Statistics & Actuarial Science (leedav@hku.hk)

**Teachers Involved**
(Prof. D. Lee, Statistics & Actuarial Science)

**Course Objectives**
This course is designed for actuarial science students to receive finance component of VEE Accounting and Finance from the Society of Actuaries. The objective of this course is to introduce students to the fundamental principles of corporate finance. The course will provide students with a systematic framework within which to evaluate investment and financing decisions for corporations.

**Course Contents & Topics**
The first part of the course will give an introduction to corporate finance and provide an overview of some topics covered in STAT2902 and STAT3615. These include financial markets and companies, time value of money, and measures and performance assessment of financial performance. The main part of the course will focus on some important topics of corporate finance including: portfolio theory, utility theory, Markowitz mean-variance analysis, capital asset pricing model, weighted average cost of capital, market efficiency and behavioural finance, capital structure and dividend policy, financial leverage and firm value.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- 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 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, and explain investor behaviour using behavioural finance theories
- CLO 7: explain the core features of the utility theory

**Pre-requisites**
(Pass in ACCT1101 and STAT2802) or (Pass in STAT3615); and Not for students who have passed in FINA1310, or have already enrolled in this course.
Department of Statistics & Actuarial Science

Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
<th>Examination</th>
<th>May 2023</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 presentional skills.</td>
<td></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. Apply effective organizational and presentional skills.</td>
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<td></td>
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<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 presentional 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 presentional skills.</td>
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<td></td>
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<tr>
<td>F</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 presentional skills are minimally effective or ineffective.</td>
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Communication-intensive Course

N

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>36</td>
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<td>Tutorials</td>
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Assessment Methods and Weighting

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<tr>
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<tr>
<td>Assignments</td>
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<td>25</td>
<td>CLO 1,2,3,4,5,6,7</td>
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<td>Examination</td>
<td>One 3-hour written examination</td>
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<td>CLO 1,2,3,4,5,6,7</td>
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Required/recommended reading and online materials


Course Website
http://moodle.hku.hk

STAT3905
Introduction to financial derivatives (6 credits)

Academic Year
2022

Offering Department
Statistics & Actuarial Science

Course Co-ordinator
Prof K C Cheung, Statistics & Actuarial Science (kccg@hku.hk)

Teachers Involved
(Prof K C Cheung,Statistics & Actuarial Science)

Course Objectives
Nowadays all risk managers must be well versed in the use and valuation of derivatives. The two basic types of derivatives are forwards (having a linear payoff) and options (having a non-linear payoff). All other derivatives can be decomposed to these underlying payoffs or alternatively they are variations on these basic ideas. This course aims at demonstrating the practical use of financial derivatives in risk management. Emphases are on pricing and hedging strategies, and the no-arbitrage principle.

Course Contents & Topics
Derivatives; short-selling; call options; put options; equity-linked CD; trading strategies; hedging; forwards and futures; commodity swaps; interest rate swaps; put-call parity; binomial model; Black-Scholes option pricing model. Not for students who have passed in STAT3618, or have already enrolled in this course; and For BSc(Actuarial Science) students only.

Assessment

<table>
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Course Type
Lecture-based course

Course Teaching & Learning Activities

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Required/recommended reading and online materials

Course Website: http://moodle.hku.hk

**STAT3906 Risk theory I (6 credits)**

Offering Department: Statistics & Actuarial Science
Course Co-ordinator: Prof K C Cheung, Statistics & Actuarial Science (kccg@hku.hk)

Course Objectives: Risk theory is one of the main topics in actuarial science. Risk theory is the applications of statistical models and stochastic processes to insurance problems such as the premium calculation.

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

Offer in 2022 - 2023: 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 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 effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining all 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.

Communication-intensive Course: N

Course Type: Lecture-based course

Course Teaching & Learning Activities: Activities Details No. of Hours
- Lectures
- 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 1,2,3
- Examination One 3-hour written examination 75 CLO 1,2,3


Course Website: http://moodle.hku.hk

**STAT3907 Linear models and forecasting (6 credits)**

Offering Department: Statistics & Actuarial Science
Course Co-ordinator: Dr E A L Li, Statistics & Actuarial Science (erclili11@hku.hk)

Course Objectives: This course deals with applied statistical methods of linear models and investigates various forecasting procedures through using linear models and time series analysis.

Course Contents & Topics: Regression and multiple linear regression; predicting; generalized linear models; 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
- CLO 6 fit generalized linear model to real data

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in STAT2602 or STAT3902, or already enrolled in this course; and
Not for students who have passed in STAT3600, or have already enrolled in this course; and Not for students who have passed in STAT4601, or have already enrolled in this course; and Not for students who have passed in ECON2280, or have already enrolled in this course; and For BSc(Actuarial Science) students only.

Offer in 2022 - 2023: Y
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:

- 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 highly 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.
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- Fail

Assessment Methods and Weighting

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<td>CLO 1,2,3,4,5,6</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</td>
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</table>

Required/recommended reading and online materials

- G James, D Witten, T Hastie and R Tibshirani (2021) An Introduction to Statistical Learning with Applications in R, second edition, Springer.
- http://moodle.hku.hk

STAT3908

Credibility theory and loss distributions (6 credits)

Offering Department

Statistics & Actuarial Science

Course Co-ordinator

Dr M Hofert, Statistics & Actuarial Science (mhofert@hku.hk)

Teachers Involved

(Prof M Hofert, Statistics & Actuarial Science)

Course Learning Outcomes

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.
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Communication-intensive Course

N

Course Type

Lecture-based course

Communication-intensive Course

N

Course Type

Lecture-based course

Course Website

http://moodle.hku.hk

Grade Descriptors (A+ to F)

A

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C

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Fail

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Communication-intensive Course

N

Course Type

Lecture-based course

Communication-intensive Course

N

Course Type

Lecture-based course

Grade Descriptors (A+ to F)

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Communication-intensive Course

N

Course Type

Lecture-based course

Communication-intensive Course

N

Course Type

Lecture-based course
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<td><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></td>
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<table>
<thead>
<tr>
<th>STAT3909 Life contingencies II (6 credits)</th>
<th>Academic Year 2022</th>
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<tbody>
<tr>
<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr D Lee, Statistics &amp; Actuarial Science (<a href="mailto:leedav@hku.hk">leedav@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr D Lee, Statistics &amp; Actuarial Science)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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.</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 calculate policy values for life insurances and annuities</td>
</tr>
<tr>
<td></td>
<td>CLO 2 incorporate expenses in gross premium and calculate policy values based on the gross premium for life insurances and annuities</td>
</tr>
<tr>
<td></td>
<td>CLO 3 calculate probabilities and actuarial present values under the multiple state model framework</td>
</tr>
<tr>
<td></td>
<td>CLO 4 analyze multiple decrement models and calculate the life insurances and annuities in models with multiple decrements</td>
</tr>
<tr>
<td></td>
<td>CLO 5 analyze multiple life models and calculate the life insurances and annuities in models with multiple lives</td>
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<tr>
<td></td>
<td>CLO 6 explain the concept of profit testing</td>
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<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in STAT3901, or already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
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| Course Website                                    | http://moodle.hku.hk |

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<tr>
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<tbody>
<tr>
<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof H Yang, Statistics &amp; Actuarial Science (<a href="mailto:hlyang@hku.hk">hlyang@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Prof H Yang, Statistics &amp; Actuarial Science)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course is on option pricing, hedging and embedded options in life insurance and annuity products. The course will concentrate on the theory and idea of derivatives pricing and risk management, valuation and risk management</td>
</tr>
</tbody>
</table>
### Course Contents & Topics

The Black-Scholes formula; implied volatility; option Greeks; market-making and hedging; exotic options; various types of equity-linked life insurance guarantees, options that are embedded in life insurance and annuity contracts.

For obtaining IFoA credit, the assessment is different. The assessment becomes final exam (60%), midterm test (10%) and computer-based assignment (30%).

### Course Learning Outcomes

<table>
<thead>
<tr>
<th>CLO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Understand the Black-Scholes formula, including the assumptions, the Greek letters, option elasticity, and implied volatility</td>
</tr>
<tr>
<td>2</td>
<td>Understand the hedging strategies and portfolio, market-mover risk, self-financing portfolio</td>
</tr>
<tr>
<td>3</td>
<td>Understand the market-maker's profit</td>
</tr>
<tr>
<td>4</td>
<td>Understand exotic options, including Asian options, barrier options, compound options, gap options, and exchange options</td>
</tr>
<tr>
<td>5</td>
<td>Define and calculate payoffs under various options embedded in insurance and annuity contracts</td>
</tr>
<tr>
<td>6</td>
<td>Use the Black-Scholes model, value the guaranteed minimum death benefit and the guaranteed minimum accumulation/maturity benefit</td>
</tr>
<tr>
<td>7</td>
<td>Understand the hedging and risk management of various options embedded in insurance products</td>
</tr>
</tbody>
</table>

### Pre-requisites (and Co-requisites and Impermissible combinations)

Passed in STAT3602 or STAT3902; and Not for students who have passed in STAT3818, or have already enrolled in this course; and Not for students who have passed in FINA2232, or have already enrolled in this course.

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade</th>
<th>Y</th>
<th>1st sem</th>
<th>Offer in 2023 - 2024: Y</th>
<th>Examination</th>
<th>Dec</th>
</tr>
</thead>
</table>

### Grade Descriptors

- **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.

- **D**
  - 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 familiar situations. Apply moderately effective organizational and presentational skills.

- **C**
  - 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.

- **B**
  - 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.

- **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.

### Communication-intensive Course

- **N**

### 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>
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<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>Coursework (assignments, tutorials, a computer-based assessment 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>

### Required/recommended reading and online materials

3. Options, Futures and Other Derivatives, 4th or later edition, by J. Hull.

### Course Website

http://moodle.hku.hk

---

### STAT3911 Financial economics II (6 credits)

#### Offering Department

- **Statistics & Actuarial Science**

#### Course Co-ordinator

- **Prof H Yang, Statistics & Actuarial Science (hlyang@hku.hk)**

#### Teachers Involved

- **(Prof H Yang, Statistics & Actuarial Science)**

#### Course Objectives

- Brownian motion; introduction to stochastic calculus; arithmetic and geometric Brownian motion; Ito formula; Sharpe ratio and risk premium; Black-Scholes equation; risk-neutral stock-price process and option pricing; option's elasticity and volatility; Vasicek, Cox-Ingersoll-Ross, and Black-Derman-Toy models; delta-hedging for bonds and the Sharpe-ratio equality constraint; Black's model; options on zero-coupon bonds; interest-rate caps and caplets.

#### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1** understand measure theory based probability
- **CLO 2** understand conditional probability and martingale
- **CLO 3** understand Brownian motion and its properties
- **CLO 4** understand the Ito calculus and Ito formula
- **CLO 5** understand the Black-Scholes model and option pricing theory

#### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH3603 or STAT3603 or STAT3903 or STAT3910

#### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade</th>
<th>Y</th>
<th>2nd sem</th>
<th>Offer in 2023 - 2024: Y</th>
<th>Examination</th>
<th>May</th>
</tr>
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</table>
STAT3951

Further topics in contingencies (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 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; graduation and related tests; unit-linked contracts; cost of guarantees and options; equity-linked life-contingent insurance products and their valuation; 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 estimate age-dependent transition probabilities
- CLO 3 explain the concept of graduation and apply statistical tests for mortality table comparisons
- CLO 4 apply the Esscher transform on probability distributions and stochastic processes
- CLO 5 price various equity-linked insurance products using Esscher transforms and risk-neutral methods
- CLO 6 formulate simple ruin models and evaluate ruin probabilities as well as related quantities

Pre-requisites
Pass in STAT3909; and Pass in STAT3910, or already enrolled in this course; and For BSc(Actuarial Science) students only.

Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : 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.

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 partial 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.

Communication-intensive Course
N

Course Type
Lecture-based course

Communication-intensive Course
N

Course Teaching & Learning Activities

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<th>Activities</th>
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Assessment Methods and Weighting

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<td>Assignments</td>
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<td>25</td>
<td>CLO 1,2,3,4,5,6</td>
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Course Website
http://moodle.hku.hk
**Course Website**: http://moodle.hku.hk

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**STAT3952**  
**Investment and asset management (6 credits)**

**Offering Department**: Statistics & Actuarial Science  
**Course Co-ordinator**: TBC, Statistics & Actuarial Science (uy.enquiry@saas.hku.hk)

**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.

**Course Contents & Topics**
- 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.

**Assessment Methods**
- Examination One 2-hour written examination 50 CLO 1,2,3,4,5,6

**Grade Descriptors (A+ to F)**

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</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>
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<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>
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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 analytical and critical abilities and logical thinking, and ability to apply knowledge to most unfamiliar situations.</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>
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**Communication-intensive Course**: N

**Course Type**: Lecture-based course

**Course Teaching & Learning Activities**

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<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Assignments, tutorials/example classes, group discussions, project and presentation</td>
<td>50</td>
<td>CLO 1,2,3,4,5,6,7,8</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</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)**

**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 (watkp@hku.hk)

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**Academic Year**: 2022
Course Objectives
This course teaches students about the business environment and exposes them to practical real-world situations using the actuarial control cycle as a framework.

Course Contents & Topics
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.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 provide introductory description of financial security systems, common actuarial techniques and practical experiences
CLO 2 describe actuarial practices, principles, approaches, methods, commonalities, problems and solutions
CLO 3 explain actuarial practices across the traditional areas of practice on behalf of financial security system providers or as a consultant to those providers
CLO 4 apply actuarial skills in nontraditional and emerging areas of practice
CLO 5 provide context for the specific mathematical and technical skills developed in the basic actuarial courses
CLO 6 communicate technical information and participate in peer review
CLO 7 manage uncertainty by responding to questions in ambiguous or open-ended situations with limited time to prepare or react
CLO 8 prepare for the professional role as an Associate of the Society of Actuaries

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT3901.

Offer in 2022 - 2023
Y 2nd sem Offer in 2023 - 2024 : 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 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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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. Organizational and presentational skills are minimally effective or ineffective.

Communication-intensive Course
N

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, interim report and peer review 30 CLO 4, 5, 6, 7
Project reports Written report 30 CLO 4, 5, 6
Test In-class quizzes, discussions and participation 40 CLO 1, 2, 3, 4, 5, 6, 7, 8

Required/recommended reading and online materials

Course Website
http://moodle.hku.hk

STAT3954 Current topics in actuarial science (6 credits)
Academic Year 2022
Offering Department Statistics & Actuarial Science
Course Co-ordinator TBC, Statistics & Actuarial Science (uq.enquiry@saas.hku.hk)
Teachers Involved

Course Objectives
This course aims at providing practical elements for actuarial students including daily life actuarial practice and the basic capability to understand, research in and handle the laws as and when situations would arise, which will benefit students in their coming future career.

Course Contents & Topics
This course covers a full range of topics related to both areas including 1) Practical Actuarial Practice and 2) Actuaries’ Legal Thinking.

For Practical Actuarial Practice: It covers the major practical topics in both Life and Casualty areas. For Life Insurance, it covers the full picture of actuarial control cycle including Product Pricing, Valuation, Financial Reporting and Experience Analysis. For General Insurance, it covers the backbone areas including Product Pricing and Valuation.

For Actuaries’ Legal Thinking: This is the 7th year of the course and the full start of a new course structure echoing changes in the market for basic legal and general insurance skills for actuaries. Intellectually stimulating recent legal materials with heavy involvement of actuarial and other general insurance expertise would dominate the course, alongside with basic legal research skills and fundamental legal thinking. Sharing of experience from guests from the General Insurance Industry would also infiltrate the course.
**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** have a basic understanding regarding Actuarial Control Cycle from A to Z for Life Insurance and General Insurance
- **CLO 2** possess some experience regarding fundamental actuarial practice through practical project
- **CLO 3** possess basic understanding of the legal system in Hong Kong
- **CLO 4** possess fundamental knowledge in certain core legal aspects such as the law of contract and the law of tort
- **CLO 5** possess fundamental knowledge of the law of insurance
- **CLO 6** conduct elementary legal researches when facing with legal problems
- **CLO 7** understand the basic elements of a routine judgment, the matrix of the facts and the law involved

**Pre-requisites (and Co-requisites and Impermissible combinations)**

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.

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>N</th>
<th>Offer in 2023 - 2024 : N</th>
<th>Examination</th>
<th>---</th>
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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.
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**Communication-intensive Course**

N

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
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<td>Tutorials</td>
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**Assessment Methods and Weighting**

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<tbody>
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<td>Assignments</td>
<td>Coursework (assignments, practical project &amp; class test(s))</td>
<td>100</td>
<td>CLO 1,2,3,4,5,6,7</td>
</tr>
</tbody>
</table>

**Course Website**

http://moodle.hku.hk

**STAT3955 Survival analysis (6 credits)**

**Offering Department**

Statistics & Actuarial Science

**Teachers Involved**

TBC, Statistics & Actuarial Science (ug_enquiry@saas.hku.hk)

**Course Objectives**

This course is designed to equip students with skills in the area of survival analysis and to provide them with a solid foundation in the theory and application of survival models. The course will cover the following topics:

- Basic concepts of survival analysis
- Kaplan-Meier estimator
- Nelson-Aalen estimator
- Log-rank test
- Cox proportional hazards model
- Other survival models

**Course Contents & Topics**

- The nature and properties of parametric and nonparametric survival models will be covered. 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; Not for students who have passed in STAT3955, or already enrolled in this course.

**Offer in 2022 - 2023**

<table>
<thead>
<tr>
<th>N</th>
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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.
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Course Website
http://moodle.hku.hk

Required/recommended reading and online materials
Course Website
http://moodle.hku.hk

STAT4011
Natural language processing (6 credits)
Academic Year 2022
Offering Department Statistics & Actuarial Science
Quota 15
Course Co-ordinator Dr A S M Lau, Statistics & Actuarial Science (adelalau@hku.hk)
Teachers Involved (Dr A S M Lau,Statistics & Actuarial Science)
Course Objectives
Natural language processing (NLP) is a subfield of artificial intelligence, focusing on understanding human language. In essence, NLP is interested in building a tool that can use language like humans. This course will introduce the mathematical, statistical and computational challenges in language processing. It covers main applications of NLP techniques and a range of models in structured prediction and deep learning. In this course, students will gain a thorough introduction to cutting-edge machine learning and deep learning techniques for NLP.
Course Contents & Topics
This course covers a broad range of topics in natural language processing (NLP), including text classification, sentiment analysis, neural network, word embedding, sequence models, language models, neural encoder-decoder models, machine translation, question answering, and contextualized world representation. The underlying techniques from probability, statistics, machine learning and deep learning will also be introduced.
Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 learn about the techniques behind modern NLP
CLO 2 implement basic algorithms and methods on real-world data
CLO 3 gain hands-on experience on building NLP models
CLO 4 learn backgrounds to understand current research
CLO 5 get exposed to linguistic concepts and tasks in NLP
Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT2602 and (COMP2113 or COMP2119 or COMP2396).
Recommended: familiarity with deep learning or machine learning; strong programming skills (e.g., Python)
Offer in 2022 - 2023 Y 2nd sem Offer in 2023 - 2024 : 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 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.
Communication-intensive Course N
Course Type Lecture-based course
Course Teaching & Learning Activities Activities Details No. of Hours
Lectures 36
Tutorials 12
Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework (assignments and tutorials) 30 CLO 1,2,3
Project reports 40 CLO 1,2,3,4,5
Test 30 CLO 1,2,3
Course Website http://moodle.hku.hk

STAT4022
Omic data analysis (6 credits)
Academic Year 2022
Offering Department Statistics & Actuarial Science
Quota 15
Course Co-ordinator Dr D Y Zhang, Statistics & Actuarial Science (doraz@hku.hk)
Teachers Involved (Dr D Y Zhang,Statistics & Actuarial Science)
Course Objectives
This course introduces omics data acquisition techniques and emphasizes advanced statistical tools to analyze the high-throughput omics data. This course is designed for learners with basic background knowledge in molecular biology who are interested in different aspects of omics and bioinformatics. This course aims to introduce the tools and techniques needed to obtain, analyze, and interpret a variety of modern genome-scale data types.
Course Contents & Topics
Introduction to molecular biology, omics, and high throughput technologies, analysis of microarray data, analysis of high-throughput data, experimental design commonly encountered in genomic data analysis, functional genomics, enrichment analysis.
Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 Obtain an overview of current computational systems biology approaches for omics data analysis
CLO 2 Understand the principles behind data pre-processing, quality control and analysis of large-scale biological datasets
CLO 3 Apply basic computational and statistical tools to analyze multiple omics data types
CLO 4 Learn the basics of machine learning analysis for omics sample clustering and classification
Medical imaging has been a critical part in modern healthcare procedures. Its primary use is to visualize the human body at different levels (e.g., at organ, tissue, cell, and molecular levels) using different imaging modalities (e.g., those in radiology, pathology, dermatology, ophthalmology, microscopy, and genetics). The objective of this course is to provide students with an overview of the machine learning and deep learning methods in medical image processing and analytics. We will study many of the current methods used to enhance and extract useful information from medical images. A variety of medical image diagnostic scenarios will be used as examples to motivate the methods.

Course Contents & Topics
This course covers the basic concepts and computational methods (especially machine learning and deep learning methods) in medical image analysis. Topics covered in this course include but are not limited to:
- An overview of medical imaging modalities,
- An overview of medical image analysis applications and their challenges,
- Traditional image processing techniques for medical image analysis,
- Basics of machine learning/deep learning techniques,
- Machine learning/deep learning for medical image analysis, and
- Case studies.

Course Learning Outcomes
On successful completion of this course, students should be able to:
1. Understand the basic concepts and motivation of medical image analysis
2. Learn about the various applications and challenges of medical image analysis
3. Learn about the computational techniques behind modern medical image analysis
4. Gain hands-on experience on building practical computational models for medical image analysis
5. Gain exposure to current research topics in medical imaging

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT2602 and (COMP2113 or COMP2119 or COMP2396).
Recommended: familiarity with machine learning/deep learning; strong programming skills (we will use Python/PyTorch in this course)

Communication-intensive Course
N

Course Type
Lecture-based course

Assessment Methods and Weighing
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
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<td>Assignments</td>
<td>Coursework (assignments; may include project report)</td>
<td>60</td>
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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>40</td>
<td>CLO 1,2,3,4</td>
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Course Website
http://moodle.hku.hk
Course Teaching & Learning Activities

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<td>50</td>
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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
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<td>CLO 1,2,3,5</td>
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Course Website

http://moodle.hku.hk

STAT4601

Time-series analysis (6 credits)

Offering Department

Statistics & Actuarial Science

Course Co-ordinator

Prof G Li, Statistics & Actuarial Science (gdl@hku.hk)

Teachers Involved

(Prof G Li, Statistics & Actuarial Science)

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.

On successful completion of this course, students should be able to:

- 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 STAT3007, or have already enrolled in this course.

Offer in 2022 - 2023

Y 1st sem Offer in 2023 - 2024 : 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.
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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.

Communication-intensive Course

N

Course Type

Lecture-based course

Course Teaching & Learning Activities

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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
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Required/recommended reading and online materials


Course Website

http://moodle.hku.hk

STAT4602

Multivariate data analysis (6 credits)

Offering Department

Statistics & Actuarial Science

Course Co-ordinator

Dr C Zhang, Statistics & Actuarial Science (zhangcys@hku.hk)

Teachers Involved

(Prof G Li, Statistics & Actuarial Science)
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 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

Offer in 2022 - 2023

Y 2nd sem Offer in 2023 - 2024 : Y Examination May

Grade Descriptors

(A+ to F)

Outcomes

Course Learning & Topics

Lectures

Assignments

Tutorials

Reading / Self study

No. of Hours

36

12

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)

40

CLO 1,2,3,4,5

Examination

One 3-hour written examination

60

CLO 1,2,3,4,5

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 2022

Offering Department

Statistics & Actuarial Science

Quota ---

Course Co-ordinator

Dr O T K Choi, Statistics & Actuarial Science (ochoi@hku.hk)

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 (and Co-requisites and Impermissible combinations)

Pass in (STAT3618 or FINA2322)

Offer in 2022 - 2023

Y 1st sem Offer in 2023 - 2024 : Y Examination Dec
Department of Statistics & Actuarial Science

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.

Communication-intensive Course  N

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, 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>
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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 (6 credits)

Offering Department  Statistics & Actuarial Science

Course Co-ordinator  TBC, Statistics & Actuarial Science (ug_enquiry@saas.hku.hk)

Teachers Involved

Course Objectives  To provide comprehensive knowledge and in-depth understanding of risk management in the banking and finance industry to students. The focus is on management with basic measurement fundamentals only forming a part of the course. Accordingly, minimal background in quantitative methods will be required and involved. However, basic financial product (eg: bonds, swaps, options) knowledge will be required.

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 2022 - 2023  N  Offer in 2023 - 2024 : 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.

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.
Credit risk has always been a significant financial risk in the banking industry. It is related to the possibility of loss arising from defaults on debts, swaps, or other counterparty instruments. Credit risk may also result from a change in the value of an asset resulting from a change in the counterparty'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 approaches; 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 credit 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 2022 - 2023**
Y 2nd sem  Offer in 2023 - 2024 : 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 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 Teaching & Learning Activities**
- Activities: Lectures, Tutorials, Reading / Self study
- Details: No. of Hours
- Lectures: 36
- Tutorials: 12
- Reading / Self study: 100

**Assessment Methods and Weighting**
- Methods: Assignments, Examinations
- Details: Weighting in final course grade (%)
- Assignments: Coursework (participation, assignments, tutorials, and a class test) 40 CLO 1,2,3,4
- Examinations: One 2-hour written examination 60 CLO 1,2,3,4,5

**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.
Financial risk management has experienced a revolution in the last decade thanks to the introduction of new methods for measuring risk, particularly Value-at-Risk (VaR). This course introduces modern risk management techniques covering the measurement of market risk using VaR models and financial time series models, 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
- 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

### Pre-requisites and Co-requisites
- Pass in STAT3907 and STAT3910; or Pass in STAT4601 and (FINA2320 or STAT3609)

### 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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### Communication-intensive Course
- N

### Course Type
- Lecture-based course

### Course Teaching & Learning Activities
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<td>CLO 1, 2, 3, 4, 5</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
## Course Contents & Topics
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.

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<td>(A+ to F)</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>30</td>
<td>CLO 1,2,3,4</td>
<td></td>
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<tr>
<td>Project reports</td>
<td>30</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>40</td>
<td>CLO 3,4</td>
<td></td>
</tr>
</tbody>
</table>

## Required/recommended reading and online materials

## Course Website
http://moodle.hku.hk

## STAT4610
Bayesian learning (6 credits)  
**Offering Department**: Statistics & Actuarial Science  
**Quota**: 2022

## Course Objectives
This course aims to introduce Bayesian methodologies and computational techniques of Markov Chain Monte Carlo methods, and applications in machine learning.

## Course Contents & Topics
This course covers the fundamental Bayesian formulation, prior elicitation, posterior inference. For Markov Chain Monte Carlo methods, the contents include the Gibbs sampler, the Metropolis-Hastings algorithm, approximate Bayesian computation, the Hamiltonian Monte Carlo algorithm. For more advanced Bayesian modeling, hierarchical models and nonparametric Bayes are covered.

## Course Learning Outcomes
On successful completion of this course, students should be able to:

- **CLO 1**: generate samples from any distribution.
- **CLO 2**: use Monte Carlo methods for approximation.
- **CLO 3**: apply MCMC methods to real problems.
- **CLO 4**: develop nonparametric Bayesian models.
- **CLO 5**: apply Bayesian methods in machine learning tasks.

## Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT3600 or STAT3602 or STAT3603 or STAT3902.

<table>
<thead>
<tr>
<th>Offer in 2022 - 2023</th>
<th>Y</th>
<th>1st sem</th>
<th>Offer in 2023 - 2024</th>
<th>Y</th>
<th>Examination</th>
<th>Dec</th>
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<tbody>
<tr>
<td>Grade Descriptors</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(A+ to F)</td>
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<tr>
<td>A</td>
<td></td>
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<td>B</td>
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## Communication-intensive Course
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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<tr>
<td>Lectures</td>
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<td>36</td>
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<tr>
<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
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</table>
Department of Statistics & Actuarial Science

Course Objectives

Teachers Involved

Communication-intensive Course

Course Type

Course Teaching & Learning Activities

Assessment Methods and Weighting

Course Website

STAT4710

Capstone experience for statistics undergraduates (6 credits)

Offering Department

Course Co-ordinator

Course Objectives

Course Contents & Topics

Course Learning Outcomes

Pre-requisites (and Co-requisites and Impermissible combinations)

Offer in 2022 - 2023

Grade Descriptors (A+ to F)

Communication-intensive Course

Course Type

Course Teaching & Learning Activities

Assessment Methods and Weighting

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.

N

Lecture-based course

Activities

Details

No. of Hours

Lectures

36

Tutorials

12

Reading / Self study

100

Assignments

Coursework (assignments, tutorials, and class test(s))

50

CLO 1, 2, 3, 4, 5

Examination

One 2-hour written examination

50

http://moodle.hku.hk

Academic Year Quota

2022 50

Y 1st sem 2nd sem Offer in 2023 - 2024 : Y Examination No Exam

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.
STAT4766 Statistics internship (6 credits)  Academic Year 2022

Offering Department Statistics & Actuarial Science
Course Co-ordinator Prof G Yin, Statistics & Actuarial Science (ug. enquiry@saas.hku.hk)
Teachers Involved (Various teachers as the assessors of oral presentations and written reports, Statistics & Actuarial Science)

Course Objectives
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.

Course Contents & Topics
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 three to 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.

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 also encouraged to suggest topics in non-traditional actuarial areas provided they can find a suitable teacher and/or industry supervisor. All topics for this course will be subject to final approval by the Department to ensure relevance to actuarial science.

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.

Course Learning Outcomes
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

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 (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.

Offer in 2022 - 2023 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.

Communication-intensive Course N

Course Type Project-based course
Course Teaching & Learning Activities Activities Details Reading / Self study Tutorials, group work/project, reading/self-study No. of Hours 120

Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Oral presentation oral presentation, progress, attendance and in-class discussion 50 CLO 1,2,3,4,5,6
Research report written report 50 CLO 1,2,3,4,5

Course Website http://moodle.hku.hk

844
<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Statistics &amp; Actuarial Science</th>
<th>Quota</th>
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<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr E A L Li, Statistics &amp; Actuarial Science (<a href="mailto:ericli11@hku.hk">ericli11@hku.hk</a>)</td>
<td></td>
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<tr>
<td>Teachers Involved</td>
<td>(Various teachers as the assessors of oral presentations and written reports, Statistics &amp; Actuarial Science)</td>
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<tr>
<td>Course Objectives</td>
<td>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.</td>
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<tr>
<td>Course Content &amp; Topics</td>
<td>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.</td>
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<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
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</tr>
<tr>
<td>Pre-requisites and Co-requisites</td>
<td>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.</td>
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<tr>
<td>Grade Descriptors</td>
<td>Distinction: Demonstrates excellent ability in applying knowledge to solve problems in the workplace. Demonstrates excellent performance in handling and carrying out the work required in the job or assigned by supervisor(s). Establishes highly 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, with excellent performance in written and oral report, and excellent evaluation by supervisor(s), etc.</td>
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<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></td>
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<tr>
<td>Course Type</td>
<td>Internship</td>
<td></td>
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<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td><strong>Activities</strong>: Internship work</td>
<td><strong>Details</strong>: it is expected that students are to work at least 160 hours (or equivalent to 4 weeks full-time)</td>
<td><strong>No. of Hours</strong>: 160</td>
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<tr>
<td>Assessment Methods and Weighting</td>
<td><strong>Methods</strong>: Oral presentation</td>
<td><strong>Details</strong>: oral presentation and in-class discussion</td>
<td><strong>Weighting in final course grade (%)</strong>: 40</td>
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<tr>
<td></td>
<td>Written report</td>
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<td></td>
<td><strong>Assessment Methods to CLO Mapping</strong>: CLO 1,2,3,4</td>
</tr>
<tr>
<td>Course Information</td>
<td>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 &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>
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<tr>
<td>STAT4767</td>
<td>Actuarial science internship (6 credits)</td>
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<tr>
<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
<td></td>
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<tr>
<td>Course Co-ordinator</td>
<td>Dr E A L Li, Statistics &amp; Actuarial Science (<a href="mailto:ericli11@hku.hk">ericli11@hku.hk</a>)</td>
<td></td>
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<tr>
<td>Teachers Involved</td>
<td>(Various teachers as the assessors of oral presentations and written reports, Statistics &amp; Actuarial Science)</td>
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<tr>
<td>Course Objectives</td>
<td>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. 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.</td>
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<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
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<tr>
<td>Pre-requisites and Co-requisites</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>
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</table>
### Course Description

Each year a few projects suitable for Actuarial Science students will be offered to provide students with practical and theoretical 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. 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.

### Offer in 2022 - 2023

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>Distinction/Pass/Fail</th>
<th>Examination</th>
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<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>
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### Communication-intensive Course

<table>
<thead>
<tr>
<th>Type</th>
<th>Internship</th>
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### Course Teaching & Learning Activities

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<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

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<tbody>
<tr>
<td>Oral presentation</td>
<td>oral presentation and in-class discussion written report</td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Written report</td>
<td>written report</td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
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### 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)**

<table>
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<tr>
<th>Offering Department</th>
<th>Statistics &amp; Actuarial Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof S M S Lee, Statistics &amp; Actuarial Science (<a href="mailto:smslee@hku.hk">smslee@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Various teachers as the assessors of oral presentations and written reports, Statistics &amp; Actuarial Science)</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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.</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 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.</td>
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<td>Y 1st sem 2nd sem Offer in 2023 - 2024 : Y</td>
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<tr>
<td>Grade Descriptors (A+ to F)</td>
<td>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.]</td>
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<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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. Organizational and presentational skills are minimally effective or ineffective.</td>
</tr>
<tr>
<td>Communication-intensive Course</td>
<td>N</td>
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### Assessment

<table>
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<tr>
<th>Activities &amp; Learning Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading / Self study</td>
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<td>120</td>
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</table>

<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>Methods</td>
<td></td>
<td></td>
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</tbody>
</table>
### Course Details

#### STAT4799

**Statistics project (12 credits)**

**Offering Department**: Statistics & Actuarial Science  
**Academic Year**: 2022  
**Quota**: 50

**Course Co-ordinator**: Prof S M S Lee, Statistics & Actuarial Science  
**Smalee@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 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**: 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 (and Co-requisites and Impermissible combinations)**: Pass in at least 24 credits of advanced level disciplinary/core/elective courses in the Decision Analytics/Risk Management/Statistics Majors including STAT3800; 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.

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 2022 - 2023**: Y  
**Year long** Y  
**Examination** No Exam

<table>
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<th>Grade Descriptors</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
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<td><strong>(A+ to F)</strong></td>
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<td><strong>Course Type</strong></td>
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<td><strong>Course Teaching &amp; Learning Activities</strong></td>
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<td>Details</td>
<td>No. of Hours</td>
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<td>the student is expected to meet &amp; discuss with a supervisor regularly in the course of the project</td>
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<td>Dissertation</td>
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<td>Oral presentation</td>
<td>oral presentation &amp; in-class discussion</td>
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**Course Website**: http://moodle.hku.hk

**Additional Course Information**: Approval is subject to past academic performance.

---

### Additional Details

#### STAT4901

**Risk theory II (6 credits)**

**Offering Department**: Statistics & Actuarial Science  
**Academic Year**: 2022  
**Quota**: ---

**Course Co-ordinator**: TBC, Statistics & Actuarial Science  
**Ug_enquiry@saas.hku.hk**

**Teachers Involved**: This course is an advanced course in risk theory which extends various topics discussed in STAT3906. It discusses utility theory, ruin theory, aggregate claims process, and related topics.

**Course Objectives**: Utility theory; discrete ruin model; compound Poisson risk model; ruin probability; reinsurance; adjustment coefficient; Lundbergs inequality; Tijms approximation; non-homogeneous birth process; contagion model; mixed Poisson process; inflation model; IBNR (Incurred But Not Reported) claims; mixed Erlang distributions; stop-loss moments; equilibrium distributions.

**Course Contents & Topics**: 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 understand utility theory including some commonly used utility functions, Jense’s inequality, risk aversion and utility maximization.

---

847
### STAT4902 Selected topics in actuarial science (6 credits)

<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
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<td>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.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>C 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. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D 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.</td>
</tr>
<tr>
<td>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.</td>
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<table>
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<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
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<th>Course Teaching &amp; Learning Activities</th>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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<td>---------</td>
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<td>Assignments</td>
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<td>Examination</td>
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<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
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<th>Course Website</th>
<th><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></th>
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### Offer in 2022 - 2023

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<tr>
<td>C</td>
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<tr>
<td>D</td>
</tr>
<tr>
<td>Fail</td>
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</tbody>
</table>
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.

Assessment

- Examination One 2-hour written examination 75

Assignment Details

- Assignments: Coursework (assignments, tutorials and class test(s)) 25
- Examination: One 2-hour written examination 75

Assessment to CLO Mapping

- CLO 1, CLO 2, CLO 3, CLO 4

Contact Information


Course Website

http://moodle.hku.hk
### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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<td>Tutorials</td>
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<tr>
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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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<tr>
<td>Assignments</td>
<td>coursework (assignments, tutorials, and a class test)</td>
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<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 2,3</td>
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### Required/recommended reading and online materials

- 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.

### Course Website

http://moodle.hku.hk

### Course Information

**References:**
- Actuarial Standard Board of the American Academy of Actuaries, Actuarial Standard of Practice No. 13, Trending Procedures in Property/Casualty Insurance Ratemaking
- American Academy of Actuaries Committee on Risk Classification, Risk Classification Statement of Principles, June 1980
- Feldblum, S., Personal Automobile Premiums: An Asset Share Pricing Approach for Property-Casualty Insurance, PCAS LXXXIII, 1996, pp. 190-256 (excluding Sections 7-9)

### Course Contents & Topics

- Basics of statistical learning, cross-validation, linear model selection and regularization (subset selection, shrinkage methods, dimensional reduction methods), tree-based methods (decision trees, bagging, boosting, random forests), principal component analysis, naive Bayes classification, cluster analysis (K-means clustering, hierarchical clustering), deep learning, survival analysis, multiple testing.

### 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 and Impermissible combinations)

- Pass in STAT3907 or STAT3600; and
- Not for students who have passed in STAT3612, or already enrolled in this course; and
- For BSc(Actuarial Science) students only.

### Course Teaching & Learning Activities

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<tr>
<th>Activities</th>
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<td>Tutorials</td>
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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3</td>
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### Required/recommended reading and online materials

An Introduction to Statistical Learning, with Applications in R, James, Witten, Hastie, Tibshirani, 2021, New York: Springer

### Course Website

http://moodle.hku.hk
Department of Statistics & Actuarial Science

STAT7609
Research methods in statistics (6 credits)  Academic Year 2022
Offering Department Statistics & Actuarial Science  Quota ---
Course Co-ordinator Dr K Zhu, Statistics & Actuarial Science (mazhuke@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.
(6) U-statistics, projection methods.
(7) 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 language and technicalities found in statistical research literature
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

Pre-requisites
Pass in STAT3600 or STAT3907

Offer in 2022 - 2023
Y 1st sem Offer in 2023 - 2024 : Y
Grade Descriptors
(A+ to F)
Academic Year 2022 - 2023

Communication-intensive Course
N

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) 40 CLO 1,2,3,4
Examination One 2-hour written examination 60 CLO 1,2,3,4

Required/recommended reading and online materials
http://moodle.hku.hk

STAT7610
Advanced probability (6 credits)  Academic Year 2022
Offering Department Statistics & Actuarial Science  Quota ---
Course Co-ordinator Prof H Yang, Statistics & Actuarial Science (hlyang@hku.hk)
Course Objectives
This course provides an introduction to measure theory and probability. The course will focus on some basic concepts in theoretical probability which are important for students to do research in actuarial science, probability and statistics.

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
### Course Introduction

#### Course Objectives
This course aims to give undergraduate and postgraduate students in statistics a background in modern computationally intensive methods in statistics. It emphasizes the role of computation as a fundamental tool of discovery in data analysis, of statistical inference, and for development of statistical theory and methods.

#### Course Contents & Topics
Contents include: Bayesian statistics, Markov chain Monte Carlo methods including Gibbs sampler, the Metropolis-Hastings algorithm, and data augmentation; Generation of random variables including the inversion methods, rejection sampling, the sampling/importance resampling method; Optimization techniques including Newton’s method, expectation-maximization (EM) algorithm and its variants, and minorization-maximization (MM) algorithms; Integration including Laplace approximations, Gaussian quadrature, the importance sampling method; and other topics such as Hidden Markov models, neural networks, and Bootstrap methods.

#### Course Learning Outcomes
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

### Assessment Methods and Weighting
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<td>Examination</td>
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<td>CLO 1,2,3,4</td>
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### Required/recommended reading and online materials
- http://moodle.hku.hk

### 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 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.

### Pre-requisites and Co-requisites
- Pass in STAT3603 or STAT3903
- Offer in 2022 - 2023: Y

#### Pre-requisites and Co-requisites (and Impermissible combinations)
- Offer in 2022 - 2023: Y
- Grade Descriptors (A+ to F)
- Examination: Dec

#### Communication-intensive Course
- N

#### Course Type
- Lecture-based course

#### Course Co-ordinator
- TBC, Statistics & Actuarial Science

#### Teachers Involved
- http://moodle.hku.hk

#### Assessment Methods
- Details
- No. of Hours
- Lectures
- Tutorials
- Reading / Self study
- No. of Hours
- 12
- 100

#### Examination One
- 2-hour written examination
- 60

#### Grade Descriptors
- (A+ to F)
- Examination
- Grade Descriptors
- 852
## Communication-intensive Course

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## Course Teaching & Learning Activities

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## Assessment Methods and Weighting

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<td>Examination</td>
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## Required/recommended reading and online materials

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## Course Website

http://moodle.hku.hk

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<th>STAT7614</th>
<th>Advanced statistical modelling (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
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<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
<td>Quota</td>
<td>---</td>
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<tr>
<td>Course Co-ordinator</td>
<td>Dr C Wang, Statistics &amp; Actuarial Science (<a href="mailto:stacw@hku.hk">stacw@hku.hk</a>)</td>
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<tr>
<td>Teachers Involved</td>
<td>(Dr C Wang, Statistics &amp; Actuarial Science)</td>
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<tr>
<td>Course Objectives</td>
<td>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.</td>
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<tr>
<td>Course Contents &amp; Topics</td>
<td>Topics from: (i) Linear regression models; (ii) Generalized linear models; (iii) Model selection and regularization; (iv) Kernel and local polynomial regression; selection of smoothing parameters; (v) Generalized additive models; (vi) Hidden Markov models and Bayesian networks.</td>
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<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to: CLO 1 describe clearly the basic characteristic and rationale behind the formulation of each statistical model CLO 2 identify for a given set of data the most suitable statistical model and tools to use CLO 3 demonstrate the ability of using computing software for building scoring models for various management and prediction problems involving binary and counting responses; employing the powerful tool of kernel smoothing using R or Python for real data mining problems</td>
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<td>Pre-requisites (and Co-requisites and Impermissible combinations)</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 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 effective organizational and presentational skills.</td>
<td></td>
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<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show some evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar situations. Apply moderately effective organizational and presentational skills.</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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Communication-intensive Course

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture-based course</td>
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</table>

## 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>24</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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<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>Assignments</td>
<td>Coursework (assignments and class test(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>
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</table>

## Required/recommended reading and online materials

<table>
<thead>
<tr>
<th> </th>
<th>Statistics &amp; Actuarial Science</th>
<th> </th>
</tr>
</thead>
<tbody>
<tr>
<td>R.H. Myers et al., 2010: Generalized Linear Models (2nd ed.), Wiley</td>
<td> </td>
<td></td>
</tr>
<tr>
<td>W. Hardle et al., 2004: Nonparametric and Semi-parametric Models. Springer</td>
<td> </td>
<td></td>
</tr>
<tr>
<td>M. Scutan &amp; J. Denis, 2015: Bayesian Networks: with Examples in R, CRC Press</td>
<td> </td>
<td></td>
</tr>
</tbody>
</table>

## Course Website

http://moodle.hku.hk

<table>
<thead>
<tr>
<th>STAT7615</th>
<th>Advanced quantitative risk management and finance (6 credits)</th>
<th>Academic Year</th>
<th>2022</th>
</tr>
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<tbody>
<tr>
<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
<td>Quota</td>
<td>---</td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr Z Zhang, Statistics &amp; Actuarial Science (<a href="mailto:zhangz08@hku.hk">zhangz08@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>(Dr Z Zhang, Statistics &amp; Actuarial Science)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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

Contents include: 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

Pass in STAT4608

Offer in 2022 - 2023: N
Offer in 2023 - 2024: N

Communication-intensive Course

N

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>
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<td>36</td>
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<tr>
<td>Tutorials</td>
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<td>12</td>
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<td>Reading / Self study</td>
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Assessment Methods and Weighting

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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 2-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3</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 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 and thereafter.

(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 regular major programme, or 144 credits (or a higher credit requirement by the accredited bodies) of the prescribed courses in the intensive 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.
REGULATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE (BSc)

These regulations apply to students admitted under the 4-year 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.

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 regular major programme, or 144 credits (or a higher credit requirement by the accredited bodies) of the prescribed courses in the intensive 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 equal weighting:

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(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.
REGULATIONS FOR THE DEGREE OF
BACHELOR OF SCIENCE
(BSc)

These regulations apply to students admitted under the 4-year 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.

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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.
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

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:

<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 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 ¹

(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 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

¹ These regulations are applicable to candidates admitted from 2022-23 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.
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
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 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;

(d) successful completion of a capstone experience as specified in the syllabuses of the degree curriculum; and

(e) successful completion of any other non-credit bearing courses as required.

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.

\(^2\) Candidates who have achieved Level 5 or above in English Language in the Hong Kong Diploma of Secondary Education Examination, or equivalent, are exempted from this requirement, and Core University English is optional. Those who do not take this course 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.
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>

(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.

5 UG 8 is not applicable to the respective Professional Core of the BDS and MBBS curricula.
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 (GGPA), with all courses taken (including failed courses) 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>
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<tr>
<td>Second Class Honours</td>
<td>(2.40 – 3.59)</td>
</tr>
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</tr>
<tr>
<td>Pass</td>
<td>1.00 – 1.69</td>
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(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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6 UG 9 is not applicable to the BChinMed, BDS and MBBS curricula.

7 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.
Teaching Weeks

SCIENCE
### First Semester: Sep 1 - Dec 23, 2022

#### Week

<table>
<thead>
<tr>
<th>Sun</th>
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</tbody>
</table>

**First Day of Teaching:** Sep 1, 2022

**Reading/Field Trip Week:** Oct 10 - 15, 2022

**Last Day of Teaching:** Nov 30, 2022

**Revision Period:** Dec 1 - 7, 2022

**Assessment Period:** Dec 8 - 23, 2022

**Second Semester: Jan 16 - May 23, 2023**

#### Week

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
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</table>

**First Day of Teaching:** Jan 16, 2023

**Class Suspension Period for the Lunar New Year:** Jan 23 - 28, 2023

**Revision Period:** May 1 - 6, 2023

**Assessment Period:** May 8 - 23, 2023

**Optional Summer Semester**

**JUN 26 - AUG 19, 2023**

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
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<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
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</tbody>
</table>

**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**

**Notes:**

First Semester: 11 Mondays and Tuesdays, 12 Wednesdays, Thursdays and Fridays, 11 Saturdays

Second Semester: 12 Mondays, 13 Tuesdays, 12 Wednesdays, Thursdays and Fridays, 11.5 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 (General Enquiries)  
- sci.ug.enquiry@hku.hk (Academic Matters)  
- sci.ug.el@hku.hk (Experiential Learning & Enrichment Opportunities)  
Website: https://www.scifac.hku.hk/

(Please visit https://www.scifac.hku.hk/ for the latest updates of BSc courses, timetables, notices and forms)

<table>
<thead>
<tr>
<th>Departments/Schools</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Sciences</td>
<td><a href="https://www.biosch.hku.hk/">https://www.biosch.hku.hk/</a></td>
</tr>
<tr>
<td>Biomedical Sciences</td>
<td><a href="http://www.sbms.hku.hk/">http://www.sbms.hku.hk/</a></td>
</tr>
<tr>
<td>Chemistry</td>
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</tr>
<tr>
<td>Earth Sciences</td>
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</tr>
<tr>
<td>Mathematics</td>
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</tr>
<tr>
<td>Physics</td>
<td><a href="https://www.physics.hku.hk/">https://www.physics.hku.hk/</a></td>
</tr>
<tr>
<td>Statistics and Actuarial Science</td>
<td><a href="https://saasweb.hku.hk/">https://saasweb.hku.hk/</a></td>
</tr>
</tbody>
</table>

**Academic Advising Office**

Tel: 3917 0128  
Website: http://aaos.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

**Common Core courses**

Website: https://commoncore.hku.hk/

**HKU Worldwide Undergraduate Exchange Programme**

Website: https://aal.hku.hk/studyabroad/

**Centre of Development and Resources for Students (CEDARS)**

Tel: 3917 2305  
Website: https://www.cedars.hku.hk/

**University Health Service**

Tel: 3917 2501 (General enquiries)  
2549 4686 (Medical appointments only)  
Website: http://www.uhs.hku.hk

**Plagiarism**

Website: https://tl.hku.hk/plagiarism/