This booklet includes information on:

- **BSc Degree curriculum and graduation requirements**
- **List of courses and descriptions**
  A full list of Science courses and descriptions include information on course code, title, credit value, contents, semester offered, teaching and learning activities, assessment methods and grade descriptors.
- **Majors & Minors**
  Details of the Science Majors and Minors available for students.
- **Degree regulations**
  Rules that cover curriculum requirements and progression in curriculum, selection of courses, assessment, advanced standing, grading system and degree honours classification.
- **Teaching weeks**
  Teaching weeks show the dates of semesters, University holidays, revision and examination periods.

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

Updates on BSc Syllabuses and Regulations can be found at http://webapp.science.hku.hk/sr4/servlet/enquiry
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BSc Degree Curriculum and Graduation Requirements
1. A BSc Degree Curriculum

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

All students admitted to the 6901 BSc programme under the 4-year curriculum are required to complete at least one Science major out of the 16 Science majors as the primary major for the award of the BSc degree. In addition to the primary Science major, students may take a second major or a minor in a Science or non-Science discipline. Students should note that some non-Science majors and minors may require students to have achieved a minimum academic result before they are allowed to enroll in them.

(a) A typical BSc curriculum for students admitted under the 4-year ‘2012 curriculum’ in 2012-13 or thereafter

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:
- 16 courses for the Science major including 2 Science Foundation courses, Disciplinary courses and capstone courses (96 credits)
- 2 English courses and 1 Chinese course for university language requirements (18 credits)
- 6 common core courses in 4 Areas of Inquiry (36 credits)
- A choice of 15 courses as elective courses, or to fulfill the requirements of a minor or a second major (90 credits)

<table>
<thead>
<tr>
<th>Option A</th>
<th>Option B</th>
<th>Option C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students taking one Science major</td>
<td>Students taking one Science major and one minor</td>
<td>Students taking double majors (one Science major and a 2nd major)</td>
</tr>
<tr>
<td><strong>Curriculum requirements (240 credits)</strong></td>
<td><strong>Primary Science Major: 96 credits</strong>&lt;br&gt;2 Science Foundation courses (SCNC1111 &amp; SCNC1112, taken in Year 1), 13 Disciplinary courses and 1 Capstone course</td>
<td><strong>Primary Science Major: 96 credits</strong>&lt;br&gt;2 Science Foundation courses (SCNC1111 &amp; SCNC1112, taken in Year 1), 13 Disciplinary courses and 1 Capstone course</td>
</tr>
<tr>
<td></td>
<td><strong>Common Core Courses: 36 credits</strong>&lt;br&gt;6 courses in 4 Areas of Inquiry (at least 1 and not more than 2 courses from each AoI)</td>
<td><strong>Common Core Courses: 36 credits</strong>&lt;br&gt;6 courses in 4 Areas of Inquiry (at least 1 and not more than 2 courses from each AoI)</td>
</tr>
<tr>
<td></td>
<td><strong>Language Courses: 18 credits</strong>&lt;br&gt;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)]&lt;br&gt;Chinese: 6 credits (CSCI9001, taken in Year 3)</td>
<td><strong>Language Courses: 18 credits</strong>&lt;br&gt;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)]&lt;br&gt;Chinese: 6 credits (CSCI9001, taken in Year 3)</td>
</tr>
<tr>
<td></td>
<td><strong>Electives: 90 credits</strong>&lt;br&gt;To make up the 240 total credits</td>
<td><strong>Electives: 90 credits</strong>&lt;br&gt;To make up the 240 total credits</td>
</tr>
<tr>
<td></td>
<td><em><em>Minor</em>: 36 – 48 credits</em>*</td>
<td><em><em>Minor</em>: 36 – 48 credits</em>*</td>
</tr>
<tr>
<td></td>
<td><strong>Electives: 42 – 54 credits</strong>&lt;br&gt;To make up the 240 total credits</td>
<td><strong>2nd Major</strong>: 72 – 96 credits</td>
</tr>
</tbody>
</table>

---

^*| Minor*: 36 – 48 credits
^| 2nd Major**: 72 – 96 credits
^| Electives: 42 – 54 credits
^*| Minor*: 36 – 48 credits
^| 2nd Major**: 72 – 96 credits
^*| Electives: 42 – 54 credits
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 Literacy; (2) Humanities; (3) Global Issues; (4) China: Culture, State and Society.

Students have to pass 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits. Common Core courses should be completed normally within the first three years of study.

2. BSc Graduation Requirements and Honours Classification (for students admitted under the 4-year ‘2012 curriculum’ in 2012-13 or thereafter)

(a) Award of a BSc degree

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 major programme of the BSc degree curriculum.
UG5 specifies that students have to successfully complete:

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

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

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

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

(b) Honours Classification

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

<table>
<thead>
<tr>
<th>CGPA range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class Honours</td>
<td>3.60 – 4.30</td>
</tr>
<tr>
<td>Second Class Honours Division I</td>
<td>3.00 – 3.59</td>
</tr>
<tr>
<td>Second Class Honours Division II</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>

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

---

\(^1\) Candidates with the following qualifications shall be exempted from this requirement and should take a 6-credit elective course in lieu, see Regulation UG6:

- 5** on the HKDSE English Language Paper
tested by CAES to be of a native English speaker standard
holder of Bachelor’s degree from an English-medium university
achieved an overall IELTS score of no less than a 7.5 and no less than a 7 on the Reading, Speaking, Listening and Writing Tests
achieved an overall TOEFL Internet Based Test score of no less than 102 and no less than 27 on the writing and speaking sections and no less than 24 on the listening and reading sections
achieved a level of no less than 5 in the HL English Language A: Literature or English Language A: Language and Literature paper or no less than 6 in the SL English Language A: Literature or English Language A: Language and Literature paper in the International Baccalaureate Diploma
achieved a Scholastic Aptitude Test (SAT) essay score of no less than 10 and no less than 700 on the Critical Reading and Writing Tests
achieved a score of no less than 5 on the Advanced Placement English Language and Composition Test or the Literature and Composition Test
achieved an A* in the English Language, English Literature or English Language and Literature GCE English A level paper (including specification A or B, if given)

Exempted students will not be able to enroll CAES1000 via Self Service enrollment.

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

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

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

\(^3\) Candidates who have not studied Chinese language during their secondary education may be exempted from this requirement and should take a 6-credit elective course in lieu, see Regulation UG6.
Capstone Requirement for Science Students
Capstone experience is an integral part of the major programme which focuses on integration and application of knowledge and skills gained in the early years of study. The capstone course carries a minimum of 6 credits and students must complete this for fulfillment of the graduation requirements. Capstone course is normally taken in the senior years (year 3 or 4) of study. The earliest that a student is allowed to take a capstone course is their year 3 study. The capstone courses in each Science major may be different but a range of courses (e.g. research project, seminar, field work, internship and capstone project) is offered to suit individual student's needs and interests. The following courses are currently recognized as capstone courses in the different majors:

<table>
<thead>
<tr>
<th>BSc - Major</th>
<th>Recognized Capstone Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Biochemistry</td>
<td>1. BIOC3999 Directed studies in biochemistry (6)</td>
</tr>
<tr>
<td></td>
<td>2. BIOC4966 Biochemistry internship (6)</td>
</tr>
<tr>
<td></td>
<td>3. BIOC4999 Biochemistry project (12)</td>
</tr>
<tr>
<td>2. Biological Sciences</td>
<td>1. BIOL3994 Directed studies in biological sciences (6)</td>
</tr>
<tr>
<td></td>
<td>2. BIOL4964 Biological sciences internship (6)</td>
</tr>
<tr>
<td></td>
<td>3. BIOL4994 Biological sciences project (12)</td>
</tr>
<tr>
<td>3. Chemistry</td>
<td>1. CHEM3999 Directed studies in chemistry (6)</td>
</tr>
<tr>
<td></td>
<td>2. CHEM4910 Chemistry literacy and research (6)</td>
</tr>
<tr>
<td></td>
<td>3. CHEM4911 Capstone experience for chemistry undergraduates: HKUtopia (6)</td>
</tr>
<tr>
<td></td>
<td>4. CHEM4966 Chemistry internship (6)</td>
</tr>
<tr>
<td></td>
<td>5. CHEM4999 Chemistry project (12)</td>
</tr>
<tr>
<td>4. Earth System Science</td>
<td>1. EASC4911 Earth system: contemporary issues (6)</td>
</tr>
<tr>
<td>5. Ecology &amp; Biodiversity</td>
<td>1. BIOL3951 Ecology &amp; biodiversity field course (6) *</td>
</tr>
<tr>
<td></td>
<td>2. BIOL3991 Directed studies in ecology &amp; biodiversity (6)</td>
</tr>
<tr>
<td></td>
<td>3. BIOL4911 Conservation science in practice (6)</td>
</tr>
<tr>
<td></td>
<td>4. BIOL4921 Animal behaviour and behavioural ecology: field course (6)</td>
</tr>
<tr>
<td></td>
<td>5. BIOL4991 Ecology &amp; biodiversity project (12)</td>
</tr>
<tr>
<td>6. Environmental Science</td>
<td>1. ENVS3999 Directed studies in environmental science (6)</td>
</tr>
<tr>
<td></td>
<td>2. ENVS4955 Environmental science in practice (6)</td>
</tr>
<tr>
<td></td>
<td>3. ENVS4966 Environmental science internship (6)</td>
</tr>
<tr>
<td></td>
<td>4. ENVS4999 Environmental science project (12)</td>
</tr>
<tr>
<td>7. Food &amp; Nutritional Science</td>
<td>1. BIOL3992 Directed studies in food &amp; nutritional science (6)</td>
</tr>
<tr>
<td></td>
<td>2. BIOL4912 Sensory evaluation of food (6)</td>
</tr>
<tr>
<td></td>
<td>3. BIOL4922 Food product development and evaluation (6)</td>
</tr>
<tr>
<td></td>
<td>4. BIOL4962 Food &amp; nutritional science internship (6)</td>
</tr>
<tr>
<td></td>
<td>5. BIOL4992 Food &amp; nutritional science project (12)</td>
</tr>
<tr>
<td>8. Geology</td>
<td>1. EASC4955 Integrated field studies (6)</td>
</tr>
<tr>
<td>9. Mathematics</td>
<td>1. MATH3999 Directed studies in mathematics (6)</td>
</tr>
<tr>
<td></td>
<td>2. MATH4910 Senior mathematics seminar (6)</td>
</tr>
<tr>
<td></td>
<td>3. MATH4911 Mathematics capstone project (6)</td>
</tr>
<tr>
<td></td>
<td>4. MATH4966 Mathematics internship (6)</td>
</tr>
<tr>
<td></td>
<td>5. MATH4999 Mathematics project (12)</td>
</tr>
<tr>
<td>10. Mathematics / Physics</td>
<td>1. MATH3999 Directed studies in mathematics (6)</td>
</tr>
<tr>
<td></td>
<td>2. MATH4910 Senior mathematics seminar (6)</td>
</tr>
<tr>
<td></td>
<td>3. MATH4911 Mathematics capstone project (6)</td>
</tr>
<tr>
<td></td>
<td>4. MATH4966 Mathematics internship (6)</td>
</tr>
<tr>
<td></td>
<td>5. MATH4999 Mathematics project (12)</td>
</tr>
<tr>
<td></td>
<td>6. PHYS3999 Directed studies in physics (6)</td>
</tr>
<tr>
<td></td>
<td>7. PHYS4966 Physics internship (6)</td>
</tr>
<tr>
<td></td>
<td>8. PHYS4999 Physics project (12)</td>
</tr>
<tr>
<td>11. Molecular Biology &amp; Biotechnology</td>
<td>1. BIOL3993 Directed studies in molecular biology &amp; biotechnology (6)</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>12. Astronomy</td>
<td>1. PHYS3999 Directed studies in physics (6)</td>
</tr>
<tr>
<td>13. Physics</td>
<td>2. PHYS4966 Physics internship (6)</td>
</tr>
<tr>
<td></td>
<td>3. PHYS4999 Physics project (12)</td>
</tr>
<tr>
<td>14. Decision Analytics</td>
<td>1. STAT3799 Directed studies in statistics (6)</td>
</tr>
<tr>
<td>15. 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>
</tbody>
</table>

* For students taken in 2015 or before.
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)**
Students have to undertake at least 160 hours of internship work
Internships aim to offer students the opportunity to gain work experience related to their major of study. The teacher meets with the student regularly to discuss work progress. Students have to undertake at least 160 hours of internship work arranged formally. Assessment tasks (100%) normally include the following outputs: a written report of no more than 2000 words and feedback from the internship supervisor and an oral presentation on students’ internship experience. Details of the assessment tasks can be found in the description of individual courses.

3. **The types of courses in the 16 Science Majors and 17 Science Minors are as follows:**

<table>
<thead>
<tr>
<th>Majors/Minors</th>
<th>Lecture-based</th>
<th>Lecture with laboratory component</th>
<th>Laboratory &amp; Workshop</th>
<th>Project-based</th>
<th>Field camps</th>
<th>Internship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial Studies (Minor)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astronomy (Major &amp; Minor)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biochemistry (Major &amp; Minor)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological Sciences (Major)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry (Major &amp; Minor)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computational &amp; Financial Mathematics (Minor)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decision Analytics (Major)</td>
<td></td>
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</tr>
<tr>
<td>Earth Sciences (Minor)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth System Science (Major)</td>
<td>✓</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Ecology &amp; Biodiversity (Major &amp; Minor)</td>
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<td></td>
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<tr>
<td>Environmental Science (Major &amp; Minor)</td>
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<tr>
<td>Food &amp; Nutritional Science (Major &amp; Minor)</td>
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<td></td>
<td></td>
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<tr>
<td>Geology (Major)</td>
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<tr>
<td>Marine Biology (Minor)</td>
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<tr>
<td>Mathematics (Major &amp; Minor)</td>
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<tr>
<td>Mathematics / Physics (Major)</td>
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<tr>
<td>Molecular Biology &amp; Biotechnology (Major &amp; Minor)</td>
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<tr>
<td>Operations Research &amp; Mathematical Programming (Minor)</td>
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<tr>
<td>Physics (Major &amp; Minor)</td>
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<tr>
<td>Plant Science (Minor)</td>
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<tr>
<td>Risk Management (Major &amp; Minor)</td>
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<tr>
<td>Statistics (Major &amp; Minor)</td>
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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 2016-17 and 2017-18
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
<th>Pre-requisite</th>
<th>Available in 2016-2017</th>
<th>Semester offered in 2016-2017 (prey long)</th>
<th>Exam held in 2016-2017</th>
<th>Quota</th>
<th>Course Coordinator</th>
<th>Major / Minor that this course appears as</th>
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</thead>
<tbody>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
<td>6</td>
<td>Pass in BIOC1600 or BIOL1110 or ENGG1207, and Not for students who have passed in BIOL2200 or MEDE2301, or have already enrolled in these courses</td>
<td>Y Y 1 Dec 300</td>
<td>prof D K Y Shum, Biomedical Sciences</td>
<td>Major in Biochemistry (2016,2015,2014,2013,2012)</td>
<td>Minor in Biochemistry (2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOC3999</td>
<td>Directed studies in biochemistry</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 BIOC2600 and BIOL3401. 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 36</td>
<td>Prof J D Huang, Biomedical Sciences</td>
<td>Major in Biochemistry (2016,2015,2014,2013,2012)</td>
<td>Minor in Biochemistry (2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOC4696</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 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</td>
<td>Prof J D Huang, Biomedical Sciences</td>
<td>Major in Biochemistry (2016,2015,2014,2013,2012)</td>
<td>Minor in Biochemistry (2016,2015,2014,2013,2012)</td>
<td></td>
<td></td>
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<tr>
<td>BIOC4699</td>
<td>Biochemistry project</td>
<td>12</td>
<td>Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Biochemistry Major including 4 of the following 5 courses: BIOL3401, BIOC3601, BIOC3604, BIOC4610 and BIOC4613, BIOC4610 and BIOC4613 can be taken concurrently with this course. This capstone course is for Biochemistry Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 0 No exam 25</td>
<td>Dr N S Wong, Biomedical Sciences</td>
<td>Major in Biochemistry (2016,2015,2014,2013,2012)</td>
<td>Minor in Biochemistry (2016,2015,2014,2013,2012)</td>
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</table>

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### Availability of courses in 2017-2018 is subject to change.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
<th>Pre-requisite</th>
<th>Available in</th>
<th>Semester offered in 2016-2017</th>
<th>Exam held in 2016-2017</th>
<th>Quota</th>
<th>Course Coordinator</th>
<th>School of Biological Sciences</th>
<th>Major / Minor</th>
</tr>
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<tbody>
<tr>
<td>BIOL1501</td>
<td>Bioethics</td>
<td>6</td>
<td>NIL</td>
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<td>Biological Sciences</td>
<td>Biological Sciences</td>
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<tr>
<td>BIOL1502</td>
<td>The gene</td>
<td>6</td>
<td>NIL</td>
<td>Not for students with level 3 or above in HKDSE Biology or Combined Science with Biology component or equivalent.</td>
<td>N N</td>
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<td>50</td>
<td>Biological Sciences</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in Semester offered in 2016-2017</td>
<td>Exam held in 2016-2017</td>
<td>Quota</td>
<td>Course Coordinator</td>
<td>Major / Minor (The Major/Minor that this course appears as)</td>
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<tr>
<td>BIOL3105</td>
<td>Animal physiology and environmental adaptation</td>
<td>6</td>
<td>Pass in BIOL2102 or BIOL2103 or BIOL2220 or BIOL2306</td>
<td>Y Y 2 May</td>
<td>50</td>
<td>Prof A O L Wong, Biological Sciences</td>
<td>Major in Biological Sciences (2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOL3108</td>
<td>Microbial physiology</td>
<td>6</td>
<td>Pass in BIOC2600 or BIOC2602 or BIOC2604</td>
<td>N N ---</td>
<td>---</td>
<td>Dr A Yan, Biological Sciences</td>
<td>Major in Biological Sciences (2015,2014,2013,2012)</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in</td>
<td>Exam held in</td>
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<td>Course Code</td>
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<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in</td>
<td>Exam held in</td>
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<tr>
<td>BIOL3305</td>
<td>Tropical and temperate marine ecology field course</td>
<td>6</td>
<td>Pass in BIOL2306 or BIOL3301 or BIOL3951</td>
<td>Y Y</td>
<td>5</td>
<td>No exam</td>
<td>15</td>
<td>Dr B Russell, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2016,2015,2014,2013,2012)</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in</td>
<td>Exam held in</td>
<td>Quota</td>
<td>Course Coordinator</td>
<td>Major / Minor (The Major/Minor that this course appears as)</td>
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<tr>
<td>BIOL3406</td>
<td>Reproduction and reproductive biotechnology</td>
<td>6</td>
<td>Pass in BIOL2102 or BIOL2103 or BIOL2220 or BIOL2306</td>
<td>Y Y</td>
<td>1 Dec</td>
<td>40</td>
<td></td>
<td>Prof A O L Wong, Biological Sciences</td>
<td>Major in Biological Sciences (2016); Major in Molecular Biology &amp; Biotechnology (2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOL3501</td>
<td>Evolution</td>
<td>6</td>
<td>Pass in BIOL2306</td>
<td>Y Y</td>
<td>1 Dec</td>
<td>50</td>
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<td>Dr M Sun, Biological Sciences</td>
<td>Major in Biological Sciences (2016)</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in</td>
<td>Exam held in</td>
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<td>Course Coordinator</td>
<td>Major / Minor (The Major/Minor that this course appears as)</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>Y Y 2</td>
<td>May</td>
<td>50</td>
<td>Dr M Sun, Biological Sciences</td>
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<tr>
<td>BIOL3503</td>
<td>Endocrinology: human physiology II</td>
<td>6</td>
<td>Pass in BIOL2103</td>
<td>Y Y 2</td>
<td>May</td>
<td>60</td>
<td>Prof B K C Chow, Biological Sciences</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>Y Y 2</td>
<td>No exam</td>
<td>20</td>
<td>Dr T Vingiethan, Biological Sciences</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 BIOL2600 or BIOL3604; Not for students who have passed in BIOL3105 or BIOL4402.</td>
<td>Y Y 1</td>
<td>Dec</td>
<td>60</td>
<td>Dr A Yan, Biological Sciences</td>
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<tr>
<td>BIOL3951</td>
<td>Ecology &amp; biodiversity field course</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 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>N N ---</td>
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<td>20</td>
<td>Dr L Karczmarski, Biological Sciences</td>
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<tr>
<td>BIOL3991</td>
<td>Directed studies in ecology &amp; biodiversity</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 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>Y Y 0</td>
<td>No exam</td>
<td>---</td>
<td>Prof G A Williams, Biological Sciences</td>
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<tr>
<td>BIOL3992</td>
<td>Directed studies in food &amp; nutritional science</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</td>
<td>Dec, May</td>
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<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>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Molecular Biology &amp; Biotechnology Major. This capstone course is for Molecular Biology &amp; Biotechnology Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 0</td>
<td>No exam</td>
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<td>Dr W K Yip, Biological Sciences</td>
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<tr>
<td>BIOL3994</td>
<td>Directed studies in biological sciences</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 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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<td>Prof W W M Lee, Biological Sciences</td>
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<tr>
<td>BIOL4201</td>
<td>Public health nutrition</td>
<td>6</td>
<td>Pass in BIOL3201 or BIOL3202</td>
<td>Y Y 2</td>
<td>May</td>
<td>50</td>
<td>Dr J M F Wan, Biological Sciences</td>
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<tr>
<td>BIOL4204</td>
<td>Diet, brain function and behavior</td>
<td>6</td>
<td>Pass in BIOL3204, or already enrolled in this course</td>
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<td>30</td>
<td>Dr E T S LI, Biological Sciences</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in</td>
<td>Exam held in</td>
<td>Quota</td>
<td>Course Coordinator</td>
<td>Major / Minor (The Major/Minor that this course appears as)</td>
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<tr>
<td>BIOL4304</td>
<td>Ecosystem functioning and services</td>
<td>6</td>
<td>Pass in two of the following courses: BIOL3301, BIOL3303, BIOL3313 or BIOL3319</td>
<td>Y Y 1 Dec</td>
<td>2016-2017</td>
<td>Y Y 1 Dec</td>
<td>30</td>
<td>Dr B D Russell, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2016,2015,2014,2013,2012)</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in</td>
<td>Exam held in</td>
<td>Quota</td>
<td>Course Coordinator</td>
<td>Major / Minor (The Major/Minor that this course appears as)</td>
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<tr>
<td>BIOL4409</td>
<td>General virology</td>
<td>6</td>
<td>Pass in BIOL3401 or BIOL3403</td>
<td>Y Y 1</td>
<td>Dec</td>
<td>30</td>
<td>Dr W B L Lim, Biological Sciences</td>
<td>Major in Molecular Biology &amp; Biotechnology (2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology</td>
<td>6</td>
<td>Pass in BIOC3601 or BIOC3604 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3405</td>
<td>Y Y 2</td>
<td>May</td>
<td>40</td>
<td>Dr K W Y Yuen, Biological Sciences</td>
<td>Major in Molecular Biology &amp; Biotechnology (2016,2015,2014,2013,2012); Minor in Molecular Biology &amp; Biotechnology (2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOL4417</td>
<td>‘Omnics’ and systems biology</td>
<td>6</td>
<td>Pass in BIOC3601 or BIOC3604 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3405</td>
<td>Y Y 2</td>
<td>May</td>
<td>40</td>
<td>Dr J W Zhang, Biological Sciences</td>
<td>Major in Molecular Biology &amp; Biotechnology (2016,2015,2014,2013,2012); Minor in Molecular Biology &amp; Biotechnology (2016,2015,2014,2013,2012)</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 This experiential field course is primarily for Ecology &amp; Biodiversity Major students. The earliest that a student is allowed to take this experiential course is their Year 3 study; and because it is conducted in early June, this course is best suited for year 3 students.</td>
<td>Y Y 2</td>
<td>No exam</td>
<td>12</td>
<td>Dr L Karczmarski, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOL4861</td>
<td>Ecology &amp; biodiversity internship</td>
<td>6</td>
<td>This course is for Ecology &amp; Biodiversity Major students only. The earliest that a student is allowed to take this course is their Year 3.</td>
<td>Y Y 1, 2, S</td>
<td>No exam ---</td>
<td>Dr T Venglesen, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2016,2015,2014,2013,2012)</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in</td>
<td>Exam held in</td>
<td>Quota</td>
<td>Course Coordinator</td>
<td>Major / Minor (The Major/Minor that this course appears as)</td>
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<tr>
<td>BIOL4911</td>
<td>Conservation science in practice</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 Ecology &amp; Biodiversity Major including BIOL3903. 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>2016-2017</td>
<td>2016-2017 1st sem 2nd sem S=Summer</td>
<td>Y Y 2</td>
<td>No exam</td>
<td>Prof Y J Badovy, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2016,2015,2014,2013,2012)</td>
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<tr>
<td>BIOL4912</td>
<td>Sensory evaluation of food</td>
<td>6</td>
<td>Pass in BIOL301; 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>
<td>2016-2017</td>
<td>2016-2017 1st sem 2nd sem S=Summer</td>
<td>Y Y S</td>
<td>No exam</td>
<td>Prof N P Shah, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science (2016,2015,2014,2013,2012)</td>
<td></td>
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<tr>
<td>BIOL4921</td>
<td>Animal behaviour and behavioural ecology: field course</td>
<td>6</td>
<td>Pass in BIOL3101; and Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Ecology &amp; Biodiversity Major. This capstone course is for Ecology &amp; Biodiversity Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>2016-2017</td>
<td>2016-2017 1st sem 2nd sem S=Summer</td>
<td>Y N 2</td>
<td>No exam</td>
<td>Dr L Karczmarski, Biological Sciences</td>
<td>Major in Ecology &amp; Biodiversity (2016,2015,2014,2013,2012)</td>
<td></td>
</tr>
<tr>
<td>BIOL4922</td>
<td>Food product development and evaluation</td>
<td>6</td>
<td>Pass in BIOL3203 or BIOL3205; 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>
<td>2016-2017</td>
<td>2016-2017 1st sem 2nd sem S=Summer</td>
<td>Y Y 1</td>
<td>Dec 20</td>
<td>Dr M F Wang, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science (2016,2015,2014,2013,2012)</td>
<td></td>
</tr>
<tr>
<td>BIOL4902</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>2016-2017</td>
<td>2016-2017 1st sem 2nd sem S=Summer</td>
<td>Y Y 1, 2, S</td>
<td>No exam</td>
<td>--- Dr J C Y Lee, Biological Sciences</td>
<td>Major in Food &amp; Nutritional Science (2016,2015,2014,2013,2012)</td>
<td></td>
</tr>
<tr>
<td>BIOL4903</td>
<td>Molecular biology &amp; biotechnology 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 Molecular Biology &amp; Biotechnology Major. This capstone course is for Molecular Biology &amp; Biotechnology Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>2016-2017</td>
<td>2016-2017 1st sem 2nd sem S=Summer</td>
<td>Y Y 1, 2, S</td>
<td>No exam</td>
<td>--- Dr W K Yip, Biological Sciences</td>
<td>Major in Molecular Biology &amp; Biotechnology (2016,2015,2014,2013,2012)</td>
<td></td>
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<tr>
<td>BIOL4904</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 students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>2016-2017</td>
<td>2016-2017 1st sem 2nd sem S=Summer</td>
<td>Y Y 1, 2, S</td>
<td>No exam</td>
<td>--- Prof W W M Lee, Biological Sciences</td>
<td>Major in Biological Sciences (2016,2015,2014,2013,2012)</td>
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<td>Course Code</td>
<td>Title</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 biological sciences courses (BIOL3XXX or BIOL4XXX) in the Ecology &amp; Biodiversity Major, and Cumulative GPA of 3.0 or above. Students are not permitted to take both BIOL391 and BIOL491. 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>Y Y 0</td>
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<tr>
<td>ENVS1301</td>
<td>Environmental life science</td>
<td>6</td>
<td>NIL</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>Dr T Vengatesen, Biological Sciences</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</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 biological sciences courses (BIOL3XXX or BIOL4XXX) in the Molecular Biology &amp; Biotechnology Major, and Cumulative GPA of 3.0 or above. This capstone course is for Molecular Biology &amp; Biotechnology Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 0</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. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 0</td>
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<tr>
<td>ENVS2001</td>
<td>Environmental field and lab course</td>
<td>6</td>
<td>Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401</td>
<td>Y Y 1</td>
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<tr>
<td>ENVS2002</td>
<td>Environmental data analysis</td>
<td>6</td>
<td>Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401</td>
<td>Y Y 2</td>
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</table>

**School of Biological Sciences (Cont'd)**

**BIOL4991** Ecology & biodiversity project: Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Ecology & Biodiversity Major, and Cumulative GPA of 3.0 or above. Students are not permitted to take both BIOL391 and BIOL491. 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.

**ENVS1301** Environmental life science: 6 NIL Y Y 2 May 40 Dr T Vengatesen, Biological Sciences

**ENVS2001** Environmental field and lab course: 6 Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401 Y Y 1 No exam 45 Dr D M Baker, Biological Sciences

**ENVS2002** Environmental data analysis: 6 Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401 Y Y 2 May 65 Dr T C Bonebrake, Biological Sciences

**BIOL4992** Food & nutritional science project: 12 Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Food & Nutritional Science Major, and Cumulative GPA of 3.0 or above. This capstone course is for Food & Nutritional Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

**BIOL4993** Molecular biology & biotechnology project: 12 Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Molecular Biology & Biotechnology Major, and Cumulative GPA of 3.0 or above. This capstone course is for Molecular Biology & Biotechnology Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

**BIOL4994** Biological sciences project: 12 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.

**ENVS2002** Environmental data analysis: 6 Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401 Y Y 2 May 65 Dr T C Bonebrake, Biological Sciences

**ENVS2001** Environmental field and lab course: 6 Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401 Y Y 1 No exam 45 Dr D M Baker, Biological Sciences

**ENVS1301** Environmental life science: 6 NIL Y Y 2 May 40 Dr T Vengatesen, Biological Sciences

**ENVS2002** Environmental data analysis: 6 Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401 Y Y 2 May 65 Dr T C Bonebrake, Biological Sciences

**Major / Minor (The Major/Minor that this course appears as):**
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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
<th>Pre-requisite</th>
<th>Available in 2016-2017</th>
<th>Semester offered in 2016-2017</th>
<th>Exam held in 2016-2017</th>
<th>Quota</th>
<th>Course Coordinator</th>
<th>Major / Minor (The Major/Minor that this course appears as)</th>
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</thead>
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<tr>
<td>ENV54555</td>
<td>Environmental science in practice</td>
<td>6</td>
<td>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.</td>
<td>Y</td>
<td>Y</td>
<td>0</td>
<td>No exam</td>
<td>Dr M Yasuhara, Biological Sciences</td>
<td>Major in Environmental Science (2016,2015,2014,2013,2012)</td>
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<tr>
<td>CAES1000</td>
<td>Core University English</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>Y</td>
<td>1, 2 Dec, May</td>
<td>---</td>
<td>Dr N Fong, English</td>
<td>Centre for Applied English Studies (2016,2015,2014,2013,2012)</td>
</tr>
<tr>
<td>CAES9820</td>
<td>Academic English for science students</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>Y</td>
<td>1, 2 No exam</td>
<td>---</td>
<td>Ms E Law, English</td>
<td></td>
</tr>
<tr>
<td>CHEM1041</td>
<td>Foundations of chemistry</td>
<td>6</td>
<td>Level 3 or above in HKDSE Combined Science with Chemistry component or Integrated Science, or equivalent. Students without such background but keen on taking this foundation chemistry course may approach the course coordinator for consideration. Not for students with Level 3 or above in HKDSE Chemistry.</td>
<td>Y</td>
<td>Y</td>
<td>1 Dec</td>
<td>166</td>
<td>Dr A P L Tong, Chemistry</td>
<td>Department of Chemistry (2016,2015,2014,2013,2012)</td>
</tr>
<tr>
<td>CHEM2041</td>
<td>Principles of chemistry</td>
<td>6</td>
<td>Pass in CHEM1042; and Not for students who have passed in CHEM2541, 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.</td>
<td>N</td>
<td>N</td>
<td>---</td>
<td>140</td>
<td>Dr I K Chu, Chemistry</td>
<td>Major in Environmental Science (2016,2015,2014,2013,2012); Major in Chemistry (2016,2015,2014,2013,2012); Minor in Environmental Science (2016,2015,2014,2013,2012)</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Pre-requisite</td>
<td>Available in</td>
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<td>Exam held in 2016-2017</td>
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<td>Course Coordinator</td>
<td>Major / Minor</td>
<td>(The Major/Minor that this course appears as)</td>
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<tr>
<td>CHEM2341</td>
<td>Inorganic chemistry I</td>
<td>6 Pass in CHEM1042, and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2013-14 or before); Pass in CHEM1042, and Pass in CHEM1043, or already enrolled in this course; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)</td>
<td>Y Y</td>
<td>1, 2</td>
<td>Dec, May</td>
<td>120</td>
<td>Prof V W W Yim (1st sem); Dr H Y Au Yeung (2nd sem), Chemistry</td>
<td>Major in Chemistry (2016,2015,2014,2013,2012)</td>
<td>Minor in Chemistry (2016,2015,2014,2013,2012)</td>
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<tr>
<td>CHEM2441</td>
<td>Organic chemistry I</td>
<td>6 Pass in CHEM1042, and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2013-14 or before); Pass in CHEM1042, and Pass in CHEM1043, or already enrolled in this course; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)</td>
<td>Y Y</td>
<td>1, 2</td>
<td>Dec, May</td>
<td>200</td>
<td>Dr X Y Li (1st sem); Prof P Chu (2nd sem), Chemistry</td>
<td>Major in Biochemistry (2016,2015,2014,2013,2012); Major in Chemistry (2016,2015,2014,2013,2012)</td>
<td>Minor in Chemistry (2016,2015,2014,2013,2012)</td>
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<tr>
<td>CHEM2541</td>
<td>Introductory physical chemistry</td>
<td>6 Pass in CHEM1042, and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2013-14 or before); Pass in CHEM1042 and CHEM1043; and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)</td>
<td>Y Y</td>
<td>1, 2</td>
<td>Dec, May</td>
<td>200</td>
<td>Dr J M Y Yuen (1st sem); Dr J Y Tang (2nd sem), Chemistry</td>
<td>Major in Chemistry (2016,2015,2014,2013,2012)</td>
<td>Major in Biochemistry (2014,2013,2012); Minor in Chemistry (2016,2015,2014,2013,2012)</td>
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<tr>
<td>CHEM3142</td>
<td>Chemical process industries and analysis</td>
<td>6 Pass in CHEM2041 or CHEM2341 or CHEM2441 or CHEM2541</td>
<td>Y Y</td>
<td>2</td>
<td>May</td>
<td>60</td>
<td>Prof G K Y Chan, Chemistry</td>
<td>Major in Chemistry (2014,2013,2012); Minor in Chemistry (2016,2015,2014,2013,2012)</td>
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<td>Course Code</td>
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<td>Available in</td>
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<tr>
<td>CHEM3143</td>
<td>Introduction to materials chemistry</td>
<td>6</td>
<td>Pass in CHEM2041 or CHEM2341 or CHEM3341 or CHEM2442 or CHEM2541</td>
<td>Y Y 1 Dec</td>
<td>100</td>
<td>Prof W K Chan, Chemistry</td>
<td>Major in Chemistry (2014,2013,2012); Minor in Chemistry (2016,2015,2014,2013,2012)</td>
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<tr>
<td>CHEM3243</td>
<td>Introductory instrumental chemical analysis</td>
<td>6</td>
<td>Pass in CHEM2041 or CHEM2241; and Not for students who have passed CHEM3241, or have already enrolled in this course.</td>
<td>Y Y 2 May</td>
<td>65</td>
<td>Dr X LL, Chemistry</td>
<td>Major in Chemistry (2014,2013,2012); Minor in Chemistry (2016,2015,2014,2013,2012)</td>
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<tr>
<td>CHEM3244</td>
<td>Analytical techniques for pharmacy students</td>
<td>6</td>
<td>Pass in BPHM2136 (This course is for BPharm students only)</td>
<td>Y Y 2 May</td>
<td>35</td>
<td>Dr X LL, Chemistry</td>
<td>Major in Chemistry (2014,2013,2012); Minor in Chemistry (2016,2015,2014,2013,2012)</td>
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<tr>
<td>CHEM3443</td>
<td>Organic chemistry laboratory</td>
<td>6</td>
<td>Pass in CHEM2241; 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 2014-15 (for students admitted in 2014-15 or before) Pass in CHEM2241 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)</td>
<td>Y Y 1, 2 Dec, May</td>
<td>80</td>
<td>Dr A M Y Yuen, Chemistry</td>
<td>Major in Chemistry (2016,2015)</td>
<td>Major in Chemistry (2014,2013,2012); Minor in Chemistry (2016,2015,2014,2013,2012)</td>
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<tr>
<td>CHEM3999</td>
<td>Directed studies in chemistry</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major including a pass in CHEM2341 or CHEM2441 or CHEM2541 or CHEM3146. This capstone course is for Chemistry Major 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.</td>
<td>Y Y 1, 2 No exam</td>
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TBC = To be confirmed
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<th>Available in</th>
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<td>CHEM4910</td>
<td>Chemistry literacy and research</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major including CHEM3241, and CHEM3341, and CHEM3441, and CHEM3541. This capstone course is for Chemistry Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y</td>
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<td>No exam</td>
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<td>Dr X Li, Chemistry</td>
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<tr>
<td>CHEM4911</td>
<td>Capstone experience for chemistry undergraduates: HKUtopia</td>
<td>6</td>
<td>Students are expected to have satisfactorily completed all introductory chemistry disciplinary core courses and at least 24 credits of advanced level disciplinary core/elective chemistry courses in the Chemistry Major. Students who are interested in taking the course should contact the course coordinator for application in April - May. Late application may not be considered. This capstone course is for Chemistry Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y</td>
<td>Y</td>
<td>5</td>
<td>No exam</td>
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<td>Dr A P L Tong, Chemistry</td>
</tr>
<tr>
<td>CHEM4966</td>
<td>Chemistry internship</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major. 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>
<td>Y</td>
<td>1, 2, S</td>
<td>No exam</td>
<td>---</td>
<td>Dr H Y Au-Yeung, Chemistry</td>
</tr>
<tr>
<td>CHEM4999</td>
<td>Chemistry project</td>
<td>12</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective chemistry courses (CHEM3XXX or CHEM4XXX) in the Chemistry Major including CHEM3241, and CHEM3341, and CHEM3441, and CHEM3541. This capstone course is for Chemistry Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y</td>
<td>Y</td>
<td>0</td>
<td>No exam</td>
<td>---</td>
<td>Dr J Y Tang, Chemistry</td>
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**Department of Chemistry (Cont'd)**

**School of Chinese**

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<th>Course Code</th>
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<th>Pre-requisite</th>
<th>Available in</th>
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<th>Quota</th>
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<tr>
<td>CSCI001</td>
<td>Practical Chinese for science students</td>
<td>6</td>
<td>NIL</td>
<td>Y</td>
<td>Y</td>
<td>1, 2</td>
<td>Dec, May</td>
<td>---</td>
<td>Mr K W Wong, Chemistry</td>
</tr>
<tr>
<td>Course Code</td>
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<tr>
<td>EASC1404</td>
<td>Early tills on earth</td>
<td></td>
<td>6</td>
<td>N N</td>
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<td>50</td>
<td>TBC</td>
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<tr>
<td>EASC2409</td>
<td>Regional field studies</td>
<td></td>
<td>6</td>
<td>Pass in EASC1401 or EASC1402; and consent of course coordinator</td>
<td>Y Y</td>
<td>1 No exam</td>
<td>40</td>
<td></td>
<td>Dr J R Ali, Earth Sciences</td>
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<tr>
<td>Course Code</td>
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<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in 2016-2017</td>
<td>Semester offered in 2016-2017</td>
<td>Exam held in 2016-2017</td>
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<td>Pre-requisite</td>
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<td>Course Coordinator</td>
<td>Major / Minor (The Major/Minor that this course appears as)</td>
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Department of Earth Sciences (Cont'd)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
<th>Pre-requisite</th>
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<tbody>
<tr>
<td>EASC4999</td>
<td>Earth sciences project</td>
<td>12</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>
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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 core/elective courses in Environmental Science Major. Cumulative GPA of 2.5 or above in Environmental Science Major. This capstone course is for Environmental Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
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</table>
## List of BSc Courses

### Department of Earth Sciences (Cont'd)

<table>
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<th>Course Code</th>
<th>Title</th>
<th>Credit</th>
<th>Available in 2016-2017</th>
<th>Semester offered in 2016-2017</th>
<th>Exam held in 2016-2017</th>
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<th>Major / Minor</th>
<th>(The Major/Minor that this course appears as)</th>
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<tr>
<td>ENVS4966</td>
<td>Environmental science internship</td>
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<tr>
<td>ENVS4999</td>
<td>Environmental science project</td>
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### Department of Mathematics

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<th>Credit</th>
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<th>Major / Minor</th>
<th>(The Major/Minor that this course appears as)</th>
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<tbody>
<tr>
<td>MATH1009</td>
<td>Basic mathematics for business and economics</td>
<td>6</td>
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<tr>
<td>MATH1011</td>
<td>University mathematics I</td>
<td>6</td>
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<tr>
<td>MATH1641</td>
<td>Mathematical laboratory and modeling</td>
<td>6</td>
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<tr>
<td>MATH1821</td>
<td>Mathematical methods for actuarial science I</td>
<td>6</td>
<td>Level 4 or above in HKDSE Mathematics plus Module 1, or Level 4 or above in HKDSE Mathematics plus Module 2, or equivalent,</td>
<td>Pass in MATH1013 or (MATH1851 and MATH1853), or have already enrolled in these courses. For BSc(ActuarSc) students only.</td>
<td>Dec</td>
<td>20</td>
<td>TBC, Mathematics</td>
<td>Minor in Actuarial Science (2016,2015,2014,2013,2012)</td>
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<td>Course Code</td>
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<td>Available in</td>
<td>Semester offered in 2016-2017</td>
<td>Exam held in 2016-2017</td>
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<tr>
<td>MATH1851</td>
<td>Calculus and ordinary differential equations</td>
<td>6</td>
<td>Pass in MATH1011 or Module 1, or Module 2 of HKDSE Mathematics or equivalent, or</td>
<td>Y Y 1, 2 Dec, May</td>
<td>640</td>
<td>Prof K M Tsang (1st sem); Dr Y K Lau (2nd sem), Mathematics</td>
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<tr>
<td>MATH1853</td>
<td>Linear algebra, probability and statistics</td>
<td>6</td>
<td>(This course is exclusively for Engneering students.)</td>
<td>Y Y 1, 2 Dec, May</td>
<td>640</td>
<td>Prof W K Ching (1st sem); Dr G Han (2nd sem), Mathematics</td>
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<tr>
<td>MATH2012</td>
<td>Fundamental concepts of mathematics</td>
<td>6</td>
<td>Pass in MATH1013 or MATH1821 or MATH1853</td>
<td>Y Y 1, 2 Dec, May</td>
<td>—</td>
<td>Prof J J Lu (1st sem); Dr Y M Chan (2nd sem), Mathematics Major in Mathematics (2016,2015,2014,2013,2012)</td>
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<tr>
<td>MATH2102</td>
<td>Linear algebra II</td>
<td>6</td>
<td>Pass in MATH2101 or (MATH1821 and MATH2822)</td>
<td>Y Y 2 May</td>
<td>—</td>
<td>Prof W Zhang, Mathematics Major in Mathematics (2016,2015,2014,2013,2012)</td>
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<tr>
<td>MATH2241</td>
<td>Introduction to mathematical analysis</td>
<td>6</td>
<td>Pass in MATH1013 or (MATH1851 and MATH1853) or MATH2822. Students are strongly recommended to have taken MATH2D2 if they wish to take this course.</td>
<td>Y Y 1, 2 Dec, May</td>
<td>—</td>
<td>Dr B Kane (1st sem); Prof N Mok (2nd sem), Mathematics Major in Mathematics (2016,2015,2014,2013,2012)</td>
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<td>Course Code</td>
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<tr>
<td>MATH3901</td>
<td>Operations research I</td>
<td>6</td>
<td>Pass in MATH2014 or MATH2101 or MATH2102</td>
<td>Y Y</td>
<td>2 May</td>
<td>Dr Z Qu, Mathematics</td>
<td>Major in Operations Research &amp; Mathematical Programming (2016,2015,2014,2013)</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in</td>
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<td>Major / Minor (The Major/Minor that this course appears as)</td>
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<tr>
<td>MATH3999</td>
<td>Directed studies in mathematics</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX or MATH7XXX) in the Mathematics, and Mathematics/Physics Majors, in addition to a pass in MATH2101, MATH2102, MATH2211 and MATH2421. Subject to approval by the Department. This capstone course is for Mathematics, and Mathematics/Physics 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>1, 2</td>
<td>No exam</td>
<td>---</td>
<td>Prof W K Ching, Mathematics</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 MATH3405.</td>
<td>Y</td>
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<td>Dec</td>
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<td>Dr J Fullwood, Mathematics</td>
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<tr>
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<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in 2016-2017</td>
<td>Exam held in 2016-2017</td>
<td>Quota</td>
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<td>Major / Minor (The Major/Minor that this course appears as)</td>
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<tr>
<td>MATH4910</td>
<td>Senior mathematics seminar</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics, and Mathematics/Physics Majors including MATH3301, MATH3401, and MATH3403. Subject to approval by the Department. This capstone course is for Mathematics, and Mathematics/Physics Majors students only. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td></td>
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<td>Y Y 2 May</td>
<td>12</td>
<td>Prof T W Ng, Mathematics Minor in Mathematics (2016,2015,2014,2013,2012) Major in Mathematics (2016,2015,2014,2013,2012); Major in Mathematics/Physics (2016,2015,2014,2013,2012)</td>
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<tr>
<td>MATH4911</td>
<td>Mathematics capstone project</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics, and Mathematics/Physics Majors. Subject to approval by the Department. This capstone course is for Mathematics, 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.)</td>
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<td>Y Y 2 No exam</td>
<td>---</td>
<td>Dr S P Yung, Mathematics Minor in Mathematics (2016,2015,2014,2013,2012) Major in Mathematics (2016,2015,2014,2013,2012); Major in Mathematics/Physics (2016,2015,2014,2013,2012)</td>
</tr>
<tr>
<td>MATH4966</td>
<td>Mathematics internship</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics, and Mathematics/Physics Majors. This capstone course is for Mathematics, and Mathematics/Physics Majors 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></td>
<td>Y Y 1, 2, S No exam</td>
<td>---</td>
<td>Prof T W Ng, Mathematics Minor in Mathematics (2016,2015,2014,2013,2012) Major in Mathematics (2016,2015,2014,2013,2012); Major in Mathematics/Physics (2016,2015,2014,2013,2012)</td>
</tr>
<tr>
<td>MATH4999</td>
<td>Mathematics project</td>
<td>12</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics, and Mathematics/Physics Majors including MATH3301, MATH3401, and MATH3403. Subject to approval by the Department. This capstone course is for Mathematics, and Mathematics/Physics Majors 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>Y Y 0 No exam</td>
<td>---</td>
<td>Prof V K Ching, Mathematics Minor in Mathematics (2016,2015,2014,2013,2012) Major in Mathematics (2016,2015,2014,2013,2012); Major in Mathematics/Physics (2016,2015,2014,2013,2012)</td>
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<tr>
<td>Course Code</td>
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<td>Pre-requisite</td>
<td>Available in</td>
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<td>Exam held in 2016-2017</td>
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<tr>
<td>MATH7504</td>
<td>Geometric topology</td>
<td>6</td>
<td>Pass in MATH3301 and MATH3401</td>
<td>N</td>
<td>N</td>
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<td>TBC = To be confirmed; Disciplinary Core Course; Disciplinary Elective; Capstone - Disciplinary Core Course; Capstone - Disciplinary Elective</td>
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<tr>
<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 (This course is exclusive for Engineering students.)</td>
<td>Y</td>
<td>Y</td>
<td>1, 2 Dec, May</td>
<td>---</td>
<td>Prof M H Xie, Physics</td>
<td>Major in Mathematics (2016,2015,2014,2013,2012); Major in Mathematics/Physics (2016,2015,2014,2013,2012); Minor in Mathematics (2016,2015,2014,2013,2012)</td>
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<tr>
<td>PHYS1150</td>
<td>Problem solving in physics</td>
<td>6</td>
<td>Level 3 or above in HKDSE Physics or equivalent; Students without Level 3 or above in HKDSE Physics but having a pass in PHYS1240 may be allowed to take this course.</td>
<td>Y</td>
<td>Y</td>
<td>2 May</td>
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<td>Dr S Z Zhang, Physics</td>
<td>Major in Physics (2016,2015,2014,2013,2012)</td>
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<td>Pre-requisite</td>
<td>Available in 2016-2017</td>
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<tr>
<td>PHYS2260</td>
<td>Atomic and nuclear physics</td>
<td>6</td>
<td>Pass in PHYS2265</td>
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<td>Dr S Z Zhang, Physics</td>
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</table>
## Department of Physics (Cont’d)

### PHYS3650 Observational astronomy
- **Credit**: 6
- **Prerequisite**: Pass in PHYS1650 and (PHYS2250 or PHYS2265)
- **Semester Offered**: 2016-2017
- **Exam Held in** 2016-2017
- **Quota**: Y Y 1
- **Available in**: Dec
- **Course Coordinator**: Dr J J L Lim, Physics

### PHYS3651 The physical universe
- **Credit**: 6
- **Prerequisite**: Pass in PHYS1650 and (PHYS2250 or PHYS2265)
- **Semester Offered**: 2016-2017
- **Exam Held in** 2016-2017
- **Quota**: Y Y 1
- **Available in**: Dec
- **Course Coordinator**: Dr S C Y Ng, Physics

### PHYS3652 Principles of astronomy
- **Credit**: 6
- **Prerequisite**: Pass in PHYS1650 and (PHYS2250 or PHYS2265)
- **Semester Offered**: 2016-2017
- **Exam Held in** 2016-2017
- **Quota**: Y Y 2
- **Available in**: May
- **Course Coordinator**: Dr J J L Lim, Physics

### PHYS3750 Laser and spectroscopy
- **Credit**: 6
- **Prerequisite**: Pass in PHYS3551, or already enrolled in this course.
- **Semester Offered**: N Y
- **Exam Held in** ---
- **Quota**: ---
- **Available in**: ---
- **Course Coordinator**: Prof S J Xu, Physics

### PHYS3751 Physics of nanomaterials
- **Credit**: 6
- **Prerequisite**: Pass in PHYS3351, and Pass in PHYS3551, or already enrolled in this course.
- **Semester Offered**: N N
- **Exam Held in** ---
- **Quota**: ---
- **Available in**: ---
- **Course Coordinator**: TBC, Physics

### PHYS3850 Waves and optics
- **Credit**: 6
- **Prerequisite**: Pass in PHYS2255 and PHYS2260
- **Semester Offered**: Y Y
- **Exam Held in** 1
- **Quota**: Dec
- **Available in**: ---
- **Course Coordinator**: Prof S J Xu, Physics

### PHYS3851 Atomic and nuclear physics
- **Credit**: 6
- **Prerequisite**: Pass in PHYS3351
- **Semester Offered**: Y Y
- **Exam Held in** 2
- **Quota**: May
- **Available in**: ---
- **Course Coordinator**: Dr J H C Lee, Physics

### PHYS3999 Directed studies in physics
- **Credit**: 6
- **Prerequisite**: Pass in at least 24 credits of advanced level (3XXX level or above) disciplinary core/elective courses of the Physics Major, Mathematics/Physics, Major or Astronomy Major curriculum.
- **Semester Offered**: This course is for Astronomy, Mathematics/Physics, and Physics Majors only.
- **Exam Held in** ---
- **Quota**: No exam
- **Available in**: 1, 2, 5
- **Course Coordinator**: Prof J Wang, Physics
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<th>Title</th>
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<th>Pre-requisite</th>
<th>Available in Semester offered in 2016-2017</th>
<th>Exam held in 2016-2017</th>
<th>Quota</th>
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<td>Pre-requisite</td>
<td>Available in 2016-2017</td>
<td>Semester offered in 2016-2017</td>
<td>Exam held in 2016-2017</td>
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<td>Exam held in 2016-2017</td>
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<tr>
<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, Mathematics/Physics Major or Astronomy Major curriculum. This capstone course is for Astronomy, Mathematics/Physics, and Physics Majors 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 ---</td>
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<td>Course Code</td>
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<td>Exam held in</td>
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<tr>
<td>ENVS3006</td>
<td>Environmental radiation</td>
<td>6</td>
<td>Pass in CHEM2041 or ENVS2001 or ENVS2002 or PHYS2265</td>
<td>N N --- --- ---</td>
<td>2016-2017 2016-2017 2017-2018</td>
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<td>---</td>
<td>Dr J K C Leung, Physics</td>
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<tr>
<td>ENVS3010</td>
<td>Sustainable energy and environment</td>
<td>6</td>
<td>Pass in CHEM2041 or ENVS2001 or ENVS2002 or PHYS2260</td>
<td>Y Y 2 May ---</td>
<td>2016-2017 2016-2017 2017-2018</td>
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<td>Prof A B Djurisic, Physics</td>
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<tr>
<td>SCNC1111</td>
<td>Scientific method and reasoning</td>
<td>6</td>
<td>NIL (This course is compulsory for all students taking a Science major offered by the Faculty of Science. Students should take this course in their first year.)</td>
<td>Y Y 1, 2 Dec, May ---</td>
<td>2016-2017 2016-2017 2017-2018</td>
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<td>Dr K F Lam, Statistics &amp; Actuarial Science</td>
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<tr>
<td>Course Code</td>
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<td>Pre-requisite</td>
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<tr>
<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
<td>6</td>
<td>NIL (This course is compulsory for all students taking a Science major offered by the Faculty of Science. Students should take this course in their first year.)</td>
<td>Y Y 1, 2 Dec, May</td>
<td>32</td>
<td>Dr J C S Pun, Biological Sciences</td>
<td>TBC = To be confirmed</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>SCNC1113</td>
<td>The big history of our planet: a scientific perspective on everything that has ever happened</td>
<td>6</td>
<td>Level 3 or above in at least one science subject at the pre-university level (HKDSE Physics, Chemistry, Biology, Combined/Integrated Science or equivalent) This course is not offered to students in the 6901 BSc or 6119 BEd&amp;BSc programmes.</td>
<td>Y Y 1 No exam</td>
<td>50</td>
<td>Dr W M Y Cheung, Faculty</td>
<td></td>
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<tr>
<td>SCNC2121</td>
<td>Sustainable food production</td>
<td>6</td>
<td>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.</td>
<td>Y Y 5 No exam</td>
<td>32</td>
<td>Dr H S El-Nezami, Biological Sciences</td>
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<tr>
<td>SCNC2122</td>
<td>Marine life science: a North East Pacific perspective</td>
<td>6</td>
<td>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.</td>
<td>Y Y 5 Summer</td>
<td>32</td>
<td>Dr T Vengatesen, Biological Sciences</td>
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<tr>
<td>SCNC3111</td>
<td>Frontiers of science honours seminar course</td>
<td>6</td>
<td>Pass in SCNC1111, SCNC1112 and a level 2 science course. Students who participated or will participate in ORF/SRF must take this course.</td>
<td>Y Y 2 No exam</td>
<td>120</td>
<td>Dr R K W Lui, Faculty</td>
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<tr>
<td>STAT1600</td>
<td>Statistics: ideas and concepts</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1, 2 Dec, May</td>
<td>32</td>
<td>Dr Y K Chung, Statistics &amp; Actuarial Science</td>
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### Department of Statistics & Actuarial Science

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<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
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<tbody>
<tr>
<td>STAT1601</td>
<td>Elementary statistical methods</td>
<td>6</td>
<td>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</td>
<td>Y Y 2 May</td>
<td>—</td>
<td>Dr R W L Wong, Statistics &amp; Actuarial Science</td>
<td>Major in Environmental Science (2012)</td>
<td>Major in Environmental Science (2016,2015,2014,2013); Minor in Risk Management (2016,2015,2014,2013,2012); Minor in Statistics (2016,2015,2014,2013,2012)</td>
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<tr>
<td>STAT1603</td>
<td>Introductory statistics</td>
<td>6</td>
<td>(Level 2 or above in HKDSE Mathematics Extended Module 1 or 2 or equivalent) or (Pass in MATH1009 Basic Mathematics for business and economics or MATH1011 or MATH1013, or already enrolled in these courses); and Not for students who have passed or already enrolled in any of these courses: STAT1601, STAT1602, STAT2601, ECON1280</td>
<td>Y Y 1, 2 Dec, May</td>
<td>—</td>
<td>Dr E K F Lam, Statistics &amp; Actuarial Science</td>
<td>Major in Environmental Science (2012)</td>
<td>Major in Environmental Science (2016,2015,2014,2013,2012); Minor in Risk Management (2016,2015,2014,2013,2012); Minor in Statistics (2016,2015,2014,2013,2012)</td>
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<tr>
<td>STAT2601</td>
<td>Probability and statistics: foundations of actuarial science</td>
<td>6</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, STAT2601, STAT1603</td>
<td>Y Y 2 May</td>
<td>—</td>
<td>Prof J J P Yau, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</td>
<td>Minor in Actuarial Studies (2016,2015,2014,2013,2012)</td>
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<tr>
<td>STAT2602</td>
<td>Financial mathematics</td>
<td>6</td>
<td>Pass in STAT2901, or already enrolled in this course; and Not for students who have passed in STAT3615, or already enrolled in this course.</td>
<td>Y Y 2 May</td>
<td>—</td>
<td>Dr K C Cheung, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</td>
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<tr>
<td>STAT3606</td>
<td>Business logistics</td>
<td>6</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2601; and Not for students who have passed MATH3901, or have already enrolled in this course.</td>
<td>Y Y 1 Dec</td>
<td>---</td>
<td>Ms O T K Choi, Statistics &amp; Actuarial Science</td>
<td>Major in Statistics (2016,2015,2014,2013,2012); Minor in Statistics (2016,2015,2014,2013,2012)</td>
<td>Major in Risk Management (2016,2015,2014,2013,2012); Minor in Statistics (2016,2015,2014,2013,2012)</td>
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<tr>
<td>STAT3609</td>
<td>The statistics of investment risk</td>
<td>6</td>
<td>Pass in STAT2602, or already enrolled in this course, or Pass in (STAT1603 and any University level 2 course) or STAT3611 or STAT3614; and Not for students who have passed in FINA2020, or have already enrolled in this course; and Not for BSc(Actuarial Science) students</td>
<td>Y Y 1 Dec</td>
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<td>Dr K P Wai, Statistics &amp; Actuarial Science</td>
<td>Major in Risk Management (2016,2015,2014,2013,2012)</td>
<td>Major in Risk Management (2016,2015,2014,2013,2012)</td>
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<tr>
<td>STAT3610</td>
<td>Risk management and insurance</td>
<td>6</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2601; (Not available to Actuarial Science students)</td>
<td>Y Y 2 May</td>
<td>---</td>
<td>Dr R W L Wong, Statistics &amp; Actuarial Science</td>
<td>Major in Risk Management (2016,2015,2014,2013,2012); Minor in Risk Management (2016,2015,2014,2013,2012)</td>
<td>Major in Risk Management (2016,2015,2014,2013,2012); Minor in Risk Management (2016,2015,2014,2013,2012)</td>
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<tr>
<td>STAT3611</td>
<td>Computer-aided data analysis</td>
<td>6</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1603 and any University level 2 course); and Not for students who have passed in or have already enrolled in any of these courses: STAT2601, STAT2901, STAT3616</td>
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<tr>
<td>STAT3612</td>
<td>Data mining</td>
<td>6</td>
<td>Pass in STAT2602 or (STAT1603 and any University level 2 course) or STAT3602 Co-requisites: STAT3600</td>
<td>Y Y 1, 2 No exam</td>
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<td>STAT3613</td>
<td>Marketing engineering</td>
<td>6</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT2601 or (STAT1603 and any University level 2 course) or STAT2901</td>
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<td>STAT3614</td>
<td>Business forecasting</td>
<td>6</td>
<td>Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT2601 and any University level 2 course) or (STAT1603 and any University level 2 course) or STAT2901</td>
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<td>STAT3615</td>
<td>Practical mathematics for investment</td>
<td>6</td>
<td>Pass in (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1603 and any University level 2 course) or STAT2901; and Not for students who have passed in or have already enrolled in any of these courses: STAT2601, STAT2901, STAT3607, STAT4601, ECON2820</td>
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<td>STAT3616</td>
<td>Advanced SAS programming</td>
<td>6</td>
<td>Pass in STAT2601 or STAT2901 (Students are strongly recommended to take STAT2603 prior to taking this course.)</td>
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<td>STAT3617</td>
<td>Sample survey methods</td>
<td>6</td>
<td>Pass or already enrolled in BIOL2102, or (ECON1280 and any University level 2 course), or (STAT1601 and any University level 2 course), or (STAT1602 and any University level 2 course), or STAT2601, or (STAT1603 and any University level 2 course), or STAT2901.</td>
<td>Y Y 2 May</td>
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<td>STAT3618</td>
<td>Derivatives and risk management</td>
<td>6</td>
<td>Pass in STAT3615, and Not for students who have passed in STAT3910, or have already enrolled in this course; and Not for students who have passed in STAT3905, or have already enrolled in this course; and Not for students who have passed in FINA2322, or have already enrolled in this course; and Not for BSc(Actuarial Science) students.</td>
<td>Y Y 1 Dec</td>
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<tr>
<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 Y 1, 2 No exam 30</td>
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<td>Major in Decision Analytics (2016,2015,2014,2013,2012); Major in Risk Management (2016,2015,2014,2013,2012); Major in Statistics (2016,2015,2014,2013,2012)</td>
<td>TBC = To be confirmed</td>
<td>Statistics &amp; Actuarial Science</td>
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<tr>
<td>STAT3901</td>
<td>Life contingencies</td>
<td>6</td>
<td>(Pass in STAT2602 and STAT3615) or (Pass in STAT2602 and (Pass in STAT3902 or already enrolled in this course)) or (Pass in STAT2602 and STAT2902)</td>
<td>Y Y 1 Dec ---</td>
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<td>Major in Actuarial Studies (2016,2015,2014,2013,2012)</td>
<td>TBC = To be confirmed</td>
<td>Statistics &amp; Actuarial Science</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 already enrolled in STAT2602, or already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>Y Y 1 Dec ---</td>
<td>---</td>
<td>Major in Actuarial Studies (2016,2015,2014,2013,2012)</td>
<td>TBC = To be confirmed</td>
<td>Statistics &amp; Actuarial Science</td>
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<td>STAT3903</td>
<td>Stochastic models</td>
<td>6</td>
<td>Pass in STAT2901; and Not for students who have already enrolled 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.</td>
<td>Y Y 2 May ---</td>
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<td>Major in Actuarial Studies (2016,2015,2014,2013,2012)</td>
<td>TBC = To be confirmed</td>
<td>Statistics &amp; Actuarial Science</td>
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<td>STAT3904</td>
<td>Corporate finance for actuarial science</td>
<td>6</td>
<td>(Pass in ACCT1101 and STAT2902) or (Pass in STAT3610 and STAT3615) or (Pass in STAT2902 and (Pass in STAT3902 or already enrolled in this course)) or (Pass in STAT2602 and STAT2902)</td>
<td>Y Y 2 May ---</td>
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<td>Major in Actuarial Studies (2016,2015,2014,2013,2012)</td>
<td>TBC = To be confirmed</td>
<td>Statistics &amp; Actuarial Science</td>
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<td>STAT3905</td>
<td>Introduction to financial derivatives</td>
<td>6</td>
<td>Pass in STAT2902; and Not for students who have already enrolled in STAT3618, or have already enrolled in this course; and Not for students who have passed in FINA2322, or have already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>Y Y 1 Dec ---</td>
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<td>Major in Actuarial Studies (2016,2015,2014,2013,2012)</td>
<td>TBC = To be confirmed</td>
<td>Statistics &amp; Actuarial Science</td>
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<td>STAT3906</td>
<td>Risk theory</td>
<td>6</td>
<td>Pass in STAT3903, or already enrolled in this course; or Pass in MATH3603 or STAT3603</td>
<td>Y Y 2 May ---</td>
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<td>Major in Actuarial Studies (2016,2015,2014,2013,2012)</td>
<td>TBC = To be confirmed</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 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.</td>
<td>Y Y 2 May</td>
<td>---</td>
<td>Dr G Li, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</td>
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<tr>
<td>STAT3909</td>
<td>Advanced life contingencies</td>
<td>6</td>
<td>Pass in STAT3901, or already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>Y Y 2 May</td>
<td>---</td>
<td>Prof H L Yang, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</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 STAT3618, 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 1 Dec</td>
<td>---</td>
<td>Prof H L Yang, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012) Minor in Actuarial Studies (2016,2015,2014,2013,2012)</td>
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<tr>
<td>STAT3951</td>
<td>Advanced contingencies</td>
<td>6</td>
<td>Pass in STAT3909; and Pass in STAT3910, or already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>Y Y 1 Dec</td>
<td>---</td>
<td>Dr E C K Cheung, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</td>
<td></td>
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</tr>
<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 FINA2322, or have already enrolled in this course; and For BSc(Actuarial Science) students only.</td>
<td>N N ---</td>
<td>---</td>
<td>---</td>
<td>BSc in Actuarial Science (2012)</td>
<td></td>
<td></td>
<td></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>
<td>---</td>
<td>---</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</td>
<td></td>
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</tr>
<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in 2016-2017</td>
<td>Semester offered in 2016-2017</td>
<td>Exam held in 2016-2017</td>
<td>Quota</td>
<td>Course Coordinator</td>
<td>Major / Minor</td>
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<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 STAT3795, STAT4766, and STAT4799. 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</td>
<td>Prof W K Li, Statistics &amp; Actuarial Science</td>
<td>Major in Decision Analytics (2016,2015,2014,2013,2012); Major in Risk Management (2016,2015,2014,2013,2012); Major in Statistics (2016,2015,2014,2013,2012)</td>
<td></td>
<td></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 STAT3300, or already enrolled in this course; or Pass in STAT3909, or already enrolled in this course); and This capstone course is only for BSc(Actuarial Science) students, and is mutually exclusive with STAT4767 and STAT4798. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 1, 2</td>
<td>No exam</td>
<td>50</td>
<td>Prof W K Li, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in 2016-2017</td>
<td>Semester offered in 2016-2017</td>
<td>Exam held in 2016-2017</td>
<td>Quota</td>
<td>Course Coordinator</td>
<td>Major / Minor (The Major/Minor that this course appears as)</td>
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<td>----------------------------------------------------------------</td>
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<tr>
<td>STAT4767</td>
<td>Actuarial science internship</td>
<td>6</td>
<td>Pass in at least 24 credits of advanced level disciplinary core/elective courses in BSc(Actuarial Science) programme including STAT3901; and This capstone course is only for BSc(Actuarial Science) students; and is mutually exclusive with STAT4711. The earliest that a student is allowed to take this capstone course is their year 3 study.</td>
<td>Y Y 1, 2 No exam ---</td>
<td>TBC = To be confirmed</td>
<td>Disciplinary Core Course</td>
<td>Disciplinary Elective</td>
<td>Capstone - Disciplinary Core Course</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</td>
<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 Sciences) programme including STAT3902 and STAT3907; and Pass or already enrolled in at least one of the following courses: STAT3616, STAT3911, STAT4601, STAT4602; 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 Y 1, 2 No exam 50</td>
<td>Prof S M S Lee, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</td>
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<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: STAT3616, STAT3911, STAT4601, STAT4602; and Not for students who have already enrolled in STAT3759 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 Y 0 No exam 30</td>
<td>Prof S M S Lee, Statistics &amp; Actuarial Science</td>
<td>BSc in Actuarial Science (2016,2015,2014,2013,2012)</td>
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<td>Course Code</td>
<td>Title</td>
<td>Credit</td>
<td>Pre-requisite</td>
<td>Available in</td>
<td>Semester offered in 2016-2017</td>
<td>Exam held in 2016-2017</td>
<td>Quota</td>
<td>Course Coordinator</td>
<td>Major / Minor (The Major/Minor that this course appears as)</td>
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<tr>
<td>CCCH9030</td>
<td>Science and Technology: Lessons from China</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>Dec</td>
<td></td>
<td>120</td>
<td>Prof L S Chan, Earth Sciences</td>
<td>Disciplinary Core Course</td>
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</tr>
<tr>
<td>CCGL9016</td>
<td>Feeding the World</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>No exam</td>
<td></td>
<td>132</td>
<td>Prof H Corke, Biological Sciences</td>
<td>Disciplinary Core Course</td>
<td></td>
</tr>
<tr>
<td>CCGL9017</td>
<td>Food: Technology, Trade and Culture</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>Dec</td>
<td></td>
<td>120</td>
<td>Prof H Corke, Biological Sciences</td>
<td>Disciplinary Core Course</td>
<td></td>
</tr>
<tr>
<td>CCGL9033</td>
<td>Weapons of Mass Destruction: Science, Proliferation and Terrorism</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr K H Lemke, Earth Sciences</td>
<td>Disciplinary Core Course</td>
<td></td>
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<tr>
<td>CCGL9043</td>
<td>Obesity: Beyond a Health Issue</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr E T S Li, Biological Sciences</td>
<td>Disciplinary Core Course</td>
<td></td>
</tr>
<tr>
<td>CCST9012</td>
<td>Our Place in the Universe</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>May</td>
<td></td>
<td>120</td>
<td>Prof S Kock, Earth Sciences</td>
<td>Disciplinary Core Course</td>
<td></td>
</tr>
<tr>
<td>CCST9013</td>
<td>Our Living Environment</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr S C Chang, Earth Sciences</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9014</td>
<td>Science and Music</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
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<td>120</td>
<td>Prof H F Chau, Physics</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9017</td>
<td>Hidden Order in Daily Life: A Mathematical Perspective</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Prof T W Ng, Mathematics</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9018</td>
<td>Origin and Evolution of Life</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr Z H Liu, Earth Sciences</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9019</td>
<td>Understanding Climate Change</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr Z H Liu, Earth Sciences</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9021</td>
<td>Hong Kong: Our Marine Heritage</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Prof K M Y Leung, Biological Sciences</td>
<td>Disciplinary Core Course</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 Y 1</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Prof H F Chau, Physics</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9023</td>
<td>The Oceans: Science and Society</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr J A King, Earth Sciences</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9026</td>
<td>Scientific Revolutions: Their Continuing Impact on Our World and Society</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Prof Q A Parker, Physics</td>
<td>Disciplinary Core Course</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 Y 2</td>
<td>No exam</td>
<td></td>
<td>144</td>
<td>Prof D L Phillips, Chemistry</td>
<td>Disciplinary Core Course</td>
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</tr>
<tr>
<td>CCST9036</td>
<td>Material World: Past, Present, and Future</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Prof W K Chan, Chemistry</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9037</td>
<td>Mathematics: A Cultural Heritage</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr B R Kane, Mathematics</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9038</td>
<td>Science and Science Fiction</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Prof A B Ojistic, Physics</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9039</td>
<td>Statistics and Our Society</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>May</td>
<td></td>
<td>120</td>
<td>Dr K C Cheung, Statistics &amp; Actuarial Science</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9043</td>
<td>Time's Arrow</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>May</td>
<td></td>
<td>120</td>
<td>Dr Y L Li, Earth Sciences</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9045</td>
<td>The Science and Lore of Culinary Culture</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr A M Y Yuen, Chemistry</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9046</td>
<td>The Science of Mind-body-health Relationship</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>Dec</td>
<td></td>
<td>120</td>
<td>Dr G W Porter, Faculty</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9048</td>
<td>Simplifying Complexity</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 1</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr T C Bonebrake, Biological Sciences</td>
<td>Disciplinary Core Course</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 Y 2</td>
<td>No exam</td>
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<td>120</td>
<td>Prof S Xu, Physics</td>
<td>Disciplinary Core Course</td>
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<tr>
<td>CCST9052</td>
<td>Coffee, Cigarettes, and Alcohol</td>
<td>6</td>
<td>NIL</td>
<td>Y Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr G W Porter, Faculty</td>
<td>Disciplinary Core Course</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 Y 5</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr D M Baker, Biological Sciences</td>
<td>Disciplinary Core Course</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 Y 2</td>
<td>No exam</td>
<td></td>
<td>120</td>
<td>Dr F C C Ling, Physics</td>
<td>Disciplinary Core Course</td>
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</table>
Equivalency of HKDSE and other qualifications
### Table of Equivalence between HKDSE and Other Qualifications

<table>
<thead>
<tr>
<th>HKDSE</th>
<th>Grade</th>
<th>Equivalent Qualification to HKDSE</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>IB</td>
</tr>
<tr>
<td>Biology</td>
<td>3 or above</td>
<td>Biology (SL/HL)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>3 or above</td>
<td>Chemistry (SL/HL)</td>
</tr>
<tr>
<td>Physics</td>
<td>3 or above</td>
<td>Physics (SL/HL)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>2 or above</td>
<td>Mathematics (SL)/Mathematical Studies (SL)</td>
</tr>
<tr>
<td>Mathematics + (M1 or M2)</td>
<td>2 or above</td>
<td>Mathematics (HL)/Mathematical Studies (HL)</td>
</tr>
</tbody>
</table>

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

**Remarks:**

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

*For other non-science students admitted through non-JUPAS scheme, they are still required to obtain the written approval from the Course Selection Adviser of the course offering department 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.*
Science Majors in 2016-17
SECTION VI  Science Majors on offer in 2016/17

Majors offered by Science Faculty

Majors (16)
Astronomy
Biochemistry
Biological Sciences
Chemistry
Decision Analytics
Earth System Science
Ecology & Biodiversity
Environmental Science
Food & Nutritional Science
Geology
Mathematics
Mathematics/Physics
Molecular Biology & Biotechnology
Physics
Risk Management
Statistics
Major Title: Major in Astronomy
Offered to students: admitted to Year 1 in 2016

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

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

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

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

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

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

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

Impermissible Combinations:
Minor in Astronomy

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

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

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

2. Advanced level courses (42 credits)

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

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

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

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

List B
PHYS3150 Theoretical physics (6)
PHYS3350 Classical mechanics (6)
PHYS3351 Quantum mechanics (6)
PHYS3450 Electromagnetism (6)
PHYS3550 Statistical mechanics & thermodynamics (6)
PHYS3551 Introductory solid state physics (6)
PHYS3750 Laser and spectroscopy (6)
PHYS3751 Physics of nanomaterials (6)
PHYS3850 Waves and optics (6)
PHYS3851 Atomic and nuclear physics (6)
PHYS4150 Computational physics (6)
3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
- PHYS3999 Directed studies in physics (6)
- PHYS4966 Physics internship (6)
- PHYS4999 Physics project (12)

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

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

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

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

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

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

2. Advanced level courses (42 credits)
   **Disciplinary Core Courses (18 credits)**
   - PHYS1250: Fundamental physics (6)
   - PHYS1650: Nature of the universe (6)
   - EASC2408: Planetary geology (6)
   - PHYS2250: Introductory mechanics (6)
   - PHYS2255: Introductory electricity and magnetism (6)
   - PHYS2265: Modern physics (6)

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

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

   **List B**
   - PHYS3150: Theoretical physics (6)
   - PHYS3350: Classical mechanics (6)
   - PHYS3351: Quantum mechanics (6)
   - PHYS3450: Electromagnetism (6)
   - PHYS3550: Statistical mechanics & thermodynamics (6)
   - PHYS3551: Introductory solid state physics (6)
   - PHYS3750: Laser and spectroscopy (6)
   - PHYS3751: Physics of nanomaterials (6)
   - PHYS3850: Waves and optics (6)
   - PHYS3951: Atomic and nuclear physics (6)
   - PHYS4150: Computational physics (6)
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<td>PHYS7750</td>
<td>Nanophysics (6)</td>
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</tr>
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### 3. Capstone requirement (6 credits)

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

### Notes:

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

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

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

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

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

### Remarks:

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

### Offered to students
admitted to Year 1 in 2014

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

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

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

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

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

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

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

### Impermissible Combinations:
Minor in Astronomy

### Required courses (96 credits)

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

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

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

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#### 2. Advanced level courses (42 credits)

**Disciplinary Core Courses (18 credits)**

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<td>PHYS3651</td>
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<tr>
<td>PHYS3652</td>
<td>Principles of astronomy (6)</td>
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</table>

**Disciplinary Electives (24 credits)**

At least 12 credits selected from courses in List A:

**List A**

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

**List B**

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### 3. Capstone requirement (6 credits)

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

### Notes:

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

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

5. Students must have level 3 or above in HKDSE 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 Astronomy  
Offered to students: 2013  
admitted to Year 1 in

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

**Impermissible Combinations:**
Minor in Astronomy

**Required courses (96 credits)**

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**Disciplinary Electives (24 credits)**

At least 12 credits selected from courses in List A:

**List A**

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

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

**List B**

- PHYS3150 Theoretical physics (6)
- PHYS3350 Classical mechanics (6)
- PHYS3351 Quantum mechanics (6)
- PHYS3450 Electromagnetism (6)
- PHYS3550 Statistical mechanics & thermodynamics (6)
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3. **Capstone requirement (6 credits)**

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

Notes:
1. 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 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 Astronomy
---|---
Offered to students | 2012
admitted to Year 1 in |

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:

1. Identify and describe astrophysical phenomena with their professional knowledge (by means of coursework and tutorial classes in the curriculum)
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)
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)
4. Communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
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)
   - SCNC1111: Scientific method and reasoning (6)
   - SCNC1112: Fundamentals of modern science (6)

2. Advanced level courses (42 credits)
   - PHYS1250: Fundamental physics (6)
   - PHYS1650: Nature of the universe (6)
   - EASC2408: Planetary geology (6)
   - PHYS2250: Introductory mechanics (6)
   - PHYS2255: Introductory electricity and magnetism (6)
   - PHYS2265: Modern physics (6)

   - PHYS3650: Observational astronomy (6)
   - PHYS3651: The physical universe (6)
   - PHYS3652: Principles of astronomy (6)
   - SCNC1111: Scientific method and reasoning (6)

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

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

   - List B
     - PHYS3150: Theoretical physics (6)
     - PHYS3350: Classical mechanics (6)
     - PHYS3351: Quantum mechanics (6)
     - PHYS3450: Electromagnetism (6)
     - PHYS3550: Statistical mechanics & thermodynamics (6)
     - PHYS3551: Introductory solid state physics (6)
     - PHYS3750: Laser and spectroscopy (6)
     - PHYS3751: Physics of nanomaterials (6)
     - PHYS3850: Waves and optics (6)
     - PHYS3951: Atomic and nuclear physics (6)
     - PHYS4150: Computational 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. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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

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

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

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

Remarks:

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

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)
- CHEM2441 Organic chemistry I (6)

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

2. Advanced level courses (48 credits)

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

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

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

Take either BIOC1600 or BIOL1110 to fulfill this 6 credits requirement, but not both.
3. **Capstone requirement (6 credits)**

   **At least 6 credits selected from the following courses:**
   - CHEM4145 Medicinal chemistry (6)
   - CHEM4444 Chemical biology (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 must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

   **Remarks:**

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

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

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

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

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

PLO 3: interpret and communicate scientific data and literature using appropriate scientific language (by means of 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)
- CHEM2441 Organic chemistry I (6)

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

2. Advanced level courses (48 credits)

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

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

At least 6 credits selected from the following courses:

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

**Notes:**

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

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

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

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

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

**Remarks:**

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

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

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

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

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

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

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

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

Impermissible Combinations:
Minor in Biochemistry

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (30 credits)
   BIOC1600 Perspectives in biochemistry (6)
   BIOL1110 From molecules to cells (6)
   CHEM1042 General chemistry I (6)
   BIOC2600 Basic biochemistry (6)
   CHEM2441 Organic chemistry I (6)
   Disciplinary Electives (6 credits)
   CHEM1043 General chemistry II (6)
   CHEM2541 Introductory physical chemistry (6)
   Take either CHEM1043 or CHEM2541 to fulfill this 6 credits requirement, but not both.

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

   Take either CHEM1043 or CHEM2541 to fulfill this 6 credits requirement, but not both.
### Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4417</td>
<td>'Omics' and systems biology</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4145</td>
<td>Medicinal chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4444</td>
<td>Chemical biology</td>
<td>(6)</td>
</tr>
</tbody>
</table>

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

At least 6 credits selected from the following courses:

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

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

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

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

**Remarks:**

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

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

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

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

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

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

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

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

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

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

Take either CHEM1043 or CHEM2541 to fulfill this 6 credits requirement, but not both.
Take either CHEM1043 or CHEM2541 to fulfill this 6 credits requirement, but not both.
3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - BIOL4417 'Omics' and systems biology (6)
   - CHEM4145 Medicinal chemistry (6)
   - CHEM4444 Chemical biology (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 must have level 3 or above in HKDSE Chemistry or equivalent to take this major. Students who do not fulfill this requirement are advised to take CHEM1041 Foundations of chemistry.

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

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

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

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

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

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

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

## Impermissible Combinations:
Minor in Biochemistry

<table>
<thead>
<tr>
<th>Required courses (96 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (48 credits)</strong></td>
</tr>
<tr>
<td>SCNC1111</td>
</tr>
<tr>
<td>SCNC1112</td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses: Science Foundation Courses (12 credits)</strong></td>
</tr>
<tr>
<td>BIOC1600</td>
</tr>
<tr>
<td>BIOL1110</td>
</tr>
<tr>
<td>CHEM1042</td>
</tr>
<tr>
<td>BIOC2600</td>
</tr>
<tr>
<td>CHEM2441</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (6 credits)</strong></td>
</tr>
<tr>
<td>CHEM1043</td>
</tr>
<tr>
<td>CHEM2541</td>
</tr>
</tbody>
</table>

**Take either CHEM1043 or CHEM2541 to fulfill this 6 credits requirement, but not both.**

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

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses:

| BIOC3605 | Sequence bioinformatics (6) |
| BIOC3606 | Molecular medicine (6) |
| BIOL3202 | Nutritional biochemistry (6) |
| BIOL3402 | Cell biology and cell technology (6) |
| BIOL3403 | Immunology (6) |
| BIOL3404 | Protein structure and function (6) |
| BIOL3408 | Genetics (6) |
| CHEM3441 | Organic chemistry II (6) |
| BIOC4612 | Molecular biology of the gene (6) |
### BIOL4417
'Omics' and systems biology (6)

### CHEM4145
Medicinal chemistry (6)

### CHEM4444
Chemical biology (6)

### 3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:

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

### Notes:

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

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

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

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

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

### Remarks:

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

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

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

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:
NIL

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)

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 ecology (6)
   - BIOL3419 Insect ecology: the little things that run the world (6)
   - BIOL3501 Evolution (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)
   - BIOL3314 Plant structure and evolution (6)
   - BIOL4411 Plant and food biotechnology (6)
   List III
   - BIOL3109 Environmental microbiology (6)
### 3. Capstone Requirement (6 Credits)

At least 6 credits selected from the following courses:

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

### Notes:

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

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

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

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

### Remarks:

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

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

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

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

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

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

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

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

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

Impermissible Combinations:
NIL

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)

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

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

(B) Physiology and systems biology
- BIOL3105 Animal physiology and environmental adaptation (6)
- BIOL3107 Plant physiology (6)
- BIOL3108 Microbial physiology (6)

- BIOL3205 Human physiology (6)
- BIOL3508 Microbial physiology and biotechnology (6)

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

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

(D) Applied biology
- BIOL3303 Conservation ecology (6)
3. **Capstone requirement (6 credits)**

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

**Notes:**

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

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

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

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

**Remarks:**

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

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

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

- **PLO 1:** understand concepts underpinning advances in cell biology and genetics, physiology and systems biology, diversity of life and environmental biology, and applied biology (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2:** evaluate diverse threads of enquiry in science, and identify the value of datasets and written output (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3:** interpret scientific data from a range of sources and explain trends observed (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 4:** demonstrate independent and critical thinking and appreciate moral and ethical issues related to biological sciences (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 5:** communicate in a professional capacity with educators, business, media and the scientific community (by means of coursework, tutorial classes, project-based and presentation opportunities in the curriculum)
- **PLO 6:** be prepared to enter employment as professional scientists, educators and managers (by means of coursework, tutorial classes, laboratory-based, project-based and capstone learning in the curriculum)

Impermissible Combinations:
NIL

**Required courses (96 credits)**

1. **Introductory level courses (48 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111: Scientific method and reasoning (6)
     - SCNC1112: Fundamentals of modern science (6)
   - **Disciplinary Core Courses (36 credits)**
     - BIOL1110: From molecules to cells (6)
     - BIOL1111: Introductory microbiology (6)
     - BIOL1309: Evolutionary diversity (6)
     - BIOL2102: Biostatistics (6)
     - BIOL2103: Biological sciences laboratory course (6)
     - BIOL2306: Ecology and evolution (6)

2. **Advanced level courses (at least 42 credits)**
   - **Disciplinary Electives (42 credits)**
     - Students must select at least 6 credits from each of the following area A, B, C & D:
     - **(A) Genetics and cell biology**
       - BIOL3401: Molecular biology (6)
       - BIOL3402: Cell biology and cell technology (6)
       - BIOL3403: Immunology (6)
       - BIOL3408: Genetics (6)
     - **(B) Physiology and systems biology**
       - BIOL3105: Animal physiology and environmental adaptation (6)
       - BIOL3107: Plant physiology (6)
       - BIOL3108: Microbial physiology (6)
     - **(C) Diversity of life and environmental biology**
       - BIOL3109: Environmental microbiology (6)
       - BIOL3110: Environmental toxicology (6)
       - BIOL3301: Marine biology (6)
       - BIOL3302: Systematics and phylogenetics (6)
     - **(D) Applied biology**
       - BIOL3303: Conservation ecology (6)

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

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BIOL3409  Business aspects of biotechnology (6)
BIOL4301  Fish and fisheries (6)
BIOL4401  Medical microbiology and applied immunology (6)

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

Notes:
1. BIOL1111 Introductory Microbiology is not offered from 2015-16. Students should take BIOL2220 Principles of Biochemistry as a replacement.

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

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

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

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

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

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

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

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

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

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

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

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

## Impermissible Combinations:
NIL

## Required courses (96 credits)

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

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

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

   **(B) Physiology and systems biology**
   - BIOL3105 Animal physiology and environmental adaptation (6)
   - BIOL3107 Plant physiology (6)
   - BIOL3108 Microbial physiology (6)
   - BIOL3205 Human physiology (6)
   - BIOL3508 Microbial physiology and biotechnology (6)
   - Take either BIOL3108 or BIOL3508 to fulfill this 42 credits requirement, but not both. BIOL3108 and BIOL3508 are mutually exclusive.

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

   **(D) Applied biology**
   - BIOL3303 Conservation ecology (6)

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

**BIOL3409** Business aspects of biotechnology (6)
**BIOL4301** Fish and fisheries (6)
**BIOL4401** Medical microbiology and applied immunology (6)

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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

### Notes:

1. **BIOL1111** Introductory Microbiology is not offered from 2015-16. Students should take **BIOL2220** Principles of Biochemistry as a replacement.

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

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

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

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

### Remarks:

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

Major in Biological Sciences

Offered to students admitted to Year 1 in 2012

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

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

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

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

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

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

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

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

Impermissible Combinations:
NIL

Required courses (96 credits)

1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

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

Disciplinary Core Courses (36 credits)

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

2. Advanced level courses (at least 42 credits)

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

(A) Genetics and cell biology

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

(B) Physiology and systems biology

BIOL3105  Animal physiology and environmental adaptation (6)
BIOL3107  Plant physiology (6)
BIOL3108  Microbial physiology (6)

BIOL3205  Human physiology (6)
BIOL3508  Microbial physiology and biotechnology (6)

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

(C) Diversity of life and environmental biology

BIOL3109  Environmental microbiology (6)
BIOL3110  Environmental toxicology (6)
BIOL3301  Marine biology (6)
BIOL3302  Systematics and phylogenetics (6)

(D) Applied biology

BIOL3303  Conservation ecology (6)
3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - BIOL3994 Directed studies in biological sciences (6)
   - BIOL4964 Biological sciences internship (6)
   - BIOL4994 Biological sciences project (12)

Notes:
1. BIOL1111 Introductory Microbiology is not offered from 2015-16. Students should take BIOL2220 Principles of Biochemistry as a replacement.
2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ("disciplinary core") by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.
3. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.
4. Students are not required to take Capstone if this Science major is taken as a second major on the condition that the capstone experience in the first major requires the integration or application of knowledge from both major disciplines. If this is approved, a 6-credit advanced level course (disciplinary electives) in the second major must be taken to fulfill the credit requirement of the capstone experience.
5. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

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

**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:

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

**Impermissible Combinations:**
Minor in Chemistry

**Required courses (96 credits)**

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

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

3. **Advanced level courses (42 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)

4. **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)
     - 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)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<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>
</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:</td>
</tr>
<tr>
<td></td>
<td>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. Capstone requirement for BEd&BSc degree students is different. Students are required to take an additional 6-credit advanced level course (disciplinary electives) in the major to replace the capstone requirement of this Major. Students should consult the Faculty of Education for details.

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

### Remarks:

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

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

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

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

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

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

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

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

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

Impermissible Combinations:
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)
   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)
### 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.

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

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

### Remarks:

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

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

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

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

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

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

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

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

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

Impermissible Combinations:
Minor in Chemistry

Required courses (96 credits)

1. Introductory level courses (42 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>

2. 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>CHEM1042</td>
<td>General chemistry I</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>

3. Disciplinary Core Courses (30 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3146</td>
<td>Principles and applications of spectroscopic and analytical techniques</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>CHEM3541</td>
<td>Physical chemistry: Introduction to quantum chemistry</td>
<td>(6)</td>
</tr>
</tbody>
</table>

4. Advanced level courses (48 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3542</td>
<td>Physical chemistry: statistical thermodynamics and kinetics theory</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4341</td>
<td>Advanced inorganic 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>
</tbody>
</table>

5. Disciplinary Electives (12 credits)

At least 12 credits selected from the following 18 credits of courses in two different areas in List A:

List A

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3542</td>
<td>Physical chemistry: statistical thermodynamics and kinetics theory</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4341</td>
<td>Advanced inorganic chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4443</td>
<td>Integrated organic synthesis</td>
<td>(6)</td>
</tr>
</tbody>
</table>

Take either CHEM4443 or CHEM4441 to fulfill this 12 credits requirement, but not both.

List B

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

Take either CHEM4443 or CHEM4441 to fulfill this 12 credits requirement, but not both.

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

### List B

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM3141</td>
<td>Environmental chemistry</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM3142</td>
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<td>Computational chemistry</td>
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<td>CHEM4543</td>
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### Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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<td>CHEM4999</td>
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</tr>
</tbody>
</table>

**Notes:**

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

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

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

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

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

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

**Remarks:**

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

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

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

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

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

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

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

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

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

Impermissible Combinations:
Minor in Chemistry

<table>
<thead>
<tr>
<th>Required courses (96 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (42 credits)</td>
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<td>SCNC1111 Scientific method and reasoning (6)</td>
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<tr>
<td>Disciplinary Core Courses (30 credits)</td>
</tr>
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<tr>
<td>2. Advanced level courses (48 credits)</td>
</tr>
<tr>
<td>CHEM3146 Principles and applications of spectroscopic and analytical techniques (6)</td>
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<td>CHEM3241 Analytical chemistry II: chemical instrumentation (6)</td>
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</tr>
<tr>
<td>CHEM3541 Physical chemistry: Introduction to quantum chemistry (6) [previous title: Physical chemistry II: Introduction to quantum chemistry (6)]</td>
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</table>

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

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### Disciplinary Electives (6 credits)

At least 6 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level, excluding CHEM3999

Directed studies in chemistry, CHEM4910 Chemistry literacy and research, CHEM4911 Capstone experience for chemistry undergraduates: HKUtopia, CHEM4966 Chemistry internship and CHEM4999 Chemistry project), subject to pre-requisite requirements. The current list include courses in List B and those courses not selected to fulfill the requirements in List A.

**List B**

<table>
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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.

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

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

**Remarks:**

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

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

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

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

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

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

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Impermissible Combinations:
Minor in Chemistry

Required courses (96 credits)

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

2. Disciplinary Core Courses: Science Foundation Courses (12 credits)
   - CHEM1042 General chemistry I (6) [previous title: General chemistry (6)]
   - CHEM2241 Analytical chemistry I (6)
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3. Disciplinary Core Courses (30 credits)
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   - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
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   - CHEM3441 Organic chemistry II (6)
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4. Disciplinary Electives (12 credits)
   At least 12 credits selected from the following 18 credits of courses in two different areas in List A:

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

**Disciplinary Electives (6 credits)**

Take either CHEM3542 or CHEM4541 to fulfill this 12 credits requirement, but not both.

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

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**Notes:**

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

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

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

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

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

**Remarks:**

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

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

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

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

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

**Required courses (96 credits)**

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

2. **Advanced level courses (42 credits)**
   - **Disciplinary Core Courses (30 credits)**
     - COMP3278: Introduction to database management systems (6)
     - MATH3904: Introduction to optimization (6)
     - STAT3600: Linear statistical analysis (6)
     - STAT3612: Data mining (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)
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</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**
   - BIOL4417 Omics' and systems biology
   - STAT3607 Statistics in clinical medicine and bio-medical research
   - STAT3608 Statistical genetics
   - STAT3620 Modern nonparametric statistics
   - STAT3621 Statistical data analysis
   - STAT4602 Multivariate data analysis

   **b. Financial and Risk Analytics**
   - STAT3616 Advanced SAS programming
   - STAT3621 Statistical data analysis
   - STAT4601 Time series analysis
   - Plus advanced level courses listed for the Major in Risk Management

   **c. Operational Analytics**
   - COMP3250 Design and analysis of algorithms
   - MATH3600 Discrete mathematics
   - MATH3901 Operations research I
   - MATH3943 Network models in operations research
   - MATH4902 Operations research II
   - STAT3606 Business logistics

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

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

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

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


### Remarks:

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

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

Disciplinary Core Courses: Science Foundation Courses (12 credits)
- COMP1117: Computer programming (6)
- MATH1013: University mathematics II (6)
- STAT2601: Probability and statistics I (6)

Disciplinary Core Courses (36 credits)
- COMP3278: Introduction to database management systems (6)
- MATH3904: Introduction to optimization (6)
- STAT3600: Linear statistical analysis (6)
- STAT3612: Data mining (6)
- STAT4609: Big data analytics (6)

2. Advanced level courses (42 credits)
Disciplinary Core Courses (30 credits)
- 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)
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### 3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:

- STAT3799  | Directed studies in statistics           | (6)     |
- STAT4710  | Capstone experience for statistics undergraduates | (6) |
- STAT4766  | Statistics internship                     | (6)     |
- STAT4799  | Statistics project                        | (12)    |

**Notes:**

1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:

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

   b. Financial and Risk Analytics
      - STAT3616 Advanced SAS programming
      - STAT3621 Statistical data analysis
      - STAT4601 Time series analysis
      - Plus advanced level courses listed for the Major in Risk Management

   c. Operational Analytics
      - COMP3250 Design and analysis of algorithms
      - MATH3600 Discrete mathematics
      - MATH3901 Operations research I
      - MATH3943 Network models in operations research
      - MATH4902 Operations research II
      - STAT3606 Business logistics

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

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

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

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


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

**Offered to students admitted to Year 1 in**
2014

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

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

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

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

- **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: Data mining (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)
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3. **Capstone requirement (6 credits)**

At least 6 credits selected from the following courses:

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**Notes:**

1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:

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

   b. Financial and Risk Analytics
      - STAT3616 Advanced SAS programming
      - STAT3621 Statistical data analysis
      - STAT4601 Time series analysis
      - Plus advanced level courses listed for the Major in Risk Management

   c. Operational Analytics
      - COMP3250 Design and analysis of algorithms
      - MATH3600 Discrete mathematics
      - MATH3901 Operations research I
      - MATH3943 Network models in operations research
      - MATH4902 Operations research II
      - STAT3606 Business logistics

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

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

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

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


**Remarks:**

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

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

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

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

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)

2. **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)

3. **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 Data mining (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)
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 'Oomics' and systems biology
   - STAT3607 Statistics in clinical medicine and bio-medical research
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   - 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
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   - STAT3606 Business logistics

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

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

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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 MATH1101 University mathematics I.


Remarks:

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

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

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

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

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   - SCNC1111 Scientific method and reasoning (6)
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   Disciplinary Core Courses (36 credits)
   - COMP1117 Computer programming (6)
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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 Data mining (6)
   - STAT4609 Big data analytics (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - COMP3250 Design and analysis of algorithms (6)
   - COMP3270 Artificial intelligence (6)
   - COMP3323 Advanced database systems (6)
   - COMP3407 Scientific computing (6)
   - MATH3408 Computational methods and differential equations with applications (6)
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3616</td>
<td>Advanced SAS programming</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>STAT3622</td>
<td>Data visualization</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4601</td>
<td>Time-series analysis</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4602</td>
<td>Multivariate data analysis</td>
<td>(6)</td>
</tr>
</tbody>
</table>

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

At least 6 credits selected from the following courses:

- STAT3799  Directed studies in statistics (6)
- STAT4710  Capstone experience for statistics undergraduates (6)
- STAT4766  Statistics internship (6)
- STAT4799  Statistics project (12)

**Notes:**

1. Students may consider taking the following courses if they wish to pursue a more focused study in the following areas:

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

   b. **Financial and Risk Analytics**
   - STAT3616 Advanced SAS programming
   - STAT3621 Statistical data analysis
   - STAT4601 Time series analysis
   Plus advanced level courses listed for the Major in Risk Management

   c. **Operational Analytics**
   - COMP3250 Design and analysis of algorithms
   - MATH3600 Discrete mathematics
   - MATH3901 Operations research I
   - MATH3943 Network models in operations research
   - MATH4902 Operations research II
   - STAT3606 Business logistics

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

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

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

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


**Remarks:**

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

Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth’s interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students’ ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

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

PLO 1: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: identify real life problems pertaining to the physical environment and find solutions to those problems (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 6: work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

Impermissible Combinations:
Minor in Earth Sciences

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (36 credits)
   BIOL1309 Evolutionary diversity (6)
   EASC1401 Blue Planet (6)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)
   EASC2402 Field methods (6)
   EASC2404 Introduction to atmosphere and hydrosphere (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (6 credits)
   EASC4403 Biogeochemical cycles (6)
   Disciplinary Electives (36 credits)
   At least 36 credits selected from Lists A and B, among which at least 12 credits from List A:
   List A
   EASC3410 Hydrogeology (6)
   EASC3415 Meteorology (6)
   ENV3313 Environmental oceanography (6)
   List B
   EASC3403 Sedimentary environments (6)
   EASC3405 Environmental remote sensing (6)
   EASC3406 Reconstruction of past climate (6)
   EASC3408 Geophysics (6)
   EASC3412 Earth resources (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENV3307 Natural hazards and mitigation (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4911 Earth system: contemporary issues (6)

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

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

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

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

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

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

Offered to students admitted to Year 1 in 2015

## Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth’s interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students’ ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

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

- **PLO 1:** describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

- **PLO 2:** have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

- **PLO 3:** provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

- **PLO 4:** equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

- **PLO 5:** identify real life problems pertaining to the physical environment and find solutions to those problems (by means of capstone learning experience in the form of internship, field learning, and project-based learning in the curriculum)

- **PLO 6:** work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

## Impermissible Combinations:
Minor in Earth Sciences

## Required courses (96 credits)

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

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

**Disciplinary Core Courses (36 credits)**
- BIOL1309: Evolutionary diversity (6)
- EASC1401: Blue Planet (6)
- EASC1402: Principles of geology (6)
- EASC2401: Fluid/solid interactions in earth processes (6)
- EASC2402: Field methods (6)
- EASC2404: Introduction to atmosphere and hydrosphere (6)

### 2. Advanced level courses (42 credits)

**Disciplinary Core Courses (6 credits)**
- EASC4403: Biogeochemical cycles (6)

**Disciplinary Electives (36 credits)**
At least 36 credits selected from Lists A and B, among which at least 12 credits from List A:

**List A**
- EASC3410: Hydrogeology (6)
- EASC3415: Meteorology (6)
- ENV3313: Environmental oceanography (6)

**List B**
- EASC3403: Sedimentary environments (6)
- EASC3405: Environmental remote sensing (6)
- EASC3406: Reconstruction of past climate (6)
- EASC3408: Geophysics (6)
- EASC3412: Earth resources (6)
- EASC3416: Advanced geochemistry and geochronology (6)
- EASC3417: Earth through time (6)
- EASC3999: Directed studies in earth sciences (6)
- ENV3307: Natural hazards and mitigation (6)
- EASC4408: Special topics in earth sciences (6)
- EASC4999: Earth sciences project (12)

### 3. Capstone requirement (6 credits)
- EASC4911: Earth system: contemporary issues (6)

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

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

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

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

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

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

Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth’s interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students’ ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

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

- PLO 1: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- PLO 2: have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- PLO 3: provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- PLO 4: equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- PLO 5: identify real life problems pertaining to the physical environment and find solutions to those problems (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- PLO 6: work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

Impermissible Combinations:
Minor in Earth Sciences

Required courses (96 credits)

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

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

Disciplinary Core Courses (36 credits)
   - BIOL1309: Evolutionary diversity (6)
   - EASC1401: Blue Planet (6)
   - EASC1402: Principles of geology (6)
   - EASC2401: Fluid/solid interactions in earth processes (6)
   - EASC2402: Field methods (6)
   - EASC2404: Introduction to atmosphere and hydrosphere (6)

2. Advanced level courses (42 credits)
   - EASC4403: Biogeochemical cycles (6)

Disciplinary Electives (36 credits)
   - At least 36 credits from Lists A and B, among which at least 12 credits from List A:
     List A
     - EASC3410: Hydrogeology (6)
     - EASC3415: Meteorology (6)
     - ENVS3313: Environmental oceanography (6)
     List B
     - EASC3403: Sedimentary environments (6)
     - EASC3405: Environmental remote sensing (6)
     - EASC3406: Reconstruction of past climate (6)
     - EASC3408: Geophysics (6)
     - EASC3412: Earth resources (6)
     - EASC3416: Advanced geochemistry and geochronology (6)
     - EASC3417: Earth through time (6)
     - EASC3999: Directed studies in earth sciences (6)
     - ENVS3307: Natural hazards and mitigation (6)
     - EASC4408: Special topics in earth sciences (6)
     - EASC4999: Earth sciences project (12)

3. Capstone requirement (6 credits)
   - EASC4911: Earth system: contemporary issues (6)

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

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

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

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

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

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

Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth’s interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students' ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

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

PLO 1: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: identify real life problems pertaining to the physical environment and find solutions to those problems (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 6: work with other students and possess an adequate level of communication skills (by means of group project learning and presentation opportunities in the curriculum)

Impermissible Combinations:
Minor in Earth Sciences

Required courses (96 credits)

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

   Disciplinary Core Courses (36 credits)
   - BIOL1309 Evolutionary diversity (6)
   - EASC1401 Blue Planet (6)
   - EASC1402 Principles of geology (6)
   - EASC2401 Fluid/solid interactions in earth processes (6)
   - EASC2402 Field methods (6)
   - EASC2404 Introduction to atmosphere and hydrosphere (6)

2. Advanced level courses (42 credits)
   
   Disciplinary Core Courses (6 credits)
   - EASC4403 Biogeochemical cycles (6)

   Disciplinary Electives (36 credits)
   
   At least 36 credits from Lists A and B, among which at least 12 credits from List A:
   
   List A
   - EASC3410 Hydrogeology (6)
   - EASC3415 Meteorology (6)
   - ENV3313 Environmental oceanography (6)

   List B
   - EASC3403 Sedimentary environments (6)
   - EASC3450 Environmental remote sensing (6)
   - EASC3406 Reconstruction of past climate (6)
   - EASC3408 Geophysics (6)
   - EASC3412 Earth resources (6)
   - EASC3416 Advanced geochemistry and geochronology (6)
   - EASC3417 Earth through time (6)
   - EASC3999 Directed studies in earth sciences (6)
   - ENV3307 Natural hazards and mitigation (6)
   - EASC4408 Special topics in earth sciences (6)
   - EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   - EASC4911 Earth system: contemporary issues (6)

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

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

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

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

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

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

Objectives:
Earth System Science seeks to understand the Earth as an integrated system, including its past, present and future behaviour, from the environments where life evolves on the surface to the interactions between the crust and its fluid envelopes (atmosphere and hydrosphere), with interests extending to the Earth's interior. Core courses in the major focus on understanding the composition, structure and processes of the solid earth, the hydrosphere and the atmosphere, and their interactions. Students will be equipped with knowledge to help manage geological resources and natural hazards. Throughout the curriculum there is consistent emphasis on transferable skills, learning through fieldwork, laboratory studies and research based classes, designed to enhance students' ability to think critically, to communicate effectively and to develop solutions to complex problems. Graduates from the major can pursue further studies in the Earth Sciences and careers in a wide variety of geoscience-related areas including resource management, hazard mitigation, soil and water conservation and teaching.

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

PLO 1: describe the key concepts of the Earth System components and processes (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: have acquired the ability to observe, describe, measure and analyze principal phenomena of earth processes and the interactions between different earth components (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: provide expertise to maintain geological environments and prevent severe perturbations due to resource exploitation and water disposal (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: equip with the knowledge and skills to better predict and deal with geological and related hazards such as earthquakes, landslides, tsunamis, floods and volcanic eruptions, and recognize and appraise the related ethical issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: identify real life problems pertaining to the physical environment and find solutions to those problems (by means of 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)
   BIOL1309 Evolutionary diversity (6)
   EASC1401 Blue Planet (6)
   EASC1402 Principles of geology (6)
   EASC2401 Fluid/solid interactions in earth processes (6)
   EASC2402 Field methods (6)
   EASC2404 Introduction to atmosphere and hydrosphere (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (6 credits)
   EASC4403 Biogeochemical cycles (6)
   Disciplinary Electives (36 credits)
   At least 36 credits from Lists A and B, among which at least 12 credits from List A:
   List A:
   EASC3410 Hydrogeology (6)
   EASC3415 Meteorology (6)
   ENVS3313 Environmental oceanography (6)
   List B:
   EASC3403 Sedimentary environments (6)
   EASC3405 Environmental remote sensing (6)
   EASC3406 Reconstruction of past climate (6)
   EASC3408 Geophysics (6)
   EASC3412 Earth resources (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENVS3007 Natural hazards and mitigation (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4911 Earth system: contemporary issues (6)

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

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

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

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

5. Students are recommended to take additional chemistry and/or physics courses above the introductory level if they are interested in postgraduate research in Earth System Science.

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

Objectives:
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal biology and includes a compulsory week-long residential field trip. Advanced courses in the major teach students about the ecology and biodiversity of different ecosystems (e.g. marine, terrestrial and freshwater environments) with an emphasis on field work, introduces the use of statistical and molecular techniques in ecology, and focuses on certain applied topics such as environmental impact assessment, ecotoxicology, fisheries and mariculture, and biodiversity conservation. Students have an opportunity to conduct independent research in ecology and biodiversity as a final year project or a dissertation under the close supervision of an individual staff member. Apart from the fundamental knowledge and skills in understanding and managing biodiversity offered in the core courses of this major, strong emphasis is placed upon experiential learning such as overseas field expedition and work placement in the environmental sector. Biodiversity conservation requires scientific input as well as passion. Through the range of formal field-based courses as well as extra-curricular activities offered, students taking this major will have opportunities to participate in research, field conservation and education projects both locally and internationally. Assistance will be provided so that students can develop expertise in one or a few groups of plants or animals, as familiarity with species identification is an essential prerequisite for biodiversity scientists or conservation biologists.

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

PLO 1: understand and appreciate the major living and non-living components of the regional and global environment, and how they interact; identify threats to them; and know how these threats can be mitigated (by means of coursework, laboratory-based, tutorial classes and/or project-based learning in the curriculum)

PLO 2: understand and appreciate the variety of life in Hong Kong's and Southeast Asia's natural habitats, become equipped to 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:
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)
   ENV2202 Environmental data analysis (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (12 credits)
   BIOL3302 Systematics and phylogenetics (6)
   BIOL3303 Conservation ecology (6)

   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   BIOL3101 Animal behaviour (6)
   BIOL3109 Environmental microbiology (6)
   BIOL3301 Marine biology (6)
   BIOL3305 Tropical and temperate marine ecology field course (6)
   BIOL3313 Freshwater ecology (6)
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<td>Cetacean behaviour, ecology and conservation: field research experience (6)</td>
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<tr>
<td>BIOL4861</td>
<td>Ecology &amp; biodiversity internship (6)</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)
- BIOL4921  Animal behaviour and behavioural ecology: field course (6)
- BIOL4991  Ecology & biodiversity project (12)

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

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

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

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

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

Offered to students admitted to Year 1 in 2015

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:
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 (12 credits)
BIOL3302 Systematics and phylogenetics (6)
BIOL3303 Conservation ecology (6)

Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:
BIOL3101 Animal behaviour (6)
BIOL3109 Environmental microbiology (6)
BIOL3301 Marine biology (6)
BIOL3305 Tropical and temperate marine ecology field course (6)
BIOL3313 Freshwater ecology (6)

Take either BIOL3101 or BIOL4303 to fulfill this 30 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.
## Science Majors

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<tr>
<th>Course Code</th>
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### 3. Capstone requirement (6 credits)

**At least 6 credits selected from the following courses:**

- **BIOL3951** Ecology & biodiversity field course (6)
- **BIOL3991** Directed studies in ecology & biodiversity (6)
- **BIOL4911** Conservation science in practice (6)
- **BIOL4921** Animal behaviour and behavioural ecology: field course (6)
- **BIOL4991** Ecology & biodiversity project (12)

*Take either BIOL3951 (subclass B) or BIOL4921 to fulfill this 6 credits requirement, but not both. BIOL3951 (subclass B) and BIOL4921 are mutually exclusive.*

**Notes:**

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

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

**Remarks:**

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

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)

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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:
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)
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2. Advanced level courses (42 credits)
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Take either BIOL3101 or BIOL4303 to fulfill this 30 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.
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<td>At least 6 credits selected from the following courses:</td>
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<td>BIOL3951</td>
<td>Ecology &amp; biodiversity field course (6)</td>
<td>Take either BIOL3951 (subclass B) or BIOL4921 to fulfill this 6 credits requirement, but not both. BIOL3951 (subclass B) and BIOL4921 are mutually exclusive.</td>
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Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Major Title | Major in Ecology & Biodiversity
Offered to students | 2013

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 South East 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:
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 (12 credits)
   - BIOL3302 Systematics and phyllogenetics (6)
   - BIOL3303 Conservation ecology (6)

   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   - BIOL3101 Animal behaviour (6)
   - BIOL3109 Environmental microbiology (6)
   - BIOL3301 Marine biology (6)
   - BIOL3305 Tropical and temperate marine ecology field course (6)
   - BIOL3313 Freshwater ecology (6)

   Take either BIOL3101 or BIOL4303 to fulfill this 30 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.
### BIOL Major

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL3314</td>
<td>Plant structure and evolution</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3318</td>
<td>Experimental intertidal ecology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3319</td>
<td>Terrestrial ecology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3320</td>
<td>The biology of marine mammals</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3322</td>
<td>Marine invertebrate zoology</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>BIOL3505</td>
<td>Oyster aquaculture and restoration</td>
<td>6</td>
</tr>
<tr>
<td>ENVS3019</td>
<td>Urban ecology</td>
<td>6</td>
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<tr>
<td>BIOL4301</td>
<td>Fish and fisheries</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4303</td>
<td>Animal behaviour</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4304</td>
<td>Ecosystem functioning and services</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4451</td>
<td>Cetacean behaviour, ecology and conservation: field research experience</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4861</td>
<td>Ecology &amp; biodiversity internship</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>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3951</td>
<td>Ecology &amp; biodiversity field course</td>
<td>6</td>
</tr>
<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>
<tr>
<td>BIOL4921</td>
<td>Animal behaviour and behavioural ecology: field course</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4991</td>
<td>Ecology &amp; biodiversity project</td>
<td>12</td>
</tr>
</tbody>
</table>

*Take either BIOL3101 or BIOL4303 to fulfill this 30 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.*

**Notes:**

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

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

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

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

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
This major is directed at teaching students: (1) how organisms interact with each other and their environments, (2) how species are distributed throughout the world, and (3) key threats and approaches to conserving biodiversity. Special reference is made to Hong Kong and Asia; the ways in which humans have impacted upon natural environments; and, the approaches used to manage or ameliorate those impacts. This major is based around an introductory core, which emphasizes plant and animal 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:
Minor in Ecology & Biodiversity
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3318</td>
<td>Experimental intertidal ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3319</td>
<td>Terrestrial ecology</td>
<td>(6)</td>
</tr>
<tr>
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<td>BIOL4301</td>
<td>Fish and fisheries</td>
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<td>BIOL4302</td>
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<td>BIOL4861</td>
<td>Ecology &amp; biodiversity internship</td>
<td>(6)</td>
</tr>
</tbody>
</table>

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

   At least 6 credits selected from the following courses:

   - BIOL3951  Ecology & biodiversity field course (6)
   - BIOL3991  Directed studies in ecology & biodiversity (6)
   - BIOL4911  Conservation science in practice (6)
   - BIOL4921  Animal behaviour and behavioural ecology: field course (6)
   - BIOL4991  Ecology & biodiversity project (12)

   *Take either BIOL3101 or BIOL4303 to fulfill this 30 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.*

**Notes:**

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

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:**

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 Environmental Science
Offered to students | admitted to Year 1 in 2016

**Objectives:**
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

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

- **PLO 1:** identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 2:** observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 3:** appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 4:** gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

**Impermissible Combinations:**
Minor in Environmental Science

### Required courses (96 credits)

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

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

**Disciplinary Core Courses (18 credits)**
- ENVS1401 Introduction to environmental science (6)
- ENVS2001 Environmental field and lab course (6)
- ENVS2002 Environmental data analysis (6)

**Disciplinary Electives (18 credits)**
At least 18 credits selected from the following courses (Level 1 & 2):
- CHEM1042 General chemistry I (6)
- EASC1020 Introduction to climate science (6)
- EASC1401 Blue Planet (6)
- ENVS1301 Environmental life science (6)
- STAT1601 Elementary statistical methods (6)

- STAT1603 Introductory statistics (6)
- BIOL2102 Biostatistics (6)
- BIOL2306 Ecology and evolution (6)
- CHEM2041 Principles of chemistry (6)
- CHEM2241 Analytical chemistry I (6)
- CHEM2442 Fundamentals of organic chemistry (6)

- May take either STAT1601 or STAT1603 to fulfill this 18 credits requirement, but not both.

#### 2. Advanced level courses (42 credits)

**Disciplinary Core Courses (6 credits)**
- ENVS3004 Environment, society and economics (6)

**Disciplinary Electives (36 credits)**
At least 36 credits selected from the following courses:
- BIOL3110 Environmental toxicology (6)
- BIOL3303 Conservation ecology (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)

- May take either STAT1601 or STAT1603 to fulfill this 18 credits requirement, but not both.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVS3010</td>
<td>Sustainable energy and environment</td>
<td>6</td>
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<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>
<tr>
<td>ENVS3042</td>
<td>Pollution</td>
<td>6</td>
</tr>
<tr>
<td>ENVS3313</td>
<td>Environmental oceanography</td>
<td>6</td>
</tr>
<tr>
<td>MATH3408</td>
<td>Computational methods and differential equations with applications</td>
<td>6</td>
</tr>
<tr>
<td>STAT3611</td>
<td>Computer-aided data analysis</td>
<td>6</td>
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<td>BIOL4302</td>
<td>Environmental impact assessment</td>
<td>6</td>
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<tr>
<td>ENVS4110</td>
<td>Environmental remediation</td>
<td>6</td>
</tr>
<tr>
<td>ENVS3999</td>
<td>Directed studies in environmental science</td>
<td>6</td>
</tr>
<tr>
<td>ENVS4955</td>
<td>Environmental science in practice</td>
<td>6</td>
</tr>
<tr>
<td>ENVS4966</td>
<td>Environmental science internship</td>
<td>6</td>
</tr>
<tr>
<td>ENVS4999</td>
<td>Environmental science project</td>
<td>12</td>
</tr>
</tbody>
</table>

### Notes:

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

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

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

### Remarks:

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

**Objectives:**
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

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

- **PLO 1:** identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/labatory/team-based learning in the curriculum)
- **PLO 2:** observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/labatory/team-based learning in the curriculum)
- **PLO 3:** appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/labatory/team-based learning in the curriculum)
- **PLO 4:** gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/labatory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

**Impermissible Combinations:**
Minor in Environmental Science

### Required courses (96 credits)

<table>
<thead>
<tr>
<th><strong>Disciplinary Core Courses: Science Foundation Courses (12 credits)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SCNC1111</td>
</tr>
<tr>
<td>SCNC1112</td>
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<table>
<thead>
<tr>
<th><strong>Disciplinary Core Courses (18 credits)</strong></th>
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</thead>
<tbody>
<tr>
<td>ENV1401</td>
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<tr>
<td>ENV2001</td>
</tr>
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<td>ENV2002</td>
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<table>
<thead>
<tr>
<th><strong>Disciplinary Electives (18 credits)</strong></th>
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<tbody>
<tr>
<td>At least 18 credits selected from the following courses (Level 1 &amp; 2):</td>
</tr>
<tr>
<td>CHEM1042</td>
</tr>
<tr>
<td>EASC1020</td>
</tr>
<tr>
<td>EASC1401</td>
</tr>
<tr>
<td>ENV1301</td>
</tr>
<tr>
<td>STAT1601</td>
</tr>
</tbody>
</table>

| STAT1603 | Introductory statistics (6) |

| BIOL2102 | Biostatistics (6) |
| BIOL2306 | Ecology and evolution (6) |
| CHEM2041 | Principles of chemistry (6) |
| CHEM2241 | Analytical chemistry I (6) |
| CHEM2442 | Fundamentals of organic chemistry (6) |

<table>
<thead>
<tr>
<th><strong>Disciplinary Core Courses (6 credits)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV3004</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Disciplinary Electives (36 credits)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>At least 36 credits selected from the following courses:</td>
</tr>
<tr>
<td>BIOL3110</td>
</tr>
<tr>
<td>BIOL3303</td>
</tr>
<tr>
<td>CHEM3141</td>
</tr>
<tr>
<td>CHEM3241</td>
</tr>
<tr>
<td>CHEM3242</td>
</tr>
<tr>
<td>EASC3020</td>
</tr>
<tr>
<td>EASC3405</td>
</tr>
<tr>
<td>ENV3006</td>
</tr>
<tr>
<td>ENV3007</td>
</tr>
</tbody>
</table>
ENVS3010 Sustainable energy and environment (6)
ENVS3019 Urban ecology (6)
ENVS3020 Global change ecology (6)
ENVS3042 Pollution (6)
ENVS3313 Environmental oceanography (6)
MATH3408 Computational methods and differential equations with applications (6)
STAT3611 Computer-aided data analysis (6)
BIOL4302 Environmental impact assessment (6)
ENVS4110 Environmental remediation (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   ENVS3999 Directed studies in environmental science (6)
   ENVS4955 Environmental science in practice (6)
   ENVS4966 Environmental science internship (6)
   ENVS4999 Environmental science project (12)

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

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc 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 2014

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/labouratory/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/labouratory/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/labouratory/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/labouratory/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)

<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>ENVS1401</td>
<td>Introduction to environmental science</td>
<td>6</td>
</tr>
<tr>
<td>ENVS2001</td>
<td>Environmental field and lab course</td>
<td>6</td>
</tr>
<tr>
<td>ENVS2002</td>
<td>Environmental data analysis</td>
<td>6</td>
</tr>
</tbody>
</table>

Disciplinary Electives (18 credits)

At least 18 credits selected from the following courses (Level 1 & 2):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1042</td>
<td>General chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>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>ENVS1301</td>
<td>Environmental life science</td>
<td>6</td>
</tr>
<tr>
<td>STAT1601</td>
<td>Elementary statistical methods</td>
<td>6</td>
</tr>
<tr>
<td>STAT1603</td>
<td>Introductory statistics</td>
<td>6</td>
</tr>
</tbody>
</table>

May take either STAT1601 or STAT1603 to fulfill this 18 credits requirement, but not both.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOL2102</td>
<td>Biostatistics</td>
<td>6</td>
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<tr>
<td>BIOL2306</td>
<td>Ecology and evolution</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2041</td>
<td>Principles of chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2241</td>
<td>Analytical chemistry I</td>
<td>6</td>
</tr>
<tr>
<td>CHEM2442</td>
<td>Fundamentals of organic chemistry</td>
<td>6</td>
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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>
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<tbody>
<tr>
<td>ENVS3004</td>
<td>Environment, society and economics</td>
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Disciplinary Electives (36 credits)

At least 36 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3110</td>
<td>Environmental toxicology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3303</td>
<td>Conservation ecology</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3141</td>
<td>Environmental chemistry</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3241</td>
<td>Analytical chemistry II; chemical instrumentation</td>
<td>6</td>
</tr>
<tr>
<td>CHEM3242</td>
<td>Food and water analysis</td>
<td>6</td>
</tr>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
<td>6</td>
</tr>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing</td>
<td>6</td>
</tr>
<tr>
<td>ENVS3006</td>
<td>Environmental radiation</td>
<td>6</td>
</tr>
<tr>
<td>ENVS3007</td>
<td>Natural hazards and mitigation</td>
<td>6</td>
</tr>
<tr>
<td>Code</td>
<td>Course</td>
<td>Credits</td>
</tr>
<tr>
<td>-----------</td>
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</tr>
<tr>
<td>ENVS3010</td>
<td>Sustainable energy and environment (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3019</td>
<td>Urban ecology (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3020</td>
<td>Global change ecology (6)</td>
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<tr>
<td>ENVS3042</td>
<td>Pollution (6)</td>
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<tr>
<td>ENVS3313</td>
<td>Environmental oceanography (6)</td>
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<td>MATH3408</td>
<td>Computational methods and differential equations</td>
<td></td>
</tr>
<tr>
<td>STAT3611</td>
<td>Computer-aided data analysis (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS4110</td>
<td>Environmental remediation (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)
- ENVS4955 Environmental science in practice (6)
- ENVS4966 Environmental science internship (6)
- ENVS4999 Environmental science project (12)

**Notes:**

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

2. If more than 24 credits (including SCNC1111 & SCNC1112) are listed as required courses ("disciplinary core") in both the first and second majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) (disciplinary electives) in the second major. Double counting of credits is not permissible for major-minor or double-minors combinations. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc 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 2013

Objectives:
The Major in Environmental Science aims to provide students with a strong scientific and technological background for understanding and addressing the environmental issues faced by humankind. This includes a flexible teaching and learning programme so that students can explore environmental issues from a range of aspects. Core courses in the curriculum emphasize fundamental knowledge in life and environment, physical and sustainable environment, pollution, monitoring and management. Throughout the curriculum, students are encouraged to undertake their own independent study from primary and secondary sources to incorporate critical thinking, field and laboratory work, documentary and archive scholarship, as integrated elements of relevant courses. By completing the curriculum, students are expected to have enhanced their knowledge in environmental science and have improved their problem-solving ability, communication and social skills. Students will be prepared to work in industries and government agencies, where they will help manage wisely the resources for which they are responsible.

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

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
PLO 4: gain an advanced level of skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods and appreciation of the related ethical issues (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Minor in Environmental Science

Required courses (96 credits)

1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (18 credits)
   ENVS1401 Introduction to environmental science (6)
   ENVS2001 Environmental field and lab course (6)
   ENVS2002 Environmental data analysis (6)
   Disciplinary Electives (18 credits)
   At least 18 credits selected from the following courses (Level 1 & 2):
   CHEM1042 General chemistry I (6)
   EASC1020 Introduction to climate science (6)
   EASC1401 Blue Planet (6)
   ENVS1301 Environmental life science (6)
   STAT1601 Elementary statistical methods (6)
   STAT1603 Introductory statistics (6)
   May take either STAT1601 or STAT1603 to fulfill this 18 credits requirement, but not both.
   BIOL2102 Biostatistics (6)
   BIOL2306 Ecology and evolution (6)
   CHEM2041 Principles of chemistry (6)
   CHEM2241 Analytical chemistry I (6)
   CHEM2442 Fundamentals of organic chemistry (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (6 credits)
   ENVS3004 Environment, society and economics (6)
   Disciplinary Electives (36 credits)
   At least 36 credits selected from the following courses:
   BIOL3110 Environmental toxicology (6)
   BIOL3303 Conservation ecology (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)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVS3010</td>
<td>Sustainable energy and environment (6)</td>
</tr>
<tr>
<td>ENVS3019</td>
<td>Urban ecology (6)</td>
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<tr>
<td>ENVS3020</td>
<td>Global change ecology (6)</td>
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<tr>
<td>ENVS3042</td>
<td>Pollution (6)</td>
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<td>ENVS3313</td>
<td>Environmental oceanography (6)</td>
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<tr>
<td>MATH3408</td>
<td>Computational methods and differential equations with applications (6)</td>
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<tr>
<td>STAT3611</td>
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<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:
   - ENVS3999 Directed studies in environmental science (6)
   - ENVS4955 Environmental science in practice (6)
   - ENVS4966 Environmental science internship (6)
   - ENVS4999 Environmental science project (12)

Notes:
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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.
## 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)

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

### Disciplinary Core Courses (12 credits)
- **ENVS1401**: Introduction to environmental science (6)
- **STAT1601**: Elementary statistical methods (6)
- **STAT1603**: Introductory statistics (6)

### Disciplinary Electives (24 credits)
- **List A**
  - **CHEM1042**: General chemistry I (6)
  - **EASC1020**: Introduction to climate science (6)
  - **EASC1401**: Blue Planet (6)
  - **ENVS1301**: Environmental life science (6)

### Disciplinary Electives (Level 2 in List B)
- **BIOL2102**: Biostatistics (6)
- **BIOL2306**: Ecology and evolution (6)
- **CHEM2041**: Principles of chemistry (6)
- **CHEM2241**: Analytical chemistry I (6)
- **CHEM2442**: Fundamentals of organic chemistry (6)
- **EASC2404**: Introduction to atmosphere and hydrosphere (6)
- **ENV1S2001**: Environmental field and lab course (6)
- **ENV1S2002**: Environmental data analysis (6)

### Disciplinary Core Courses (6 credits)
- **ENVS3004**: Environment, society and economics (6)

### Disciplinary Electives (36 credits)
- **List B**
  - **BIOL3110**: Environmental toxicology (6)
  - **BIOL3303**: Conservation ecology (6)
  - **CHEM3141**: Environmental chemistry (6)
  - **CHEM3241**: Analytical chemistry II: chemical instrumentation (6)
  - **CHEM3242**: Food and water analysis (6)
### Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts</td>
<td>6</td>
</tr>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing</td>
<td>6</td>
</tr>
<tr>
<td>ENV3306</td>
<td>Environmental radiation</td>
<td>6</td>
</tr>
<tr>
<td>ENV3307</td>
<td>Natural hazards and mitigation</td>
<td>6</td>
</tr>
<tr>
<td>ENV3308</td>
<td>Sustainable energy and environment</td>
<td>6</td>
</tr>
<tr>
<td>ENV3309</td>
<td>Urban ecology</td>
<td>6</td>
</tr>
<tr>
<td>ENV3310</td>
<td>Global change ecology</td>
<td>6</td>
</tr>
<tr>
<td>ENV3311</td>
<td>Pollution</td>
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<tr>
<td>ENV3312</td>
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</tr>
<tr>
<td>ENV4110</td>
<td>Environmental remediation</td>
<td>6</td>
</tr>
</tbody>
</table>

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

At least 6 credits selected from the following courses:
- ENV3999 Directed studies in environmental science (6)
- ENV4955 Environmental science in practice (6)
- ENV4966 Environmental science internship (6)
- ENV4999 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.

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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.
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 safety and a wide range of social, legal, technological and environmental factors; (c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students’ critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical centers, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

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

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: apply and disseminate scientific knowledge obtained from food, nutrition and related biosciences for the understanding of the influences of nutrition in health and disease, using a range of formats and approaches (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food- and/or nutrition-related hypothesis (by means of coursework, tutorial classes and laboratory-based project-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

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

Disciplinary Core Courses: Science Foundation Courses (12 credits)

<table>
<thead>
<tr>
<th>Course 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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Disciplinary Core Courses (36 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1201</td>
<td>Introduction to food and nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1312</td>
<td>Biostatistics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL1203</td>
<td>Biological sciences laboratory course</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
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</table>

2. Advanced level courses (42 credits)

Disciplinary Core Courses (18 credits)

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
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</thead>
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<tr>
<td>BIOL3201</td>
<td>Food chemistry</td>
<td>6</td>
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<tr>
<td>BIOL3202</td>
<td>Nutritional biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3203</td>
<td>Food microbiology</td>
<td>6</td>
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</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>BIOL3204</td>
<td>Nutrition and the life cycle</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3206</td>
<td>Clinical nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3207</td>
<td>Food and nutritional toxicology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3208</td>
<td>Food safety and quality management</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3209</td>
<td>Food and nutrient analysis</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3210</td>
<td>Grain production and utilization</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3211</td>
<td>Nutrigenomics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3215</td>
<td>Principles of dietary assessment</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4201</td>
<td>Public health nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4204</td>
<td>Diet, brain function and behavior</td>
<td>6</td>
</tr>
</tbody>
</table>

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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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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: BIOL3207 Food and nutritional toxicology; BIOL3208 Food safety and quality management; BIOL3209 Food and nutrient analysis; BIOL3210 Grain production and utilization; BIOL4205 Food processing and engineering; BIOL4207 Meat and dairy sciences; BIOL4209 Functional foods; BIOL4210 Food product development; BIOL4411 Plant and food biotechnology.
   (b) Nutrition and Health Science: BIOL3204 Nutrition and the life cycle, BIOL3205 Human physiology; BIOL3206 Clinical nutrition; BIOL3207 Food and nutritional toxicology; BIOL3208 Food safety and quality management; BIOL3211 Nutrigenomics; BIOL4201 Public health nutrition.

6. Students who may wish to pursue postgraduate study in dietetics are strongly advised to consult their academic and course selection advisors regarding additional courses in Physiology and Biochemistry.

### Remarks:

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

Offered to students admitted to Year 1 in 2015

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:
(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology and nutrition and their relationship to human health; (b) critical knowledge and understanding on the relationship between food safety and a wide range of social, legal, technological and environmental factors; (c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students' critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical centers, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

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

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: apply and disseminate scientific knowledge obtained from food, nutrition and related biosciences for the understanding of the influences of nutrition in health and disease, using a range of formats and approaches (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food- and/or nutrition-related hypothesis (by means of coursework, tutorial classes, laboratory-based and project-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)
1. Introductory level courses (48 credits)
2. Advanced level courses (42 credits)
3. Disciplinary Electives (24 credits)

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

Disciplinary Core Courses (36 credits)
- BIOL1110 From molecules to cells (6)
- BIOL1201 Introduction to food and nutrition (6)
- BIOL1309 Evolutionary diversity (6)
- BIOL1103 Biostatistics (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2220 Principles of biochemistry (6)

Disciplinary Core Courses (18 credits)
- BIOL3201 Food chemistry (6)
- BIOL3202 Nutritional biochemistry (6)
- BIOL3203 Food microbiology (6)

Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
- BIOL3204 Nutrition and the life cycle (6)
- BIOL3205 Human physiology (6)
- BIOL3206 Clinical nutrition (6)
- BIOL3207 Food and nutritional toxicology (6)
- BIOL3208 Food safety and quality management (6)
- BIOL3209 Food and nutrient analysis (6)
- BIOL3210 Grain production and utilization (6)
- BIOL3211 Nutrigenomics (6)
- BIOL3215 Principles of dietary assessment (6)
- BIOL4201 Public health nutrition (6)
- BIOL4204 Diet, brain function and behavior (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 who wish to specialize in a certain area may choose to emphasize selection of courses from the following lists:
   (a) Food Science and Technology: BIOL3207 Food and nutritional toxicology; BIOL3208 Food safety and quality management; BIOL3209 Food and nutrient analysis; BIOL3210 Grain production and utilization; BIOL4205 Food processing and engineering; BIOL4207 Meat and dairy sciences; BIOL4209 Functional foods; BIOL4210 Food product development; BIOL4411 Plant and food biotechnology.
   (b) Nutrition and Health Science: BIOL3204 Nutrition and the life cycle, BIOL3205 Human physiology; BIOL3206 Clinical nutrition; BIOL3207 Food and nutritional toxicology; BIOL3208 Food safety and quality management; BIOL3211 Nutrigenomics; BIOL4201 Public health nutrition.

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.

7. BIOL4210 Food product development and BIOL4922 Food product development and evaluation are mutually exclusive.

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

Offered to students admitted to Year 1 in 2014

#### Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:

(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology and nutrition and their relationship to human health;

(b) critical knowledge and understanding on the relationship between food safety and a wide range of social, legal, technological and environmental factors;

(c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students' critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical centers, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

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

- **PLO 1**: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

- **PLO 2**: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

- **PLO 3**: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

- **PLO 4**: apply and disseminate scientific knowledge obtained from food, nutrition and related biosciences for the understanding of the influences of nutrition in health and disease, using a range of formats and approaches (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

- **PLO 5**: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food- and/or nutrition-related hypothesis (by means of coursework, tutorial classes, laboratory-based and project-based learning in the curriculum)

- **PLO 6**: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

#### Impermissible Combinations:
Minor in Food & Nutritional Science

<table>
<thead>
<tr>
<th>Required courses (96 credits)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (48 credits)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses: Science Foundation Courses (12 credits)</strong></td>
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<tr>
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<td>BIOL2101 Biostatistics (6)</td>
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<tr>
<td><strong>2. Advanced level courses (42 credits)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (18 credits)</strong></td>
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<tr>
<td>BIOL3201 Food chemistry (6)</td>
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<tr>
<td>BIOL3202 Nutritional biochemistry (6)</td>
<td></td>
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<tr>
<td>BIOL3203 Food microbiology (6)</td>
<td></td>
</tr>
<tr>
<td><strong>Disciplinary Electives (24 credits)</strong></td>
<td></td>
</tr>
<tr>
<td>At least 24 credits selected from the following courses:</td>
<td></td>
</tr>
<tr>
<td>BIOL3204 Nutrition and the life cycle (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3205 Human physiology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3206 Clinical nutrition (6)</td>
<td></td>
</tr>
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<td>BIOL3207 Food and nutritional toxicology (6)</td>
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<tr>
<td>BIOL4201 Public health nutrition (6)</td>
<td></td>
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<td>BIOL4204 Diet, brain function and behavior (6)</td>
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<td>-------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>BIOL4205</td>
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<td>BIOL4207</td>
<td>Meat and dairy sciences</td>
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<td>Functional foods</td>
</tr>
<tr>
<td>BIOL4210</td>
<td>Food product development</td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology</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)
- BIOL4912: Sensory evaluation of food (6)
- BIOL4922: Food product development and evaluation (6)
- BIOL4962: Food & nutritional science internship (6)
- BIOL4992: Food & nutritional science project (12)

### Notes:

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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.

7. BIOL4210 Food product development and BIOL4922 Food product development and evaluation are mutually exclusive.

### Remarks:

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

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with: (a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology and nutrition and their relationship to human health; (b) critical knowledge and understanding on the relationship between food safety 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:
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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 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food-and/or nutrition-related hypothesis (by means of coursework, tutorial classes, laboratory-based and project-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)

1. Introductory level courses (48 credits)
   - Disciplinary Core Courses: Science Foundation Courses (12 credits)
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - Disciplinary Core Courses (30 credits)
     - BIOL1110 From molecules to cells (6)
     - BIOL1201 Introduction to food and nutrition (6)
     - BIOL2102 Biostatistics (6)
     - BIOL2103 Biological sciences laboratory course (6)
     - BIOL2220 Principles of biochemistry (6)
   - Disciplinary Electives (6 credits)
     - BIOL1309 Evolutionary diversity (6)
     - BIOL2306 Ecology and evolution (6)

Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

2. Advanced level courses (42 credits)
   - Disciplinary Core Courses (18 credits)
     - BIOL3201 Food chemistry (6)
     - BIOL3202 Nutritional biochemistry (6)
     - BIOL3203 Food microbiology (6)
   - Disciplinary Electives (24 credits)
     - At least 24 credits selected from the following courses:
       - BIOL3204 Nutrition and the life cycle (6)
       - BIOL3205 Human physiology (6)
       - BIOL3206 Clinical nutrition (6)
       - BIOL3207 Food and nutritional toxicology (6)
       - BIOL3208 Food safety and quality management (6)
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BIOL3209</td>
<td>Food and nutrient analysis</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3210</td>
<td>Grain production and utilization</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3211</td>
<td>Nutrigenomics</td>
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</table>

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

At least 6 credits selected from the following courses:

- BIOL3992 Directed studies in food & nutritional science (6)
- BIOL4912 Sensory evaluation of food (6)
- 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 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 who wish to specialize in a certain area may choose to emphasize selection of courses from the following lists:
   (a) Food Science and Technology: BIOL3207 Food and nutritional toxicology; BIOL3208 Food safety and quality management; BIOL3209 Food and nutrient analysis; BIOL3210 Grain production and utilization; BIOL4205 Food processing and engineering; BIOL4207 Meat and dairy sciences; BIOL4210 Functional foods; BIOL4210 Food product development; BIOL4411 Plant and food biotechnology.
   (b) Nutrition and Health Science: BIOL3204 Nutrition and the life cycle; BIOL3205 Human physiology; BIOL3206 Clinical nutrition; BIOL3207 Food and nutritional toxicology; BIOL3208 Food safety and quality management; BIOL3211 Nutrigenomics; BIOL4201 Public health nutrition.

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.

7. BIOL4210 Food product development and BIOL4922 Food product development and evaluation are mutually exclusive.

**Remarks:**

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

Objectives:
The Major in Food and Nutritional Science aims to offer an exciting, dynamic, and challenging environment to prepare the students for career opportunities in food and nutritional science. The goals of the programme are to provide the students with:
(a) critical knowledge and understanding of the theoretical and practical aspects of food science and technology and nutrition and their relationship to human health; (b) critical knowledge and understanding on the relationship between food safety and a wide range of social, legal, technological and environmental factors; (c) a curriculum meeting the requirements for higher degree in MPhil and PhD and or the taught Master of Science degrees in the field of Food industry: Management and Marketing, Food Safety and Toxicology and the postgraduate diploma in dietetics.

The mission is to provide a progressive and effective programme that integrates theoretical and experiential learning to better prepare students for the challenges of the workplace. Throughout the curriculum, there is consistent emphasis on experiential learning through laboratory studies, internship training, research-based learning, debate and presentations, which are designed to enhance students’ critical thinking, communication and collaboration, tackling of ill-defined problems, development of individual learning objectives and self-evaluation of performance. Internship experiences can be gained in medical centers, schools, industries, government and community setting. Students graduated from this programme are prepared for diverse careers in the food industry, government or private-sector food and nutrition agencies, and scientific research laboratories, health-care and fitness facilities, hospitals, nutrition edition and communication enterprises.

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

PLO 1: understand the science underpinning food and nutrition as applied to diet and health, and to commercial food production (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: analyze controversial food related issues such as GM foods, nutritional labeling and food security (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: understand ethical perspectives and practice in all areas of food product development, food safety and public health nutrition, and appreciate and identify the need for ethical standards and professional codes of conduct (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: apply and disseminate scientific knowledge obtained from food, nutrition and related biosciences for the understanding of the influences of nutrition in health and disease, using a range of formats and approaches (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 5: apply independent thinking and the principles of scientific enquiry to conduct a small research project to test a food- and/or nutrition-related hypothesis (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 6: demonstrate communication and teamwork skills necessary to working in a multi-disciplinary environment (by means of coursework and group-project learning in the curriculum)

Impermissible Combinations:
Minor in Food & Nutritional Science

Required courses (96 credits)

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

   Disciplinary Core Courses (36 credits)
   - BIOL1110 From molecules to cells (6)
   - BIOL1201 Introduction to food and nutrition (6)
   - BIOL2102 Biostatistics (6)
   - BIOL2103 Biological sciences laboratory course (6)
   - BIOL2220 Principles of biochemistry (6)
   - BIOL2306 Ecology and evolution (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   - BIOL3201 Food chemistry (6)
   - BIOL3202 Nutritional biochemistry (6)
   - BIOL3203 Food microbiology (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   - BIOL3204 Nutrition and the life cycle (6)
   - BIOL3205 Human physiology (6)
   - BIOL3206 Clinical nutrition (6)
   - BIOL3207 Food and nutritional toxicology (6)
   - BIOL3208 Food safety and quality management (6)
   - BIOL3209 Food and nutrient analysis (6)
   - BIOL3210 Grain production and utilization (6)
   - BIOL3211 Nutrigenomics (6)
   - BIOL3215 Principles of dietary assessment (6)
   - BIOL4201 Public health nutrition (6)
   - BIOL4204 Diet, brain function and behavior (6)
BIOL4205 Food processing and engineering (6)
BIOL4207 Meat and dairy sciences (6)
BIOL4209 Functional foods (6)
BIOL4210 Food product development (6)
BIOL4411 Plant and food biotechnology (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
- BIOL3992 Directed studies in food & nutritional science (6)
- BIOL4912 Sensory evaluation of food (6)
- 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 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 who wish to specialize in a certain area may choose to emphasize selection of courses from the following lists:
   (a) Food Science and Technology: BIOL3207 Food and nutritional toxicology; BIOL3208 Food safety and quality management; BIOL3209 Food and nutrient analysis; BIOL3210 Grain production and utilization; BIOL4205 Food processing and engineering; BIOL4207 Meat and dairy sciences; BIOL4209 Functional foods; BIOL4210 Food product development; BIOL4411 Plant and food biotechnology.
   (b) Nutrition and Health Science: BIOL3204 Nutrition and the life cycle, BIOL3205 Human physiology; BIOL3206 Clinical nutrition; BIOL3207 Food and nutritional toxicology; BIOL3208 Food safety and quality management; BIOL3211 Nutrigenomics; BIOL4201 Public health nutrition.

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.

7. BIOL4210 Food product development and BIOL4922 Food product development and evaluation are mutually exclusive.

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

Objectives:
Geology concerns 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:
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 methods (6)
   EASC2406 Geochemistry (6)
   EASC2407 Mineralogy (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (36 credits)
   EASC3402 Petrology (6)
   EASC3403 Sedimentary environments (6)
   EASC3404 Structural geology (6)
   EASC3408 Geophysics (6)
   EASC3409 Igneous and metamorphic petrogenesis (6)
   EASC4406 Earth dynamics & global tectonics (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   EASC3406 Reconstruction of past climate (6)
   EASC3410 Hydrogeology (6)
   EASC3412 Earth resources (6)
   EASC3413 Engineering geology (6)
   EASC3414 Soil and rock mechanics (6)
   EASC3416 Advanced geochemistry and geochronology (6)
   EASC3417 Earth through time (6)
   EASC3999 Directed studies in earth sciences (6)
   ENVS3007 Natural hazards and mitigation (6)
   EASC4403 Biogeochemical cycles (6)
   EASC4407 Regional geology (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4955 Integrated field studies (6)

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

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

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

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

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

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:
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 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)
   ENV S3007 Natural hazards and mitigation (6)
   EASC4403 Biogeochemical cycles (6)
   EASC4407 Regional geology (6)
   EASC4408 Special topics in earth sciences (6)
   EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   EASC4955 Integrated field studies (6)

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

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

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

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

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

**Offered to students**
admitted to Year 1 in 2014

**Objectives:**
Geology concerns with the scientific study of the Earth's structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

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

**PLO 1:** describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

**PLO 2:** have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

**PLO 3:** communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

**PLO 4:** have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

**PLO 5:** work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

**Impermissible Combinations:**
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 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)
- ENV5307: Natural hazards and mitigation (6)
- EASC4403: Biogeochanical cycles (6)
- EASC4407: Regional geology (6)
- EASC4408: Special topics in earth sciences (6)
- EASC4999: Earth Sciences project (12)

3. **Capstone requirement (6 credits)**
- EASC4955: Integrated field studies (6)

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

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

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

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

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

Objectives:
Geology concerns with the scientific study of the Earth’s structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

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

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
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 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)
       - EASC3415 Advanced geochemistry and geochronology (6)
       - EASC3417 Earth through time (6)
       - EASC3999 Directed studies in earth sciences (6)
       - ENVS3007 Natural hazards and mitigation (6)
       - EASC4403 Biogeochemical cycles (6)
       - EASC4407 Regional geology (6)
       - EASC4408 Special topics in earth sciences (6)
       - EASC4999 Earth sciences project (12)

3. Capstone requirement (6 credits)
   - EASC4955 Integrated field studies (6)

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

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

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

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

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

Objectives:
Geology concerns with the scientific study of the Earth's structure, processes, material and history. Geologists apply knowledge of chemistry, biology, physics and mathematics to solve Earth problems. The Geology Major aims to give students a sound foundation of the geological sciences and enable them to pursue postgraduate studies or careers in the geosciences. The curriculum emphasizes the development of knowledge and skills, and practical experience in the field. The core courses are designed to give students a well-rounded understanding of the geological disciplines including petrology, paleontology, geophysics, geochemistry, geochronology and the applications of geological knowledge to resource development, natural hazard management, and geotechnical and environmental engineering. Students who wish to become a professional geologist may take additional designated courses designed to meet the pathway for accreditation as a chartered geologist.

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

PLO 1: describe and apply key concepts in the conventional areas of the geosciences, covering the areas of physical geology, historical geology, mineralogy, petrology, geochemistry, geophysics, structural geology, tectonics and petrogenesis, and earth resources (by means of coursework, laboratory-based, tutorial classes and project-based learning in the curriculum)

PLO 2: have acquired the ability to make observation, description, measurement and analysis of common geological features in the field, conduct geological mapping as well as undertake independent geological study, and appraise the related ethical issues (by means of both local and overseas residential field learning experience)

PLO 3: communicate scientific concepts and critically discuss aspects of contemporary issues pertaining to earth sciences, environments and resources (by means of capstone, project-based learning and presentation opportunities in the curriculum)

PLO 4: have gained some insight to the real-life industrial environment and developed connections within the geosciences profession (by means of internship opportunities in the curriculum)

PLO 5: work with others in an effective manner and have learned to accept and appreciate different cultures (by means of group project learning, field learning experience in the curriculum)

Impermissible Combinations:
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 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 Mathematics
Offered to students admitted to Year 1 in 2016

Objectives:
The Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize fundamental knowledge and concepts in Mathematics and elective courses provide training in both pure and applied aspects of Mathematics. Throughout the curriculum there is also emphasis on experiential learning through guided studies, projects, seminars and summer internships. With the diversity of courses offered in the major, various specializations are available. These will lead to careers in a wide range of sectors including education, economics and finance, logistics, management, research and further studies.

Learning Outcomes:
By the end of this programme, students should be able to:
PLO 1: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)
PLO 2: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)
PLO 3: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)
PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

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

Required courses (96 credits)
1. Introductory level courses (48 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111  Scientific method and reasoning (6)
   SCNC1112  Fundamentals of modern science (6)
   Disciplinary Core Courses (36 credits)
   MATH1013  University mathematics II (6)
   MATH2012  Fundamental concepts of mathematics (6)
   MATH2101  Linear algebra I (6)
   MATH2102  Linear algebra II (6)
   MATH2211  Multivariable calculus (6)
   MATH2241  Introduction to mathematical analysis (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (18 credits)
   MATH3301  Algebra I (6)
   MATH3401  Analysis I (6)
   MATH3403  Functions of a complex variable (6)
   Disciplinary Electives (24 credits)

   At least 24 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.

   List A
   MATH3001  Development of mathematical ideas (6)
   MATH3002  Mathematics seminar (6)
   MATH3303  Matrix theory and its applications (6)
   MATH3304  Introduction to number theory (6)
   MATH3405  Differential equations (6)
   MATH3408  Computational methods and differential equations with applications (6)
   MATH3541  Introduction to topology (6)
   MATH3600  Discrete mathematics (6)
   MATH3601  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)
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<tr>
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<td>Functional analysis</td>
<td>6</td>
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<tr>
<td>MATH4501</td>
<td>Geometry</td>
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<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>
<td>MATH7101</td>
<td>Intermediate complex analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH7201</td>
<td>Topics in geometry</td>
<td>6</td>
</tr>
<tr>
<td>MATH7202</td>
<td>Complex manifolds</td>
<td>6</td>
</tr>
<tr>
<td>MATH7217</td>
<td>Topics in financial mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH7219</td>
<td>Topics in applied functional analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory</td>
<td>6</td>
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<tr>
<td>MATH7501</td>
<td>Topics in algebra</td>
<td>6</td>
</tr>
<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH7503</td>
<td>Topics in mathematical programming and optimization</td>
<td>6</td>
</tr>
<tr>
<td>MATH7504</td>
<td>Geometric topology</td>
<td>6</td>
</tr>
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<td>MATH7505</td>
<td>Real analysis</td>
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### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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<td>Mathematics internship</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.

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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 http://www.scifac.hku.hk/ug/current/bsccurriculum/overlapping-course-req.

### Remarks:

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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, 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)

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Impermissible Combinations:
Major in Mathematics/Physics
Minor in Computational & Financial 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)
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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.

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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**: 2014

**Objectives:**  
The Major in Mathematics provides students with a solid and comprehensive undergraduate education in the subject. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems. Core courses in the curriculum emphasize fundamental knowledge and concepts in Mathematics and elective courses provide training in both pure and applied aspects of Mathematics. Throughout the curriculum there is also emphasis on experiential learning through guided studies, projects, seminars and summer internships. With the diversity of courses offered in the major, various specializations are available. These will lead to careers in a wide range of sectors including education, economics and finance, 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)
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**Impermissible Combinations:**
- Major in Mathematics/Physics
- Minor in Computational & Financial Mathematics
- Minor in Mathematics
- Minor in Operations Research & Mathematical Programming

**Required courses (96 credits)**

1. **Introductory level courses (48 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
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   - **Disciplinary Core Courses (36 credits)**
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     - MATH2101: Linear algebra I (6)
     - MATH2102: Multivariable calculus (6)

2. **Advanced level courses (42 credits)**
   - **Disciplinary Core Courses (18 credits)**
     - MATH3301: Algebra I (6)
     - MATH3401: Analysis I (6)
     - MATH3403: Functions of a complex variable (6)
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.

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<tbody>
<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>
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<td>MATH4907</td>
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<td>(6)</td>
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<td>Intermediate complex analysis</td>
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</tr>
<tr>
<td>MATH7201</td>
<td>Topics in geometry</td>
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<tr>
<td>MATH7202</td>
<td>Complex manifolds</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7217</td>
<td>Topics in financial mathematics</td>
<td>(6)</td>
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<td>Topics in applied functional analysis</td>
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</tr>
<tr>
<td>MATH7224</td>
<td>Topics in advanced probability theory</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7501</td>
<td>Topics in algebra</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7502</td>
<td>Topics in applied discrete mathematics</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7503</td>
<td>Topics in mathematical programming and optimization</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7504</td>
<td>Geometric topology</td>
<td>(6)</td>
</tr>
<tr>
<td>MATH7505</td>
<td>Real analysis</td>
<td>(6)</td>
</tr>
</tbody>
</table>

### 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.


**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2013

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, logistics, management, research and further studies.

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

PLO 1: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)

PLO 2: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)

PLO 3: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)

PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)

PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

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

Required courses (96 credits)

1. Introductory level courses (48 credits)

Disciplinary Core Courses: Science Foundation Courses (12 credits)

<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>
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Disciplinary Core Courses (36 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
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<tr>
<td>MATH2012</td>
<td>Fundamental concepts of mathematics</td>
<td>6</td>
</tr>
<tr>
<td>MATH2101</td>
<td>Linear algebra I</td>
<td>6</td>
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<tr>
<td>MATH2102</td>
<td>Linear algebra II</td>
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<tr>
<td>MATH2211</td>
<td>Multivariable calculus</td>
<td>6</td>
</tr>
<tr>
<td>MATH2241</td>
<td>Introduction to mathematical analysis</td>
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</table>

2. Advanced level courses (42 credits)

Disciplinary Core Courses (18 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH3301</td>
<td>Algebra I</td>
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</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>
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</table>

Disciplinary Electives (24 credits)

At least 24 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.

List A

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3001</td>
<td>Development of mathematical ideas</td>
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<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>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>
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<tr>
<td>MATH3601</td>
<td>Numerical analysis</td>
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<td>MATH3603</td>
<td>Probability theory</td>
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<td>Operations research I</td>
<td>6</td>
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<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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<td>MATH3906</td>
<td>Financial calculus</td>
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<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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<tr>
<td>MATH4302</td>
<td>Algebra II</td>
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<tr>
<td>MATH4402</td>
<td>Analysis II</td>
<td>6</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>MATH4404</td>
<td>Functional analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH4405</td>
<td>Introduction to partial differential equations</td>
<td>6</td>
</tr>
<tr>
<td>MATH4501</td>
<td>Geometry</td>
<td>6</td>
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<td>MATH4511</td>
<td>Introduction to differentiable manifolds</td>
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<td>MATH4602</td>
<td>Scientific computing</td>
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<td>Operations research II</td>
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<td>MATH4907</td>
<td>Numerical methods for financial calculus</td>
<td>6</td>
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<tr>
<td>MATH7101</td>
<td>Intermediate complex analysis</td>
<td>6</td>
</tr>
<tr>
<td>MATH7201</td>
<td>Topics in geometry</td>
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<td>MATH7202</td>
<td>Complex manifolds</td>
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<td>MATH7217</td>
<td>Topics in financial mathematics</td>
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<td>MATH7224</td>
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<td>MATH7504</td>
<td>Geometric topology</td>
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<td>MATH7505</td>
<td>Real analysis</td>
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</tr>
</tbody>
</table>

### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- MATH3999 Directed studies in mathematics (6)
- MATH4910 Senior mathematics seminar (6)
- MATH4911 Mathematics capstone project (6)
- MATH4966 Mathematics internship (6)
- MATH4999 Mathematics project (12)

**Notes:**

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

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

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

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


**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 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, logistics, management, research and further studies.

Learning Outcomes:
By the end of this programme, students should be able to:
PLO 1: describe and present fundamental concepts in mathematics (by means of coursework and learning activities in the major or minor curriculum)
PLO 2: apply mathematical theory and techniques to different areas of Sciences, and appraise the related ethical issues (by means of coursework and learning activities in the major or minor curriculum)
PLO 3: communicate in mathematical language and present scientific arguments (by means of coursework, seminars, guided studies and projects)
PLO 4: collaborate and work with other students in an effective manner (by means of guided studies, projects and seminars)
PLO 5: appreciate the beauty and power of mathematics (by means of guided studies, projects and seminars)

Impermissible Combinations:
- Major in Mathematics/Physics
- Minor in Computational & Financial Mathematics
- Minor in Mathematics

Required courses (96 credits)
1. Introductory level courses (48 credits)
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)
   - 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)
   - MATH3301 Algebra I (6)
   - MATH3401 Analysis I (6)
   - MATH3403 Functions of a complex variable (6)

Disciplinary Electives (24 credits)
At least 24 credits advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), of which at least 12 credits should be from MATH4XXX or MATH7XXX level, subject to pre-requisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements, but excluding MATH4966 Mathematics Internship.

List A
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- 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)
- 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)
MATH7201 Topics in geometry (6)
MATH7202 Complex manifolds (6)
MATH7217 Topics in financial mathematics (6)
MATH7219 Topics in applied functional analysis (6)
MATH7224 Topics in advanced probability theory (6)
MATH7501 Topics in algebra (6)
MATH7502 Topics in applied discrete mathematics (6)
MATH7503 Topics in mathematical programming and optimization (6)
MATH7504 Geometric topology (6)
MATH7505 Real analysis (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
MATH3999 Directed studies in mathematics (6)
MATH4910 Senior mathematics seminar (6)
MATH4911 Mathematics capstone project (6)
MATH4966 Mathematics internship (6)
MATH4999 Mathematics project (12)

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

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

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

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

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

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

Objectives:
The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

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

PLO 1: identify and describe physical systems with a rigorous representation using their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)

PLO 3: apply mathematical theory and techniques to analyze physical problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

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

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

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

Required courses (96 credits)

1. Introductory level courses (48 credits)

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

Disciplinary Core Courses (36 credits)
MATH1013 University mathematics II (6)
MATH2101 Linear algebra I (6)
MATH2211 Multivariable calculus (6)
PHYS1250 Fundamental physics (6)
PHYS2250 Introductory mechanics (6)
PHYS2265 Modern physics (6)

2. Advanced level courses (42 credits)

Disciplinary Core Courses (36 credits)
MATH3301 Algebra I (6)
MATH3401 Analysis I (6)
MATH4501 Geometry (6)
PHYS3350 Classical mechanics (6)
PHYS3351 Quantum mechanics (6)
PHYS4351 Advanced quantum mechanics (6)

Disciplinary Electives (6 credits)
At least 6 credits of advanced level Mathematics or Physics courses (MATH3XXX or MATH4XXX or MATH7XXX or PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list of courses include courses in List A and those courses not selected to fulfill the capstone requirement, but excluding MATH4966 Mathematics Internship.

List A
MATH3001 Development of mathematical ideas (6)
MATH3002 Mathematics seminar (6)
MATH3303 Matrix theory and its applications (6)
MATH3304 Introduction to number theory (6)
MATH3403 Functions of a complex variable (6)
MATH3405 Differential equations (6)
MATH3408 Computational methods and differential equations with applications (6)
MATH3541 Introduction to topology (6)
### Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH3600</td>
<td>Discrete mathematics</td>
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<td>MATH3603</td>
<td>Probability theory</td>
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<td>MATH3901</td>
<td>Operations research I</td>
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</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>
</tr>
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<td>MATH3906</td>
<td>Financial calculus</td>
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<td>Game theory and strategy</td>
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<td>MATH3943</td>
<td>Network models in operations research</td>
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### 3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

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<td>MATH4966</td>
<td>Mathematics internship</td>
<td>6</td>
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<tr>
<td>MATH4999</td>
<td>Mathematics project</td>
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<tr>
<td>PHYS3999</td>
<td>Directed studies in physics</td>
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<td>PHYS4966</td>
<td>Physics internship</td>
<td>6</td>
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<td>PHYS4999</td>
<td>Physics project</td>
<td>12</td>
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</table>

### Notes:

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

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

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

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

5. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and
(b) Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


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

The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

**Learning Outcomes:**

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

- **PLO 1:** identify and describe physical systems with a rigorous representation using their professional knowledge (by means of coursework and tutorial classes in the curriculum)
- **PLO 2:** have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)
- **PLO 3:** apply mathematical theory and techniques to analyze physical problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)
- **PLO 4:** communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
- **PLO 5:** apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

**Impermissible Combinations:**

Major in Mathematics
Major in Physics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming
Minor in Physics

**Required courses (96 credits)**

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

2. **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
   - MATH1013 University mathematics II (6)
   - MATH2101 Linear algebra I (6)
   - MATH2211 Multivariable calculus (6)
   - PHYS1250 Fundamental physics (6)
   - PHYS2250 Introductory mechanics (6)
   - PHYS2265 Modern physics (6)

3. **Disciplinary Core Courses (36 credits)**
   - MATH1101 Linear algebra II (6)
   - MATH2101 Linear algebra I (6)
   - MATH2211 Multivariable calculus (6)
   - PHYS1250 Fundamental physics (6)
   - PHYS2250 Introductory mechanics (6)
   - PHYS2265 Modern physics (6)

4. **Advanced level courses (42 credits)**
   - MATH3001 Development of mathematical ideas (6)
   - MATH3002 Mathematics seminar (6)
   - MATH3201 Analysis I (6)
   - MATH3401 Geometry (6)
   - PHYS3350 Classical mechanics (6)
   - PHYS3351 Quantum mechanics (6)
   - PHYS4351 Advanced quantum mechanics (6)

5. **Disciplinary Electives (6 credits)**
   - At least 6 credits of advanced level Mathematics or Physics courses (MATH3XXX or MATH4XXX or MATH7XXX or PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list of courses include courses in List A and those courses not selected to fulfill the capstone requirement, but excluding MATH4966 Mathematics Internship.

**List A**

- MATH3301 Algebra I (6)
- MATH3401 Analysis I (6)
- MATH3501 Geometry (6)
- PHYS3350 Classical mechanics (6)
- PHYS3351 Quantum mechanics (6)
- PHYS4351 Advanced quantum mechanics (6)

- MATH3301 Development of mathematical ideas (6)
- MATH3302 Mathematics seminar (6)
- MATH3303 Matrix theory and its applications (6)
- MATH3304 Introduction to number theory (6)
- MATH3305 Functions of a complex variable (6)
- MATH3306 Differential equations (6)
- MATH3308 Computational methods and differential equations with applications (6)
- MATH3351 Introduction to topology (6)
- MATH3360 Discrete mathematics (6)
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<td>Numerical analysis</td>
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<td>MATH3904</td>
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<td>Queueing theory and simulation</td>
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3. **Capstone requirement (6 credits)**

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

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

5. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and

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


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

Objectives:
The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

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

PLO 1: identify and describe physical systems with a rigorous representation using their professional knowledge (by means of coursework and tutorial classes in the curriculum)

PLO 2: have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)

PLO 3: apply mathematical theory and techniques to analyze physical problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)

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

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

Impermissible Combinations:
Major in Mathematics
Major in Physics
Minor in Mathematics
Minor in Operations Research & Mathematical Programming
Minor in Physics

Required courses (96 credits)

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

Disciplinary Core Courses (36 credits)
MATH1013 University mathematics II (6)
MATH2101 Linear algebra I (6)
PHYS1250 Fundamental physics (6)
PHYS2250 Introductory mechanics (6)

2. Advanced level courses (42 credits)
Disciplinary Core Courses (36 credits)
MATH3301 Algebra I (6)
MATH3401 Analysis I (6)
MATH3501 Geometry (6)
PHYS3350 Classical mechanics (6)
PHYS3351 Quantum mechanics (6)

Disciplinary Electives (6 credits)
At least 6 credits of advanced level Mathematics or Physics courses (MATH3XXX or MATH4XXX or MATH7XXX or PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list of courses include courses in List A and those courses not selected to fulfill the capstone requirement, but excluding MATH4966 Mathematics Internship.

List A
MATH3001 Development of mathematical ideas (6)
MATH3002 Mathematics seminar (6)
MATH3303 Matrix theory and its applications (6)
MATH3304 Introduction to number theory (6)
MATH3403 Functions of a complex variable (6)
MATH3405 Differential equations (6)
MATH3408 Computational methods and differential equations with applications (6)
MATH3541 Introduction to topology (6)
MATH3600 Discrete mathematics (6)
3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:

MATH3999 Directed studies in mathematics (6)
MATH4910 Senior mathematics seminar (6)
MATH4911 Mathematics capstone project (6)
MATH4966 Mathematics internship (6)
MATH4999 Mathematics project (12)
PHYS3999 Directed studies in physics (6)
PHYS4966 Physics internship (6)
PHYS4999 Physics project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include 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. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and
(b) Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


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

**Offered to students**: admitted to Year 1 in 2013

**Objectives:**
The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

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

- **PLO 1**: identify and describe physical systems with a rigorous representation using their professional knowledge (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)
- **PLO 3**: apply mathematical theory and techniques to analyze physical problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)
- **PLO 4**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
- **PLO 5**: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

**Impermissible Combinations:**
- Major in Mathematics
- Major in Physics
- Minor in Mathematics
- Minor in Operations Research & Mathematical Programming
- Minor in Physics

**Required courses (96 credits)**

1. **Introductory level courses (48 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - **Disciplinary Core Courses (36 credits)**
     - MATH1013 University mathematics II (6)
     - MATH2101 Linear algebra I (6)
     - MATH2211 Multivariable calculus (6)
     - PHYS1250 Fundamental physics (6)
     - PHYS2250 Introductory mechanics (6)
     - PHYS2265 Modern physics (6)

2. **Advanced level courses (42 credits)**
   - **Disciplinary Core Courses (36 credits)**
     - MATH3301 Algebra I (6)
     - MATH3401 Analysis I (6)
     - MATH4501 Geometry (6)
     - PHYS3350 Classical mechanics (6)
     - PHYS3351 Quantum mechanics (6)
     - PHYS3355 Advanced quantum mechanics (6)
   - **Disciplinary Electives (6 credits)**
     - At least 6 credits of advanced level Mathematics or Physics courses (MATH3XXX or MATH4XXX or MATH7XXX or PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list of courses include courses in List A and those courses not selected to fulfill the capstone requirement, but excluding MATH4966 Mathematics Internship.

**List A**
- MATH3001 Development of mathematical ideas (6)
- MATH3002 Mathematics seminar (6)
- MATH3003 Matrix theory and its applications (6)
- MATH3004 Introduction to number theory (6)
- MATH3005 Functions of a complex variable (6)
- MATH3008 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)
MATH4511 Introduction to differentiable manifolds (6)
MATH4602 Scientific computing (6)
MATH4902 Operations research II (6)
MATH4907 Numerical methods for financial calculus (6)
MATH7201 Intermediate complex analysis (6)
MATH7202 Topics in geometry (6)
MATH7217 Topics in financial mathematics (6)
MATH7219 Topics in applied functional analysis (6)
MATH7224 Topics in advanced probability theory (6)
MATH7501 Topics in algebra (6)
MATH7502 Topics in applied discrete mathematics (6)
MATH7503 Topics in mathematical programming and optimization (6)
MATH7504 Geometric topology (6)
MATH7505 Real analysis (6)
PHYS3150 Theoretical physics (6)
PHYS3450 Electromagnetism (6)
PHYS3550 Statistical mechanics & thermodynamics (6)
PHYS3551 Introductory solid state physics (6)
PHYS3650 Observational astronomy (6)
PHYS3651 The physical universe (6)
PHYS3652 Principles of astronomy (6)
PHYS3750 Laser and spectroscopy (6)
PHYS3751 Physics of nanomaterials (6)
PHYS3850 Waves and optics (6)
PHYS3851 Atomic and nuclear physics (6)
PHYS4150 Computational physics (6)
PHYS4151 Data analysis and modeling in physics (6)
PHYS4350 Advanced classical mechanics (6)
PHYS4450 Advanced electromagnetism (6)
PHYS4550 Advanced statistical mechanics (6)
PHYS4650 Stellar physics (6)
PHYS4651 Selected topics in astrophysics (6)
PHYS4652 Planetary science (6)
PHYS4653 Cosmology (6)
PHYS4654 General relativity (6)
PHYS4655 Interstellar medium (6)
PHYS4750 Experimental physics (6)
PHYS4850 Particle physics (6)
PHYS7350 Graduate classical mechanics (6)
PHYS7351 Graduate quantum mechanics (6)
PHYS7450 Graduate electromagnetism (6)
PHYS7550 Graduate statistical mechanics (6)
PHYS7551 Solid state physics (6)
PHYS7650 Stellar atmospheres (6)
PHYS7750 Nanophysics (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:
MATH3999 Directed studies in mathematics (6)
MATH4910 Senior mathematics seminar (6)
MATH4911 Mathematics capstone project (6)
MATH4966 Mathematics internship (6)
MATH4999 Mathematics project (12)
PHYS3999 Directed studies in physics (6)
PHYS4966 Physics internship (6)
PHYS4999 Physics project (12)

Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include 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. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and
(b) Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


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

Objectives:
The Major in Mathematics/Physics aims to provide students with a solid foundation in both physics and mathematics. This major is catered especially for students interested in the more theoretical aspects of physics. It covers a wide range of core areas in both disciplines which form the blocks of fundamental knowledge for further specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics, electrodynamics, linear algebra, mathematical analysis, abstract algebra, complex variables, differential equations, modern differential geometry, etc. A large selection of elective courses is provided for students to pursue a broad spectrum of professional knowledge in mathematical and theoretical physics. Analytical thinking, quantitative reasoning and innovative ideas are fostered through the effective design of courses and research projects. The curriculum emphasizes experiential learning through internships, field studies and research projects supervised by experts. With the comprehensive training received, graduates are expected to be well-prepared for further studies and to pursue careers in many fields of science and engineering.

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

PLO 1: identify and describe physical systems with a rigorous representation using their professional knowledge (by means of coursework and tutorial classes in the curriculum)
PLO 2: have developed their scientific intuition, abilities and techniques to tackle physical problems with intellectual rigor theoretically (by means of coursework, tutorial classes and assessments in the curriculum)
PLO 3: apply mathematical theory and techniques to analyze physical problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)
PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
PLO 5: apply scientific and quantitative methods in tackling problems in research or real-world setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Major in Mathematics
Major in Physics
Minor in Mathematics
Minor in Physics

Required courses (96 credits)

1. Introductory level courses (48 credits)

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

Disciplinary Core Courses (36 credits)
MATH1013 University mathematics II (6)
MATH2101 Linear algebra I (6)
MATH2211 Multivariable calculus (6)
PHYS1250 Fundamental physics (6)
PHYS2250 Introductory mechanics (6)
PHYS2265 Modern physics (6)

2. Advanced level courses (42 credits)

Disciplinary Core Courses (36 credits)
MATH3301 Algebra I (6)
MATH3401 Analysis I (6)
MATH4501 Geometry (6)
PHYS3350 Classical mechanics (6)
PHYS3351 Quantum mechanics (6)
PHYS4351 Advanced quantum mechanics (6)

Disciplinary Electives (6 credits)
At least 6 credits of advanced level Mathematics or Physics courses (MATH3XXX or MATH4XXX or MATH7XXX or PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list of courses include courses in List A and those courses not selected to fulfill the capstone requirement, but excluding MATH4966 Mathematics Internship.

List A
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MATH3002 Mathematics seminar (6)
MATH3303 Matrix theory and its applications (6)
MATH3304 Introduction to number theory (6)
MATH3403 Functions of a complex variable (6)
MATH3405 Differential equations (6)
MATH3408 Computational methods and differential equations with applications (6)
MATH3541 Introduction to topology (6)
MATH3600 Discrete mathematics (6)
MATH3601 Numerical analysis (6)
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<td>Queueing theory and simulation</td>
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<td>Game theory and strategy</td>
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<td>Physics of nanomaterials</td>
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<tr>
<td>PHYS7750</td>
<td>Nanophysics</td>
<td>6</td>
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</table>

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

At least 6 credits selected from the following courses:

- MATH3999  Direct studies in mathematics (6)
- MATH4910  Senior mathematics seminar (6)
- MATH4911  Mathematics capstone project (6)
- MATH4966  Mathematics internship (6)
- MATH4999  Mathematics project (12)
- PHYS3999  Directed studies in physics (6)
- PHYS4966  Physics internship (6)
- PHYS4999  Physics project (12)

**Notes:**

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

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

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

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

5. (a) Students must have level 3 or above in HKDSE Physics or HKDSE Combined Science with Physics component or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry; and
(b) Students must have level 2 or above in HKDSE Extended Module 1 or 2 of Mathematics or equivalent to take this major. Students who do not fulfill this requirement are advised to take MATH1011 University mathematics I.


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

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop 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:
Minor in Molecular Biology & Biotechnology

Required courses (96 credits)

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

   Disciplinary Core Courses (24 credits)
   BIOL1110 From molecules to cells (6)
   BIOL2102 Biostatistics (6)
   BIOL2103 Biological sciences laboratory course (6)
   BIOL2220 Principles of biochemistry (6)
   BIOL2220 or BIOC2600 to fulfill this 24 credits requirement, but not both. BIOL2220 and BIOC2600 are mutually exclusive.

   BIOC2600 Basic biochemistry (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (30 credits)
   BIOL3401 Molecular biology (6)
   BIOL3402 Cell biology and cell technology (6)
   BIOL3508 Microbial physiology and biotechnology (6)
   BIOL4411 Plant and food biotechnology (6)
   BIOL4415 Healthcare biotechnology (6)

   Disciplinary Electives (18 credits)
   At least 18 credits selected from the following courses:
   BIOL3403 Immunology (6)
   BIOL3404 Protein structure and function (6)
   BIOL3406 Reproduction and reproductive biotechnology (6)
   BIOL3408 Genetics (6)
   BIOL3409 Business aspects of biotechnology (6)
   BIOL4401 Medical microbiology and applied immunology (6)

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

   Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

   Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.
Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL4409</td>
<td>General virology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4417</td>
<td>'Omics' and systems biology</td>
<td>6</td>
</tr>
<tr>
<td>ENVS4110</td>
<td>Environmental remediation</td>
<td>6</td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>BIOL3993</td>
<td>Directed studies in Molecular biology &amp; biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4963</td>
<td>Molecular biology &amp; biotechnology internship</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4993</td>
<td>Molecular biology &amp; biotechnology project</td>
<td>12</td>
</tr>
</tbody>
</table>

Notes:

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

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

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

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

Remarks:

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

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:
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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<tr>
<td>SCNC1111</td>
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<td>SCNC1112</td>
<td>Fundamentals of modern science</td>
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Disciplinary Core Courses (24 credits)

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</thead>
<tbody>
<tr>
<td>BIOL1110</td>
<td>From molecules to cells</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2102</td>
<td>Biostatistics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2103</td>
<td>Biological sciences laboratory course</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOC2600</td>
<td>Basic biochemistry</td>
<td>6</td>
</tr>
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</table>

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

Disciplinary Electives (6 credits)

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOL1309</td>
<td>Evolutionary diversity</td>
<td>6</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

2. Advanced level courses (48 credits)

Disciplinary Core Courses (30 credits)

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<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>BIOL3401</td>
<td>Molecular biology</td>
<td>6</td>
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<tr>
<td>BIOL3402</td>
<td>Cell biology and cell technology</td>
<td>6</td>
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<td>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOC2600</td>
<td>Microbial biotechnology</td>
<td>6</td>
</tr>
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</table>

Take either BIOL3508 or BIOC4402 to fulfill this 30 credits requirement, but not both. BIOL3508 and BIOC4402 are mutually exclusive.

Disciplinary Electives (18 credits)

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<tbody>
<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>

Take either BIOL3508 or BIOC4402 to fulfill this 30 credits requirement, but not both. BIOL3508 and BIOC4402 are mutually exclusive.
At least 18 credits selected from the following courses:

- BIOL3403 Immunology (6)
- BIOL3404 Protein structure and function (6)
- BIOL3405 Molecular microbiology (6)
- BIOL3406 Reproduction and reproductive biotechnology (6)
- BIOL3408 Genetics (6)
- BIOL3409 Business aspects of biotechnology (6)
- BIOL4401 Medical microbiology and applied immunology (6)
- BIOL4409 General virology (6)
- BIOL4416 Stem cells and regenerative biology (6)
- BIOL4417 'Omics' and systems biology (6)
- ENV54110 Environmental remediation (6)

3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:

- BIOL3993 Directed studies in Molecular biology & biotechnology (6)
- BIOL4963 Molecular biology & biotechnology internship (6)
- BIOL4993 Molecular biology & biotechnology project (12)

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

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

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

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

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

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

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

PLO 1: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

PLO 2: apply laboratory techniques essential to modern molecular science (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

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PLO 5: gain insights into real-life experience in the applications of biotechnology for human health, agriculture, and the environment (by means of coursework, laboratory-based and experiential learning in the curriculum)

Impermissible Combinations:
Minor in Molecular Biology & Biotechnology

Required courses (96 credits)
1. Introductory level courses (42 credits)

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

Disciplinary Core Courses (24 credit)
- BIOL1110 From molecules to cells (6)
- BIOL2102 Biostatistics (6)
- BIOL2103 Biological sciences laboratory course (6)
- BIOL2220 Principles of biochemistry (6)

- 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)

2. Advanced level courses (48 credits)

Disciplinary Core Courses (30 credit)
- BIOL3401 Molecular biology (6)
- BIOL3402 Cell biology and cell technology (6)
- BIOL3508 Microbial physiology and biotechnology (6)

- BIOL4402 Microbial biotechnology (6)
  Take either BIOL3508 or BIOL4402 to fulfill this 30 credits requirement, but not both. BIOL3508 and BIOL4402 are mutually exclusive.

Disciplinary Electives (18 credit)
- BIOL4411 Plant and food biotechnology (6)
- BIOL4415 Healthcare biotechnology (6)
At least 18 credits selected from the following courses:

- BIOL3403  Immunology (6)
- BIOL3404  Protein structure and function (6)
- BIOL3405  Molecular microbiology (6)
- BIOL3406  Reproduction and reproductive biotechnology (6)
- BIOL3408  Genetics (6)
- BIOL3409  Business aspects of biotechnology (6)
- BIOL4401  Medical microbiology and applied immunology (6)
- BIOL4409  General virology (6)
- BIOL4416  Stem cells and regenerative biology (6)
- BIOL4417  'Omics' and systems biology (6)
- ENVS4110  Environmental remediation (6)

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

- BIOL3993  Directed studies in Molecular biology & biotechnology (6)
- BIOL4963  Molecular biology & biotechnology internship (6)
- BIOL4993  Molecular biology & biotechnology project (12)

Notes:

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Impermissible Combinations:
Minor in Molecular Biology & Biotechnology

Required courses (96 credits)

1. Introductory level courses (42 credits)

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

Disciplinary Core Courses (24 credits)
BIOL1110 From molecules to cells (6)
BIOL2102 Biostatistics (6)
BIOL2103 Biological sciences laboratory course (6)
BIOL2220 Principles of biochemistry (6)

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

BIOC2600 Basic biochemistry (6)

Disciplinary Electives (6 credits)
BIOL1309 Evolutionary diversity (6)
BIOL2306 Ecology and evolution (6)

Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

2. Advanced level courses (48 credits)

Disciplinary Core Courses (30 credits)
BIOL3401 Molecular biology (6)
BIOL3402 Cell biology and cell technology (6)
BIOL3508 Microbial physiology and biotechnology (6)

BIOL4402 Microbial biotechnology (6)

Take either BIOL3508 or BIOL4402 to fulfill this 30 credits requirement, but not both. BIOL3508 and BIOL4402 are mutually exclusive.

BIOL4411 Plant and food biotechnology (6)
BIOL4415 Healthcare biotechnology (6)

Disciplinary Electives (18 credits)
At least 18 credits selected from the following courses:

- BIOL3403 Immunology (6)
- BIOL3404 Protein structure and function (6)
- BIOL3405 Molecular microbiology (6)
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3. Capstone requirement (6 credits)

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Remarks:

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

Offered to students admitted to Year 1 in 2012

Objectives:
Recent advancements in Molecular Biology & Biotechnology have not only cracked important and fundamental problems in life sciences, but also emerged as a mainstay of science and technologies of the 21st century. Innovations from advances in these fields have substantially transformed our daily lives, society and environment. This Major offers specialized training in state-of-the-art molecular and cell biology, and in the translation of basic knowledge into modern industrial and medical applications. Students will be able to gain an understanding of cutting edge molecular biology and biotechnological applications, ranging from exploitation of bioactive substances, genetic engineering for agricultural production, fisheries and aquaculture, biomedical researches for pharmaceutical and clinical purposes, biofuels as alternative energy sources, bioremediation for cleaning up contaminated environments, and wastewater treatment. Built upon a sound theoretical foundation, students will further develop various essential skills in molecular biology and biotechnology through hands-on laboratory trainings and experimental biology-based projects. A feature of this major is to provide key transferable skills by engaging students in inquiry, critical thinking, and problem solving in their learning.

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

PLO 1: describe key concepts in molecular biology and modern biotechnology using knowledge from cell biology, microbiology, biochemistry, immunology, omics and systems biology (by means of coursework and laboratory-based and/or research-based opportunities in the curriculum)

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:
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>BIOL2220</td>
<td>Principles of biochemistry</td>
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<tr>
<td>BIOLC2600</td>
<td>Basic biochemistry</td>
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</tbody>
</table>

Take either BIOL2220 or BIOLC2600 to fulfill this 24 credits requirement, but not both. BIOL2220 and BIOLC2600 are mutually exclusive.

Disciplinary Electives (6 credits)

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</table>

Take either BIOL1309 or BIOL2306 to fulfill this 6 credits requirement, but not both.

2. Advanced level courses (48 credits)

Disciplinary Core Courses (30 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<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>BIOL3508</td>
<td>Microbial physiology and biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4402</td>
<td>Microbial biotechnology</td>
<td>6</td>
</tr>
</tbody>
</table>

Take either BIOL3508 or BIOL4402 to fulfill this 30 credits requirement, but not both. BIOL3508 and BIOL4402 are mutually exclusive.

Disciplinary Electives (18 credits)

<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>
<tr>
<td>BIOL4415</td>
<td>Healthcare biotechnology</td>
<td>6</td>
</tr>
</tbody>
</table>
At least 18 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3403</td>
<td>Immunology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3404</td>
<td>Protein structure and function</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3405</td>
<td>Molecular microbiology</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>BIOL3409</td>
<td>Business aspects of biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4401</td>
<td>Medical microbiology and applied immunology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4409</td>
<td>General virology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4416</td>
<td>Stem cells and regenerative biology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4417</td>
<td>'Oomics' and systems biology</td>
<td>6</td>
</tr>
<tr>
<td>ENVS4110</td>
<td>Environmental remediation</td>
<td></td>
</tr>
</tbody>
</table>

3. Capstone requirement (6 credits)

At least 6 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3993</td>
<td>Directed studies in Molecular biology &amp; biotechnology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4963</td>
<td>Molecular biology &amp; biotechnology internship</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4993</td>
<td>Molecular biology &amp; biotechnology project</td>
<td>12</td>
</tr>
</tbody>
</table>

Notes:

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

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 Physics
Offered to students admitted to Year 1 in 2016

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

Learning Outcomes:
By the end of this programme, students should be able to:
PLO 1: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)
PLO 2: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)
PLO 3: analyze problems qualitatively and quantitatively, and appraise the related ethical issues (by means of coursework, tutorial classes and research-based projects in the curriculum)
PLO 4: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)
PLO 5: apply scientific and quantitative methods in tackling problems in research or real-word setting (by means of projects, directed studies, local and foreign internships attached to universities, research centers, government bodies, NGOs and influential companies)

Impermissible Combinations:
Major in Mathematics/Physics
Minor in Physics

Required courses (96 credits)

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

   Disciplinary Core Courses (36 credits)
   PHYS1150 Problem solving in physics (6)
   PHYS1250 Fundamental physics (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2260 Heat and waves (6)
   PHYS2265 Modern physics (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (24 credits)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS3450 Electromagnetism (6)
   PHYS3550 Statistical mechanics & thermodynamics (6)

   Disciplinary Electives (18 credits)
   At least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.

   List A
   PHYS3150 Theoretical physics (6)
   PHYS3351 Introductory solid state physics (6)
   PHYS3650 Observational astronomy (6)
   PHYS3651 The physical universe (6)
   PHYS3652 Principles of astronomy (6)
   PHYS3750 Laser and spectroscopy (6)
   PHYS3751 Physics of nanomaterials (6)
   PHYS3850 Waves and optics (6)
   PHYS3851 Atomic and nuclear physics (6)
   PHYS4150 Computational physics (6)
   PHYS4151 Data analysis and modeling in physics (6)
   PHYS4350 Advanced classical mechanics (6)
   PHYS4351 Advanced quantum mechanics (6)
   PHYS4450 Advanced electromagnetism (6)
   PHYS4550 Advanced statistical mechanics (6)
   PHYS4650 Stellar physics (6)
   PHYS4651 Selected topics in astrophysics (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Cosmology (6)
   PHYS4654 General relativity (6)
PHYS4655 Interstellar medium (6)
PHYS4750 Experimental physics (6)
PHYS4850 Particle physics (6)
PHYS7350 Graduate classical mechanics (6)
PHYS7351 Graduate quantum mechanics (6)
PHYS7450 Graduate electromagnetism (6)
PHYS7550 Graduate statistical mechanics (6)
PHYS7551 Solid state physics (6)
PHYS7650 Stellar atmospheres (6)
PHYS7750 Nanophysics (6)

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

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

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

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

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

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

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

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

Learning Outcomes:
By the end of this programme, students should be able to:
PLO 1: identify and describe physical systems with their professional knowledge (by means of coursework and tutorial classes in the curriculum)
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Impermissible Combinations:
Major in Mathematics/Physics
Minor in Physics

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

   Disciplinary Core Courses (36 credits)
   PHYS1150 Problem solving in physics (6)
   PHYS1250 Fundamental physics (6)
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   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2260 Heat and waves (6)
   PHYS2265 Modern physics (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (24 credits)
   PHYS3350 Classical mechanics (6)
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   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.
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   PHYS4650 Stellar physics (6)
   PHYS4651 Selected topics in astrophysics (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Cosmology (6)
   PHYS4654 General relativity (6)
### Capstone Requirement (6 Credits)

At least 6 credits selected from the following courses:

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

### Notes:

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

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### Remarks:

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

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:

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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)

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Impermissible Combinations:
Major in Mathematics/Physics
Minor in Physics

<table>
<thead>
<tr>
<th>Required courses (96 credits)</th>
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</thead>
<tbody>
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<td>1. Introductory level courses (48 credits)</td>
</tr>
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</tr>
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<td>2. Advanced level courses (42 credits)</td>
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<tr>
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</tr>
<tr>
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<tr>
<td>Disciplinary Electives (18 credits)</td>
</tr>
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<td>At least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.</td>
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</tr>
<tr>
<td>PHYS4654 General relativity (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. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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

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

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.

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Impermissible Combinations:
Major in Mathematics/Physics
Minor in Physics

Required courses (96 credits)
1. Introductory level courses (48 credits)
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Disciplinary Core Courses (36 credits)
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2. Advanced level courses (42 credits)
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- PHYS3350 Classical mechanics (6)
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- 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
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3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - PHYS3999 Directed studies in physics (6)
   - PHYS4966 Physics internship (6)
   - PHYS4999 Physics project (12)

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

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

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

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

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

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

Objectives:
The Major in Physics aims to provide students with a solid foundation on the subject. Core courses form the blocks of fundamental knowledge to pursue learning in specializations, e.g. quantum mechanics, statistical mechanics, classical mechanics and electrodynamics. A large selection of elective courses is provided for students to pursue a wide range of topics from the very small scale (i.e. subatomic particles) to the large scale (i.e. cosmology). Students will attain professional knowledge in physics, research experience and the training of analytical thinking and quantitative reasoning during their studies. Graduates are expected to have acquired the broad training which can equip them well for further studies in multiple science and technology disciplines and to work in their specialized area.

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

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

PLO 2: have developed their scientific intuition, abilities and techniques to tackle problems either theoretical or experimental in nature (by means of coursework, tutorial classes and laboratory works in the curriculum)

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

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

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

Impermissible Combinations:
Major in Mathematics/Physics
Minor in Physics

Required courses (96 credits)

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

   Disciplinary Core Courses (36 credits)
   PHYS1150 Problem solving in physics (6)
   PHYS1250 Fundamental physics (6)
   PHYS2250 Introductory mechanics (6)
   PHYS2255 Introductory electricity and magnetism (6)
   PHYS2260 Heat and waves (6)
   PHYS2265 Modern physics (6)

2. Advanced level courses (42 credits)
   Disciplinary Core Courses (24 credits)
   PHYS3350 Classical mechanics (6)
   PHYS3351 Quantum mechanics (6)
   PHYS3450 Electromagnetism (6)
   PHYS3550 Statistical mechanics & thermodynamics (6)

   Disciplinary Electives (18 credits)
   At least 18 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements.
   The current list includes courses in List A and those courses not selected to fulfill the capstone requirements.

List A
   PHYS3150 Theoretical physics (6)
   PHYS3351 Introductory solid state physics (6)
   PHYS3650 Observational astronomy (6)
   PHYS3651 The physical universe (6)
   PHYS3652 Principles of astronomy (6)
   PHYS3750 Laser and spectroscopy (6)
   PHYS3751 Physics of nanomaterials (6)
   PHYS3850 Waves and optics (6)
   PHYS3851 Atomic and nuclear physics (6)
   PHYS4150 Computational physics (6)
   PHYS4151 Data analysis and modeling in physics (6)
   PHYS4350 Advanced classical mechanics (6)
   PHYS4351 Advanced quantum mechanics (6)
   PHYS4450 Advanced electromagnetism (6)
   PHYS4550 Advanced statistical mechanics (6)
   PHYS4650 Stellar physics (6)
   PHYS4651 Selected topics in astrophysics (6)
   PHYS4652 Planetary science (6)
   PHYS4653 Cosmology (6)
   PHYS4654 General relativity (6)
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<tr>
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<th>Course Title</th>
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<td>PHYS4655</td>
<td>Interstellar medium</td>
<td>6</td>
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<tr>
<td>PHYS4750</td>
<td>Experimental physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS4850</td>
<td>Particle physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS7350</td>
<td>Graduate classical mechanics</td>
<td>6</td>
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<tr>
<td>PHYS7351</td>
<td>Graduate quantum mechanics</td>
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<td>PHYS7450</td>
<td>Graduate electromagnetism</td>
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<td>PHYS7550</td>
<td>Graduate statistical mechanics</td>
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</tr>
<tr>
<td>PHYS7551</td>
<td>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>
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</tbody>
</table>

### Capstone Requirement (6 credits)

At least 6 credits selected from the following courses:

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

### Notes:

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

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

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

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

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

### Remarks:

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

**Objectives:**
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

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

- **PLO 1**: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
- **PLO 2**: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
- **PLO 3**: critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
- **PLO 4**: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
- **PLO 5**: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)
- **PLO 6**: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

**Impermissible Combinations:**
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

**Required courses (96 credits)**

1. **Introductory level courses (42 credits)**
   - Disciplinary Core Courses: Science Foundation Courses (12 credits)
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - Disciplinary Core Courses (30 credits)
     - MATH1013 University mathematics II (6)
     - STAT1600 Statistics: ideas and concepts (6)
     - MATH2014 Multivariable calculus and linear algebra (6)
     - STAT2601 Probability and statistics I (6)
     - STAT2602 Probability and statistics II (6)

2. **Advanced level courses (48 credits)**
   - Disciplinary Core Courses (24 credits)
     - STAT3600 Linear statistical analysis (6)
     - STAT3609 The statistics of investment risk (6)
     - STAT3615 Practical mathematics for investment (6)
     - STAT4601 Time-series analysis (6)
   - Disciplinary Electives (24 credits)
     - At least 24 credits selected from the following courses:
       - STAT3603 Probability modelling (6)
       - STAT3610 Risk management and insurance (6)
       - STAT3612 Data mining (6)
       - STAT3618 Derivatives and risk management (6)
       - STAT3911 Financial economics II (6)
       - STAT4603 Current topics in risk management (6)
       - STAT4606 Risk management and Basel Accords in banking and finance (6)
       - STAT4607 Credit risk analysis (6)
       - STAT4608 Market risk analysis (6)

3. **Capstone requirement (6 credits)**
   - At least 6 credits selected from the following courses:
     - STAT3799 Directed studies in statistics (6)
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<tr>
<th>Course Code</th>
<th>Course Description</th>
<th>Credits</th>
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<tr>
<td>STAT4710</td>
<td>Capstone experience for statistics undergraduates</td>
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<td>STAT4766</td>
<td>Statistics internship</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT4799</td>
<td>Statistics project</td>
<td>(12)</td>
</tr>
</tbody>
</table>

**Notes:**

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

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

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

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


**Remarks:**

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

**Offered to students admitted to Year 1 in**
2015

**Objectives:**
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

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

PLO 1: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

**Impermissible Combinations:**
- Major in Computing and Data Analytics
- Major in Decision Analytics
- Major in Statistics
- Minor in Risk Management
- Minor in Statistics

**Required courses (96 credits)**

1. **Introductory level courses (42 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111: Scientific method and reasoning (6)
     - SCNC1112: Fundamentals of modern science (6)
   - **Disciplinary Core Courses (30 credits)**
     - MATH1013: University mathematics II (6)
     - STAT1600: Statistics: ideas and concepts (6)
     - MATH2014: Multivariable calculus and linear algebra (6)
     - STAT2601: Probability and statistics I (6)
     - STAT2602: Probability and statistics II (6)

2. **Advanced level courses (48 credits)**
   - **Disciplinary Core Courses (24 credits)**
     - STAT3600: Linear statistical analysis (6)
     - STAT3609: The statistics of investment risk (6)
     - STAT3615: Practical mathematics for investment (6)
     - STAT4601: Time-series analysis (6)
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits selected from the following courses:
       - STAT3603: Probability modelling (6)
       - STAT3610: Risk management and insurance (6)
       - STAT3612: Data mining (6)
       - STAT3618: Derivatives and risk management (6)
       - STAT3911: Financial economics II (6)
       - STAT4603: Current topics in risk management (6)
       - STAT4606: Risk management and Basel Accords in banking and finance (6)
       - STAT4607: Credit risk analysis (6)
       - STAT4608: Market risk analysis (6)

3. **Capstone requirement (6 credits)**
   - At least 6 credits selected from the following courses:
     - STAT3799: Directed studies in statistics (6)
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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

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

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

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

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

Objectives:
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

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

PLO 1: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: critically evaluate and make effective use of models and techniques for risk assessment and management, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

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

   Disciplinary Core Courses (30 credits)
   MATH1013 University mathematics II (6)
   STAT1600 Statistics: ideas and concepts (6)
   MATH2014 Multivariable calculus and linear algebra (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   STAT3600 Linear statistical analysis (6)
   STAT3609 The statistics of investment risk (6)
   STAT3615 Practical mathematics for investment (6)
   STAT4601 Time-series analysis (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   STAT3603 Probability modelling (6)
   STAT3610 Risk management and insurance (6)
   STAT3612 Data mining (6)
   STAT3618 Derivatives and risk management (6)
   STAT3911 Financial economics II (6)
   STAT4603 Current topics in risk management (6)
   STAT4605 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 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.


### Remarks:

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

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

PLO 1: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: critically evaluate and make effective use of models and techniques for risk assessment and management and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   - SCNC1111 Scientific method and reasoning (6)
   - SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (30 credits)
   - MATH1013 University mathematics II (6)
   - STAT1600 Statistics: ideas and concepts (6)
   - STAT2601 Probability and statistics I (6)
   - STAT2602 Probability and statistics II (6)
   - STAT2603 Data management with SAS (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   - STAT3600 Linear statistical analysis (6)
   - STAT3609 The statistics of investment risk (6)
   - STAT3615 Practical mathematics for investment (6)
   - STAT4601 Time-series analysis (6)
   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   - STAT3603 Probability modelling (6)
   - STAT3610 Risk management and insurance (6)
   - STAT3612 Data mining (6)
   - STAT3618 Derivatives and risk management (6)
   - STAT3911 Financial economics II (6)
   - STAT4603 Current topics in risk management (6)
   - STAT4606 Risk management and Basel Accords in banking and finance (6)
   - STAT4607 Credit risk analysis (6)
   - STAT4608 Market risk analysis (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - STAT3799 Directed studies in statistics (6)
   - STAT4710 Capstone experience for statistics undergraduates (6)
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<th>Course Title</th>
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<td>(6)</td>
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<tr>
<td>STAT4799</td>
<td>Statistics project</td>
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</table>

**Notes:**

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

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

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

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


**Remarks:**

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

Objectives:
The Major in Risk Management aims to provide students with the skills and expertise in the theory and methodology behind the scientific process of risk management, with application to actuarial science, finance and other related areas of interest. It is designed to provide solid training in the concepts of the risk management process, statistical models and methods of risk management, and good risk management practice. Core courses in the curriculum emphasize fundamental concepts and nature of risk assessment, risk management and governance from different standpoints while elective courses provide either training in specific Risk Management disciplines or an extension of knowledge aiming to give students more modeling, technical and analytical skills in risk management, including data mining, stochastic calculus, and financial time series modeling.

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

PLO 1: identify and categorize the various risks faced by an organization and be able to demonstrate a critical understanding of generic risk management issues and techniques (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: analyze and assess risk management situations, and be able to deal with qualitative as well as quantitative aspects appropriate to the situation (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: critically evaluate and make effective use of models and techniques for risk assessment and management and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: make informed risk management decisions, employ any techniques necessary to acquire and interpret relevant data and information from different sources and the factors that influence their perceptions of risk identification, risk reduction, risk mitigation and risk transfer (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on risk management issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: gain insights into current advances in risk management through either project or industrial training (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Decision Analytics
Major in Statistics
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

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

   Disciplinary Core Courses (30 credits)
   MATH1013 University mathematics II (6)
   STAT1600 Statistics: ideas and concepts (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)
   STAT2603 Data management with SAS (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   STAT3600 Linear statistical analysis (6)
   STAT3609 The statistics of investment risk (6)
   STAT3615 Practical mathematics for investment (6)
   STAT4601 Time-series analysis (6)

   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   STAT3603 Probability modelling (6)
   STAT3610 Risk management and insurance (6)
   STAT3612 Data mining (6)
   STAT3618 Derivatives and risk management (6)
   STAT3911 Financial economics II (6)
   STAT4603 Current topics in risk management (6)
   STAT4606 Risk management and Basel Accords in banking and finance (6)
   STAT4607 Credit risk analysis (6)
   STAT4608 Market risk analysis (6)

3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   STAT3799 Directed studies in statistics (6)
   STAT4710 Capstone experience for statistics undergraduates (6)
Notes:
1. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to undertake a second major in science. The double-counted courses must include SCNC1111 Scientific method and reasoning (6 credits) and SCNC1112 Fundamentals of modern science (6 credits). Additional credits to be double-counted must be for courses required ('disciplinary core') by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

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

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

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

5. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-course-req.

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

**Objectives:**
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

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

PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

**Impermissible Combinations:**
Major in Computing and Data Analytics  
Major in Decision Analytics  
Major in Risk Management  
Minor in Risk Management  
Minor in Statistics

### Required courses (96 credits)

1. **Introductory level courses (42 credits)**
   - Disciplinary Core Courses: Science Foundation Courses (12 credits)
     - SCNC1111: Scientific method and reasoning (6)
     - SCNC1112: Fundamentals of modern science (6)
   - Disciplinary Core Courses (30 credits)
     - MATH1013: University mathematics II (6)
     - STAT1600: Statistics: ideas and concepts (6)
     - MATH2014: Multivariable calculus and linear algebra (6)
     - STAT2601: Probability and statistics I (6)
     - STAT2602: Probability and statistics II (6)

2. **Advanced level courses (48 credits)**
   - Disciplinary Core Courses (24 credits)
     - STAT3600: Linear statistical analysis (6)
     - STAT3603: Probability modelling (6)
     - STAT4601: Time-series analysis (6)
     - STAT4602: Multivariate data analysis (6)
   - Disciplinary Electives (24 credits)
     - At least 24 credits from Lists A and B, among which at least 6 credits from List A:
       - **List A**
         - STAT3602: Statistical inference (6)
         - STAT3604: Design and analysis of experiments (6)
         - STAT3620: Modern nonparametric statistics (6)
         - STAT3621: Statistical data analysis (6)
       - **List B**
         - STAT3605: Quality control and management (6)
         - STAT3606: Business logistics (6)
         - STAT3607: Statistics in clinical medicine and bio-medical research (6)
         - STAT3608: Statistical genetics (6)
### Science Majors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT3612</td>
<td>Data mining</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3613</td>
<td>Marketing engineering</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3616</td>
<td>Advanced SAS programming</td>
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</tr>
<tr>
<td>STAT3617</td>
<td>Sample survey methods</td>
<td>(6)</td>
</tr>
<tr>
<td>STAT3955</td>
<td>Survival analysis</td>
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</tbody>
</table>

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

At least 6 credits selected from the following courses:

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<td>STAT4799</td>
<td>Statistics project</td>
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</tbody>
</table>

### Notes:

1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.

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

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

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


### Remarks:

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

Objectives:
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

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

PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Computing and Data Analytics
Major in Decision Analytics
Major in Risk Management
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)
1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111  Scientific method and reasoning (6)
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   Disciplinary Core Courses (30 credits)
   MATH1013  University mathematics II (6)
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2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   STAT3600  Linear statistical analysis (6)
   STAT3603  Probability modelling (6)
   STAT4601  Time-series analysis (6)
   STAT4602  Multivariate data analysis (6)

   Disciplinary Electives (24 credits)
   At least 24 credits from Lists A and B, among which at least 6 credits from List A:
   List A
   STAT3602  Statistical inference (6)
   STAT3604  Design and analysis of experiments (6)
   STAT3620  Modern nonparametric statistics (6)
   STAT3621  Statistical data analysis (6)

   List B
   STAT3605  Quality control and management (6)
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**Notes:**

1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.

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

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

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


**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required prerequisites and corequisite of selected courses 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 2014

**Objectives:**
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

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

PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)

PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

**Impermissible Combinations:**
- Major in Computing and Data Analytics
- Major in Decision Analytics
- Major in Risk Management
- Minor in Risk Management
- Minor in Statistics

**Required courses (96 credits)**

1. **Introductory level courses (42 credits)**
   - **Disciplinary Core Courses: Science Foundation Courses (12 credits)**
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - **Disciplinary Courses (30 credits)**
     - MATH1013 University mathematics II (6)
     - STAT1600 Statistics: ideas and concepts (6)
     - MATH2014 Multivariable calculus and linear algebra (6)
     - STAT2601 Probability and statistics I (6)
     - STAT2602 Probability and statistics II (6)

2. **Advanced level courses (48 credits)**
   - **Disciplinary Core Courses (24 credits)**
     - STAT3600 Linear statistical analysis (6)
     - STAT3603 Probability modelling (6)
     - STAT4601 Time-series analysis (6)
     - STAT4602 Multivariate data analysis (6)
   - **Disciplinary Electives (24 credit)**
     - At least 24 credits from Lists A and B, among which at least 6 credits from List A:
       - **List A**
         - STAT3602 Statistical inference (6)
         - STAT3604 Design and analysis of experiments (6)
         - STAT3620 Modern nonparametric statistics (6)
         - STAT3621 Statistical data analysis (6)
       - **List B**
         - STAT3605 Quality control and management (6)
         - STAT3606 Business logistics (6)
         - STAT3607 Statistics in clinical medicine and bio-medical research (6)
         - STAT3608 Statistical genetics (6)
3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - STAT3799 Directed studies in statistics (6)
   - STAT4710 Capstone experience for statistics undergraduates (6)
   - STAT4766 Statistics internship (6)
   - STAT4799 Statistics project (12)

Notes:
1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses
   STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly
   recommended to take STAT2603 first.

2. Double-counting of courses up to a maximum of 24 credits is permissible when a student with a science major opts to
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   courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make
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   Minors with overlapping course requirements” in the BSc syllabuses.

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

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

6. Students taking the Mathematics related major/minor should check the exemption and replacement arrangement for the
   introductory level Disciplinary Core Mathematics courses at http://www.scifac.hku.hk/ug/current/bsc/curriculum/overlapping-
   course-req.

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

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)

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Impermissible Combinations:
- Major in Decision Analytics
- Major in Risk Management
- Minor in Risk Management
- Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
   - Disciplinary Core Courses: Science Foundation Courses (12 credits)
     - SCNC1111 Scientific method and reasoning (6)
     - SCNC1112 Fundamentals of modern science (6)
   - Disciplinary Core Courses (30 credits)
     - MATH1103 University mathematics II (6)
     - STAT1600 Statistics: ideas and concepts (6)
     - STAT2601 Probability and statistics I (6)
     - STAT2602 Probability and statistics II (6)
     - STAT2603 Data management with SAS (6)

2. Advanced level courses (48 credits)
   - Disciplinary Core Courses (24 credits)
     - STAT3600 Linear statistical analysis (6)
     - STAT3603 Probability modelling (6)
     - STAT4601 Time-series analysis (6)
     - STAT4602 Multivariate data analysis (6)
   - Disciplinary Electives (24 credits)
     - At least 24 credits from Lists A and B, among which at least 6 credits from List A:
       - List A
         - STAT3602 Statistical inference (6)
         - STAT3604 Design and analysis of experiments (6)
         - STAT3620 Modern nonparametric statistics (6)
         - STAT3621 Statistical data analysis (6)
       - List B
         - STAT3605 Quality control and management (6)
         - STAT3606 Business logistics (6)
         - STAT3607 Statistics in clinical medicine and bio-medical research (6)
         - STAT3608 Statistical genetics (6)
         - STAT3612 Data mining (6)
3. Capstone requirement (6 credits)
   At least 6 credits selected from the following courses:
   - STAT3799  Directed studies in statistics (6)
   - STAT4710  Capstone experience for statistics undergraduates (6)
   - STAT4766  Statistics internship (6)
   - STAT4799  Statistics project (12)

Notes:
1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.

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

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

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

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


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The Major in Statistics focuses on the study of statistics, a scientific discipline characterized by the development and applications of analytical and quantitative tools which involve logical thinking, problem formulation, probability reasoning and intensive data analyses. The programme aims to equip students with powerful mathematical, analytical and computational skills, which are in great demand in practical areas where data are obtained for the purpose of extracting information in support of decision making. It gives students a strong background in statistical concepts, and provides broad and solid training in applied statistical methodologies. The curriculum is constantly revised to meet a steadily rising demand for specialist statisticians or quantitative analysts in government, business, finance, industry, as well as in research and teaching in local and overseas institutions.

Learning Outcomes:
By the end of this programme, students should be able to:
PLO 1: receive solid training in probability and statistics, gain insight into their underlying theory and be acquainted with their state-of-the-art applications in the modern world (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
PLO 2: conduct meticulous data analyses, supported by rigorous statistical reasoning, to make informed decisions in the face of uncertainty that arises in all sorts of institutions and companies, and appraise the related ethical issues (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
PLO 3: equip with hands-on experience in data analysis using commercial statistical software, and be competent for data-analytic jobs which require advanced computational skills (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
PLO 4: be highly motivated to explore cross-disciplinary applications of statistics in a broad variety of academic or professional areas including, in particular, mathematics, natural sciences, economics, finance, business, risk management, actuarial work, social sciences and engineering (by means of coursework, tutorial classes and/or project-based learning in the curriculum)
PLO 5: communicate and collaborate with people effectively on probability and statistical issues (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)
PLO 6: through the understanding and application of statistical concepts and techniques, gain confidence to meet challenges posed by increasingly complicated real-life problems encountered in the modern era in a creative and rational manner (by means of coursework, tutorial classes, project-based and/or capstone learning in the curriculum)

Impermissible Combinations:
Major in Decision Analytics
Major in Risk Management
Minor in Risk Management
Minor in Statistics

Required courses (96 credits)

1. Introductory level courses (42 credits)
   Disciplinary Core Courses: Science Foundation Courses (12 credits)
   SCNC1111 Scientific method and reasoning (6)
   SCNC1112 Fundamentals of modern science (6)
   Disciplinary Core Courses (30 credits)
   MATH1103 University mathematics II (6)
   STAT1600 Statistics: ideas and concepts (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)
   STAT2603 Data management with SAS (6)

2. Advanced level courses (48 credits)
   Disciplinary Core Courses (24 credits)
   STAT3600 Linear statistical analysis (6)
   STAT3603 Probability modelling (6)
   STAT4601 Time-series analysis (6)
   STAT4602 Multivariate data analysis (6)
   Disciplinary Electives (24 credits)
   At least 24 credits from Lists A and B, among which at least 6 credits from List A:
   List A
   STAT3602 Statistical inference (6)
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   STAT3620 Modern nonparametric statistics (6)
   STAT3621 Statistical data analysis (6)
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   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 Data mining (6)
3. Capstone requirement (6 credits)
At least 6 credits selected from the following courses:

- STAT3799 Directed studies in statistics (6)
- STAT4710 Capstone experience for statistics undergraduates (6)
- STAT4766 Statistics internship (6)
- STAT4799 Statistics project (12)

Notes:
1. Students who wish to specialize in the theme of data science are recommended to choose the combination of courses STAT3612, STAT3613, STAT3616 and STAT3621. Note that students who wish to take STAT3616 and STAT3621 are strongly recommended to take STAT2603 first.

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

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

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


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Science Minors in 2016-17

SCIENCE
MINORS offered by Science Faculty

MINORS (17)

Actuarial Studies
Astronomy
Biochemistry
Chemistry
Computational & Financial Mathematics
Earth Sciences
Ecology & Biodiversity
Environmental Science
Food & Nutritional Science
Marine Biology
Mathematics
Molecular Biology & Biotechnology
Operations Research & Mathematical Programming
Physics
Plant Science
Risk Management
Statistics
### Minor Title
Minor in Actuarial Studies

### Offered to students
Offered to students admitted to Year 1 in 2016

### Objectives:
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

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

**PLO 1:** understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum)

**PLO 2:** develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum)

### Impermissible Combinations:
Bachelor of Science in Actuarial Science

### Required courses (42 credits)

#### 1. Introductory level courses (12 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FINA1310</td>
<td>Corporate finance</td>
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<tr>
<td>MATH1013</td>
<td>University mathematics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT2601</td>
<td>Probability and statistics I</td>
<td>6</td>
</tr>
<tr>
<td>STAT2602</td>
<td>Probability and statistics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT2605</td>
<td>Demographic and socio-economic statistics</td>
<td>6</td>
</tr>
<tr>
<td>STAT2901</td>
<td>Probability and statistics: foundations of actuarial science</td>
<td>6</td>
</tr>
</tbody>
</table>

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

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<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>STAT3615</td>
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<td>6</td>
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<tr>
<td>STAT3901</td>
<td>Life contingencies</td>
<td>6</td>
</tr>
<tr>
<td>STAT3904</td>
<td>Corporate finance for actuarial science</td>
<td>6</td>
</tr>
<tr>
<td>STAT3906</td>
<td>Risk theory I</td>
<td>6</td>
</tr>
<tr>
<td>STAT3908</td>
<td>Credibility theory and loss distributions</td>
<td>6</td>
</tr>
<tr>
<td>STAT3910</td>
<td>Financial economics I</td>
<td>6</td>
</tr>
<tr>
<td>STAT3911</td>
<td>Financial economics II</td>
<td>6</td>
</tr>
<tr>
<td>STAT4903</td>
<td>Actuarial techniques for general insurance</td>
<td>6</td>
</tr>
</tbody>
</table>

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Actuarial Studies
Offered to students: 2015
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)
- STAT2605 Demographic and socio-economic statistics (6)
- STAT2901 Probability and statistics: foundations of actuarial science (6)

2. Advanced level courses (30 credits)
Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:
- STAT3615 Practical mathematics for investment (6)
- STAT3901 Life contingencies (6)
- STAT3904 Corporate finance for actuarial science (6)
- STAT3906 Risk theory I (6)
- STAT3908 Credibility theory and loss distributions (6)
- STAT3910 Financial economics I (6)
- STAT3911 Financial economics II (6)
- STAT4903 Actuarial techniques for general insurance (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
<table>
<thead>
<tr>
<th>Minor Title</th>
<th>Minor in Actuarial Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offered to students admitted to Year 1 in</td>
<td>2014</td>
</tr>
</tbody>
</table>

**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

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<td>STAT2605</td>
</tr>
<tr>
<td>STAT2901</td>
</tr>
</tbody>
</table>

| **2. Advanced level courses (30 credits)** |
| **Disciplinary Electives (30 credits)** |
| At least 30 credits selected from the following courses: |
| STAT3615 | Practical mathematics for investment (6) |
| STAT3901 | Life contingencies (6) |
| STAT3904 | Corporate finance for actuarial science (6) |
| STAT3906 | Risk theory I (6) |
| STAT3908 | Credibility theory and loss distributions (6) |
| STAT3910 | Financial economics I (6) |
| STAT3911 | Financial economics II (6) |
| STAT4903 | Actuarial techniques for general insurance (6) |

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title          Minor in Actuarial Studies
Offered to students 2013
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)
- STAT2605 Demographic and socio-economic statistics (6)
- STAT2901 Probability and statistics: foundations of actuarial science (6)

2. Advanced level courses (30 credits)

#### Disciplinary Electives (30 credits)
At least 30 credits selected from the following courses:

- STAT3615 Practical mathematics for investment (6)
- STAT3901 Life contingencies (6)
- STAT3904 Corporate finance for actuarial science (6)
- STAT3906 Risk theory I (6)
- STAT3908 Credibility theory and loss distributions (6)
- STAT3910 Financial economics I (6)
- STAT3911 Financial economics II (6)
- STAT4903 Actuarial techniques for general insurance (6)

### Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

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

Objectives:
The Minor in Actuarial Studies aims to provide interested students with an introduction to the basic concepts and methodologies in Actuarial Science. The minor curriculum is designed particularly for students from different majors to enhance their interests in Actuarial Science and to strengthen their confidence and potential in solving mathematical, financial, economical and investment-related problems.

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

PLO 1: understand and apply the methods used by actuaries to solve problems of insurance, investment, pension, financial risk management and demography (by means of coursework and tutorial classes and/or research-based project in the curriculum)

PLO 2: develop and apply problem-solving skills appropriate to the level of the preliminary education component specified by international actuarial bodies such as the Society of Actuaries (by means of coursework and tutorial classes and/or research-based project in the curriculum)

Impermissible Combinations:
Bachelor of Science in Actuarial Science

Required courses (42 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   FINA1310 Corporate finance (6)
   MATH1103 University mathematics II (6)
   STAT2601 Probability and statistics I (6)
   STAT2602 Probability and statistics II (6)
   STAT2605 Demographic and socio-economic statistics (6)
   STAT2901 Probability and statistics: foundations of actuarial science (6)

2. Advanced level courses (30 credits)
   Disciplinary Electives (30 credits)
   At least 30 credits selected from the following courses:
   STAT3615 Practical mathematics for investment (6)
   STAT3901 Life contingencies (6)
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   STAT3910 Financial economics I (6)
   STAT3911 Financial economics II (6)
   STAT4903 Actuarial techniques for general insurance (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

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

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

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

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Astronomy

Required courses (42 credits)
1. Introductory level courses (18 credits)
   Disciplinary Core Courses (18 credits)
   PHYS1250  Fundamental physics (6)
   PHYS1650  Nature of the universe (6)
   PHYS2265  Modern physics (6)

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   PHYS3650  Observational astronomy (6)
   PHYS3651  The physical universe (6)
   PHYS3652  Principles of astronomy (6)
   PHYS4650  Stellar physics (6)
   PHYS4651  Selected topics in astrophysics (6)
   PHYS4652  Planetary science (6)
   PHYS4653  Cosmology (6)
   PHYS4654  General relativity (6)
   PHYS4655  Interstellar medium (6)
   PHYS7650  Stellar atmospheres (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this 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.
<table>
<thead>
<tr>
<th>Minor Title</th>
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<td>Offered to students</td>
<td>2015</td>
</tr>
<tr>
<td>admitted to Year 1 in</td>
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</table>

**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:

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- **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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<th>Required courses (42 credits)</th>
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2. Students must have level 3 or above in HKDSE Physics or equivalent to take this major. Students who do not fulfill this requirement are advised to take PHYS1240 Physics by inquiry.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

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

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

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

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Astronomy

Required courses (42 credits)
1. Introductory level courses (18 credits)

Disciplinary Core Courses (18 credits)
- PHYS1250 Fundamental physics (6)
- PHYS1650 Nature of the universe (6)
- PHYS2265 Modern physics (6)

2. Advanced level courses (24 credits)

Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
- PHYS3650 Observational astronomy (6)
- PHYS3651 The physical universe (6)
- PHYS3652 Principles of astronomy (6)
- PHYS4650 Stellar physics (6)
- PHYS4651 Selected topics in astrophysics (6)
- PHYS4652 Planetary science (6)
- PHYS4653 Cosmology (6)
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- PHYS7650 Stellar atmospheres (6)

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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 Astronomy  
**Offered to students**  2013  
**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.

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### Impermissible Combinations:
Major in Astronomy

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2. 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.
## Minor Title
Minor in Astronomy

## Offered to students
admitted to Year 1 in

## 2012

### Objectives:
The Minor in Astronomy is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses to allow them to pursue their interests in the subject and to establish connections between the field of astronomy and other science disciplines.

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

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

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

**PLO 3**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

### Impermissible Combinations:
Major in Astronomy

### Required courses (42 credits)

#### 1. Introductory level courses (18 credits)

**Disciplinary Core Courses (18 credits)**

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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:

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2. 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.
Minor Title: Minor in Biochemistry
Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student's Major.

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

PLO 1: describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: integrate knowledge regarding the structure and function of biological molecules and how they come together to form the systems that make up life (by means of coursework and laboratory-based learning in the curriculum)

PLO 3: develop a general interest in biochemistry and recognize the inter-relationship of biochemistry with other disciplines (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Biochemistry

Required courses (36 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- BIOC1600 Perspectives in biochemistry (6)
- BIOL1110 From molecules to cells (6)
- BIOC2600 Basic biochemistry (6)

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
- BIOC3601 Basic metabolism (6)
- BIOC3604 Essential techniques in biochemistry and molecular biology (6)
- BIOC3605 Sequence bioinformatics (6)
- BIOC3606 Molecular medicine (6)
- BIOL3202 Nutritional biochemistry (6)
- BIOL3401 Molecular biology (6)
- BIOL3402 Cell biology and cell technology (6)
- BIOL3403 Immunology (6)
- BIOL3404 Protein structure and function (6)
- BIOC4610 Advanced biochemistry (6)
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- 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  2015  
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)
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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 Biochemistry
Offered to students admitted to Year 1 in 2014

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

**Objectives:**
The Minor in Biochemistry is designed to provide students from all backgrounds with a multidisciplinary perspective on contemporary biochemistry and molecular biology. This minor curriculum incorporates significant flexibility to allow students to select courses that will complement the individual student's Major.

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

- **PLO 1:** describe the fundamentals of biochemistry and molecular biology, and apply biochemical knowledge appropriately and effectively (by means of coursework and laboratory-based learning in the curriculum)
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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.
Minor Title  Minor in Biochemistry
Offered to students 2012
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
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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)
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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 2016

### Objectives:
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

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

- **PLO 1**: understand and apply the basic concepts of chemistry (by means of coursework and laboratory-based learning in the curriculum)
- **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

### 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:
     - CHEM2041 Principles of chemistry (6)
     - 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)
   - CHEM3244 Analytical techniques for pharmacy students (6)
   - CHEM3341 Inorganic chemistry II (6)
   - CHEM3342 Bioinorganic chemistry (6)
   - CHEM3441 Organic chemistry II (6)
   - CHEM3442 Organic chemistry of biomolecules (6)
   - CHEM3443 Organic chemistry laboratory (6)
   - 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)
   - 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)
   - CHEM4910 Chemistry literacy and research (6)
CHEM4911  Capstone experience for chemistry undergraduates: HKUtopia (6)
CHEM4966  Chemistry internship (6)
CHEM4999  Chemistry project (12)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

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

Objectives:
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

Learning Outcomes:
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

<table>
<thead>
<tr>
<th>Required courses (42 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (24 credits)</td>
</tr>
<tr>
<td>Disciplinary Core Courses (12 credits)</td>
</tr>
<tr>
<td>CHEM1042 General chemistry I (6)</td>
</tr>
<tr>
<td>CHEM1043 General chemistry II (6)</td>
</tr>
<tr>
<td>Disciplinary Electives (12 credits)</td>
</tr>
<tr>
<td>At least 12 credits selected from the following courses:</td>
</tr>
<tr>
<td>CHEM2041 Principles of chemistry (6)</td>
</tr>
<tr>
<td>CHEM2241 Analytical chemistry I (6)</td>
</tr>
<tr>
<td>CHEM2341 Inorganic chemistry I (6)</td>
</tr>
<tr>
<td>CHEM2441 Organic chemistry I (6)</td>
</tr>
<tr>
<td>CHEM2442 Fundamentals of organic chemistry (6)</td>
</tr>
<tr>
<td>CHEM2541 Introductory physical chemistry (6)</td>
</tr>
</tbody>
</table>

2. Advanced level courses (18 credits)

<table>
<thead>
<tr>
<th>Disciplinary Electives (18 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>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:</td>
</tr>
<tr>
<td>List A</td>
</tr>
<tr>
<td>CHEM3141 Environmental chemistry (6)</td>
</tr>
<tr>
<td>CHEM3142 Chemical process industries and analysis (6)</td>
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<tr>
<td>CHEM3143 Introduction to materials chemistry (6)</td>
</tr>
<tr>
<td>CHEM3146 Principles and applications of spectroscopic and analytical techniques (6)</td>
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<td>CHEM3241 Analytical chemistry II: chemical instrumentation (6)</td>
</tr>
<tr>
<td>CHEM3242 Food and water analysis (6)</td>
</tr>
<tr>
<td>CHEM3243 Introductory instrumental chemical analysis (6)</td>
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<td>CHEM3342 Bioinorganic chemistry (6)</td>
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<td>CHEM3442 Organic chemistry of biomolecules (6)</td>
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</tr>
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<td>CHEM4144 Advanced materials (6)</td>
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<td>CHEM4342 Organometallic chemistry (6)</td>
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</tr>
<tr>
<td>CHEM4443 Integrated organic synthesis (6)</td>
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<td>CHEM4444 Chemical biology (6)</td>
</tr>
<tr>
<td>CHEM4542 Computational chemistry (6)</td>
</tr>
<tr>
<td>CHEM4543 Advanced physical chemistry (6)</td>
</tr>
<tr>
<td>CHEM4910 Chemistry literacy and research (6)</td>
</tr>
</tbody>
</table>
Science Minors

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<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 credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

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

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

Required courses (42 credits)

1. Introductory level courses (18 credits)

   Disciplinary Core Courses (6 credits)
   - CHEM1042 General chemistry I (6) [previous title: General chemistry (6)]
   - CHEM2041 Principles of chemistry (6)
   - CHEM2241 Analytical chemistry I (6)
   - CHEM2341 Inorganic chemistry I (6)
   - CHEM2441 Organic chemistry I (6)
     CHEM2441 and CHEM2442 are mutually exclusive.
   - CHEM2442 Fundamentals of organic chemistry (6)
     CHEM2441 and CHEM2442 are mutually exclusive.
   - CHEM2541 Introductory physical chemistry (6) [previous title: Physical chemistry I (6)]

2. Advanced level courses (24 credits)

   Disciplinary Electives (24 credits)
   At least 24 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

   List A
   - CHEM3141 Environmental chemistry (6)
   - CHEM3142 Chemical process industries and analysis (6)
   - CHEM3143 Introduction to materials chemistry (6)
   - CHEM3146 Principles and applications of spectroscopic and analytical techniques (6)
   - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   - CHEM3242 Food and water analysis (6)
   - CHEM3243 Introductory instrumental chemical analysis (6)
   - CHEM3244 Analytical techniques for pharmacy students (6)
   - CHEM3341 Inorganic chemistry II (6)
   - CHEM3342 Bioinorganic chemistry (6)
   - CHEM3441 Organic chemistry II (6)
   - CHEM3442 Organic chemistry of biomolecules (6)
   - CHEM3443 Organic chemistry laboratory (6)
   - CHEM3541 Physical chemistry: Introduction to quantum chemistry (6)
     Physical chemistry: statistical thermodynamics and kinetics theory (6) [previous title: Physical chemistry II: Introduction to quantum chemistry (6)]
   - CHEM3542 Modern chemical instrumentation and applications (6)
   - CHEM3543 Analytical chemistry (6)
   - CHEM3441 Advanced inorganic chemistry (6)
   - CHEM3442 Organometallic chemistry (6)
   - CHEM4443 Advanced organic chemistry (6)
   - CHEM4444 Integrated organic synthesis (6)
   - CHEM4445 Chemical biology (6)
   - CHEM4542 Computational chemistry (6)
   - CHEM4543 Advanced physical chemistry (6)
   - CHEM4910 Chemistry literacy and research (6)
   - CHEM4911 Capstone experience for chemistry undergraduates:
## Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

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

Objectives:
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

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

- **PLO 1**: understand and apply the basic concepts of chemistry (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 2**: apply chemistry concepts in other subjects (by means of coursework and laboratory-based learning in the curriculum)
- **PLO 3**: transfer the basic concepts to complement their major area of study (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Chemistry

### Required courses (42 credits)

#### 1. Introductory level courses (18 credits)

**Disciplinary Core Courses (6 credits)**

- CHEM1042: General chemistry I (6)  
  *previous title: General chemistry (6)*

**Disciplinary Electives (12 credits)**

- At least 12 credits selected from the following courses:
  - CHEM2041: Principles of chemistry (6)
  - CHEM2241: Analytical chemistry I (6)
  - CHEM2341: Inorganic chemistry I (6)
  - CHEM2441: Organic chemistry I (6)
  - CHEM2442: Fundamentals of organic chemistry (6)  
    *CHEM2441 and CHEM2442 are mutually exclusive.*
  - CHEM2541: Introductory physical chemistry (6)  
    *previous title: Physical chemistry I (6)*

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

**Disciplinary Electives (24 credits)**

- At least 24 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

**List A**

- CHEM3141: Environmental chemistry (6)
- CHEM3142: Chemical process industries and analysis (6)
- CHEM3143: Introduction to materials chemistry (6)
- CHEM3146: Principles and applications of spectroscopic and analytical techniques (6)
- CHEM3241: Analytical chemistry II: chemical instrumentation (6)
- CHEM3242: Food and water analysis (6)
- CHEM3243: Introductory instrumental chemical analysis (6)
- CHEM3244: Analytical techniques for pharmacy students (6)
- CHEM3341: Inorganic chemistry II (6)
- CHEM3342: Bioinorganic chemistry (6)
- CHEM3344: Organic chemistry II (6)
- CHEM3442: Organic chemistry of biomolecules (6)
- CHEM3443: Organic chemistry laboratory (6)
- CHEM3541: Physical chemistry: Introduction to quantum chemistry (6)  
  *previous title: Physical chemistry II: Introduction to quantum chemistry (6)*
- CHEM3542: Physical chemistry: statistical thermodynamics and kinetics theory (6)
- CHEM3999: Directed studies in chemistry (6)
- CHEM4142: Symmetry, group theory and applications (6)
- CHEM4143: Interfacial science and technology (6)
- CHEM4144: Advanced materials (6)
- CHEM4145: Medicinal chemistry (6)
- CHEM4241: Modern chemical instrumentation and applications (6)
- CHEM4242: Analytical chemistry (6)
- CHEM4341: Advanced inorganic chemistry (6)
- CHEM4342: Organometallic chemistry (6)
- CHEM4441: Advanced organic chemistry (6)
- CHEM4443: Integrated organic synthesis (6)
- CHEM4444: Chemical biology (6)
- CHEM4541: Physical chemistry III: statistical thermodynamics and kinetics theory (6)
- CHEM4542: Computational chemistry (6)
- CHEM4543: Advanced physical chemistry (6)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM4910</td>
<td>Chemistry literacy and research</td>
<td>(6)</td>
</tr>
<tr>
<td>CHEM4911</td>
<td>Capstone experience for chemistry undergraduates:</td>
<td>HKUtopia (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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 credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

**Remarks:**

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

Objectives:  
The Minor in Chemistry aims to provide students with fundamental knowledge and skills of chemistry. The minor curriculum is flexible. Students of different majors in science and other disciplines will be able to select courses that complement their major areas of study as well as enhance their knowledge in chemistry.

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

1. **PLO 1**: understand and apply the basic concepts of chemistry (by means of coursework and laboratory-based learning in the curriculum)
2. **PLO 2**: apply chemistry concepts in other subjects (by means of coursework and laboratory-based learning in the curriculum)
3. **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

Required courses (42 credits)

1. Introductory level courses (18 credits)
   - **Disciplinary Core Courses (6 credits)**
     - CHEM1042 General chemistry I (6)  
     - [previous title: General chemistry (6)]
   - **Disciplinary Electives (12 credits)**
     - At least 12 credits selected from the following courses:
       - CHEM2041 Principles of chemistry (6)
       - CHEM2241 Analytical chemistry I (6)
       - CHEM2341 Inorganic chemistry I (6)
       - CHEM2441 Organic chemistry I (6)  
       - CHEM2442 Fundamentals of organic chemistry (6)  
       - CHEM2541 Introductory physical chemistry (6)
     - CHEM2441 and CHEM2442 are mutually exclusive.
     - CHEM2442 and CHEM2441 are mutually exclusive.
     - [previous title: Physical chemistry I (6)]

2. Advanced level courses (24 credits)
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits of advanced level Chemistry courses (CHEM3XXX or CHEM4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:
     - **List A**
       - CHEM3141 Environmental chemistry (6)
       - CHEM3142 Chemical process industries and analysis (6)
       - CHEM3143 Introduction to materials chemistry (6)
       - CHEM3146 Principles and applications of spectroscopic and analytical techniques (6)
       - CHEM3241 Analytical chemistry II: chemical instrumentation (6)
       - CHEM3242 Food and water analysis (6)
       - CHEM3243 Introductory instrumental chemical analysis (6)
       - CHEM3244 Analytical techniques for pharmacy students (6)
       - CHEM3341 Inorganic chemistry II (6)
       - CHEM3342 Bioinorganic chemistry (6)
       - CHEM3441 Organic chemistry II (6)
       - CHEM3442 Organic chemistry of biomolecules (6)
       - CHEM3443 Organic chemistry laboratory (6)
       - CHEM3541 Physical chemistry: Introduction to quantum chemistry (6)
       - [previous title: Physical chemistry II: Introduction to quantum chemistry (6)]
       -CHEM3542 Physical chemistry: statistical thermodynamics and kinetics theory (6)
       - CHEM3999 Directed studies in chemistry (6)
       - CHEM4142 Symmetry, group theory and applications (6)
       - CHEM4143 Interfacial science and technology (6)
       - CHEM4144 Advanced materials (6)
       - CHEM4145 Medicinal chemistry (6)
       - CHEM4241 Modern chemical instrumentation and applications (6)
       - CHEM4242 Analytical chemistry (6)
       - CHEM4341 Advanced inorganic chemistry (6)
       - CHEM4342 Organometallic chemistry (6)
       - CHEM4441 Advanced organic chemistry (6)
       - CHEM4443 Integrated organic synthesis (6)
       - CHEM4444 Chemical biology (6)
       - CHEM4541 Physical chemistry III: statistical thermodynamics and kinetics theory (6)
       - CHEM4542 Computational chemistry (6)
       - CHEM4543 Advanced physical 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 credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

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

### Offered to students
admitted to Year 1 in 2016

### Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

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

**PLO 1:** understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

**PLO 2:** apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

**PLO 3:** communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

### Impermissible Combinations:

- Major in Mathematics
- Major in Mathematics/Physics
- Minor in Mathematics
- Minor in Operations Research & Mathematical Programming

### Required courses (42 credits)

#### 1. Introductory level courses (18 credits) (note 3)

<table>
<thead>
<tr>
<th>Disciplinary Core Courses (18 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013 University mathematics II (6)</td>
</tr>
<tr>
<td>MATH2101 Linear algebra I (6)</td>
</tr>
<tr>
<td>MATH2211 Multivariable calculus (6)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Disciplinary Core Courses (12 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3601 Numerical analysis (6)</td>
</tr>
<tr>
<td>MATH3906 Financial calculus (6)</td>
</tr>
</tbody>
</table>

#### 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.


### Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2015

Admitted to Year 1 in

Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

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

PLO 1: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

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

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Courses (18 credits)
   MATH1013 University mathematics II (6)
   MATH2101 Linear algebra I (6)
   MATH2211 Multivariable calculus (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   MATH3601 Numerical analysis (6)
   MATH3906 Financial calculus (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   MATH3408 Computational methods and differential equations with applications (6)
   MATH3603 Probability theory (6)
   MATH3904 Introduction to optimization (6)
   MATH3911 Game theory and strategy (6)
   MATH4602 Scientific computing (6)
   MATH4907 Numerical methods for financial calculus (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

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


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
<table>
<thead>
<tr>
<th>Minor Title</th>
<th>Minor in Computational &amp; Financial Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offered to students</td>
<td>2014</td>
</tr>
<tr>
<td>admitted to Year 1</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Objectives:</strong></td>
<td>The Minor in Computational &amp; 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.</td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>Learning Outcomes:</strong></td>
<td>By the end of this programme, students should be able to:</td>
</tr>
<tr>
<td></td>
<td>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)</td>
</tr>
<tr>
<td></td>
<td>PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)</td>
</tr>
<tr>
<td></td>
<td>PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impermissible Combinations:</strong></td>
<td>Major in Mathematics</td>
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<tr>
<td></td>
<td>Minor in Mathematics</td>
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<tr>
<td></td>
<td>Minor in Operations Research &amp; Mathematical Programming</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Required courses (42 credits)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Introductory level courses (18 credits) (note 3)</td>
<td></td>
</tr>
<tr>
<td>Disciplinary Core Courses (18 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
</tr>
<tr>
<td>MATH2101</td>
<td>Linear algebra I (6)</td>
</tr>
<tr>
<td>MATH2211</td>
<td>Multivariable calculus (6)</td>
</tr>
<tr>
<td>2. Advanced level courses (24 credits)</td>
<td></td>
</tr>
<tr>
<td>Disciplinary Core Courses (12 credits)</td>
<td></td>
</tr>
<tr>
<td>MATH3601</td>
<td>Numerical analysis (6)</td>
</tr>
<tr>
<td>MATH3906</td>
<td>Financial calculus (6)</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>MATH3408</td>
<td>Computational methods and differential equations with applications (6)</td>
</tr>
<tr>
<td>MATH3603</td>
<td>Probability theory (6)</td>
</tr>
<tr>
<td>MATH3904</td>
<td>Introduction to optimization (6)</td>
</tr>
<tr>
<td>MATH3911</td>
<td>Game theory and strategy (6)</td>
</tr>
<tr>
<td>MATH4602</td>
<td>Scientific computing (6)</td>
</tr>
<tr>
<td>MATH4907</td>
<td>Numerical methods for financial calculus (6)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

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


**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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: 2013

admitted to Year 1 in

Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

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

PLO 1: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

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

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Courses (18 credits)
   MATH1013 University mathematics II (6)
   MATH2101 Linear algebra I (6)
   MATH2211 Multivariable calculus (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   MATH3601 Numerical analysis (6)
   MATH3906 Financial calculus (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   MATH3408 Computational methods and differential equations with applications (6)
   MATH3603 Probability theory (6)
   MATH3904 Introduction to optimization (6)
   MATH3911 Game theory and strategy (6)
   MATH4602 Scientific computing (6)
   MATH4907 Numerical methods for financial calculus (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

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


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

Offered to students: 2012
admitted to Year 1 in

Objectives:
The Minor in Computational & Financial Mathematics provides students with fundamental knowledge in both computational mathematics and financial mathematics. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from computational sciences and financial industry.

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

PLO 1: understand and describe fundamental concepts in computational and financial mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics
Minor in Mathematics

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)

Disciplinary Core Courses (18 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
<td></td>
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<td>MATH2101</td>
<td>Linear algebra I (6)</td>
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</tr>
<tr>
<td>MATH2211</td>
<td>Multivariable calculus (6)</td>
<td></td>
</tr>
</tbody>
</table>

2. Advanced level courses (24 credits)

Disciplinary Core Courses (12 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MATH3601</td>
<td>Numerical analysis (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3906</td>
<td>Financial calculus (6)</td>
<td></td>
</tr>
</tbody>
</table>

Disciplinary Electives (12 credits)

At least 12 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3408</td>
<td>Computational methods and differential equations with applications (6)</td>
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</tbody>
</table>

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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.


Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2016

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

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 2015

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

Required courses (36 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - EASC1401 Blue Planet (6)
   - EASC1402 Principles of geology (6)
   - EASC2401 Fluid/solid interactions in earth processes (6)

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:
   
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<td>EASC3408 Geophysics (6)</td>
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<td>EASC4403 Biogeochemical cycles (6)</td>
</tr>
<tr>
<td>EASC4406 Earth dynamics &amp; global tectonics (6)</td>
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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>
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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 Earth Sciences
Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

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

PLO 1: understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 2: understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 3: discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

Impermissible Combinations:
Major in Earth System Science
Major in Geology

Required courses (36 credits)
1. Introductory level courses (12 credits)
2. Advanced level courses (24 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)

Disciplinary Electives (24 credits)
At least 24 credits of advanced level Earth Sciences courses (EASC3XXX or EASC4XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

List A

- EASC3020 Global change: anthropogenic impacts (6)
- EASC3402 Petrology (6)
- EASC3403 Sedimentary environments (6)
- EASC3404 Structural geology (6)
- EASC3405 Environmental remote sensing (6)
- EASC3406 Reconstruction of past climate (6)
- EASC3408 Geophysics (6)
- EASC3409 Igneous and metamorphic petrogenesis (6)
- EASC3410 Hydrogeology (6)
- EASC3412 Earth resources (6)
- EASC3413 Engineering geology (6)
- EASC3414 Soil and rock mechanics (6)
- EASC3415 Meteorology (6)
- EASC3416 Advanced geochemistry and geochronology (6)
- EASC3417 Earth through time (6)
- EASC3999 Directed studies in earth sciences (6)
- EASC4403 Biogeochemical cycles (6)
- EASC4406 Earth dynamics & global tectonics (6)
- EASC4407 Regional geology (6)
- EASC4408 Special topics in earth sciences (6)
- EASC4911 Earth system: contemporary issues (6)
- EASC4955 Integrated field studies (6)
- EASC4966 Earth sciences internship (6)
- EASC4999 Earth sciences project (12)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Objectives:
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

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

PLO 1: understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 2: understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)

PLO 3: discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

Impermissible Combinations:
Major in Earth System Science
Major in Geology

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:

- 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)
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- EASC4403 Biogeochemical cycles (6)
- EASC4406 Earth dynamics & global tectonics (6)
- EASC4407 Regional geology (6)
- EASC4408 Special topics in earth sciences (6)
- EASC4911 Earth system: contemporary issues (6)
- EASC4955 Integrated field studies (6)
- EASC4966 Earth sciences internship (6)
- EASC4999 Earth sciences project (12)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

**Objectives:**  
The Minor in Earth Sciences aims to provide interested students with an introduction to the fundamental structure, process and history of the Earth. The minor curriculum is designed particularly to provide students from different majors the flexibility to select courses to enhance their interests in Earth Sciences or to complement their major of study.

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

- **PLO 1**: understand and describe the methods used by the Earth scientists to study the Earth systems (by means to coursework, tutorial classes and field-based learning in the curriculum)
- **PLO 2**: understand and describe the basic nomenclature used in Earth Sciences (by means to coursework, tutorial classes and field-based learning in the curriculum)
- **PLO 3**: discuss and comment critically issues related to the Earth Sciences in media reports (by means to coursework, tutorial classes and field-based learning in the curriculum)

**Impermissible Combinations:**  
Major in Earth System Science  
Major in Geology  

**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)
     - EASC3042 Petrology (6)
     - EASC3052 Sedimentary environments (6)
     - EASC3072 Structural geology (6)
     - EASC3082 Environmental remote sensing (6)
     - EASC3092 Reconstruction of past climate (6)
     - EASC3102 Geophysics (6)
     - EASC3112 Igneous and metamorphic petrogenesis (6)
     - EASC3122 Hydrogeology (6)
     - EASC3132 Earth resources (6)
     - EASC3142 Engineering geology (6)
     - EASC3152 Soil and rock mechanics (6)
     - EASC3162 Meteorology (6)
     - EASC3172 Advanced geochemistry and geochronology (6)
     - EASC3182 Earth through time (6)
     - EASC3192 Directed studies in earth sciences (6)
     - EASC3202 Biogeochemical cycles (6)
     - EASC3212 Earth dynamics & global tectonics (6)
     - EASC3222 Regional geology (6)
     - EASC3232 Special topics in earth sciences (6)
     - EASC3242 Earth system: contemporary issues (6)
     - EASC3252 Integrated field studies (6)
     - EASC3262 Earth sciences internship (6)
     - EASC3292 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 admitted to Year 1 in**: 2016  

**Objectives:**  
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

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

1. **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)
2. **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)
3. **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

<table>
<thead>
<tr>
<th>Required courses (36 credits)</th>
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<tbody>
<tr>
<td><strong>1. Introductory level courses (12 credits)</strong></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 Ecology & Biodiversity
Offered to students: 2015

Objectives:
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

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

PLO 1: appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major or Minor in Ecology & Biodiversity

Required courses (36 credits)

1. Introductory level courses (12 credits)
   - BIOL1309 Evolutionary diversity (6)
   - BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   - BIOL3101 Animal behaviour (6)
   - BIOL3301 Marine biology (6)
   - BIOL3302 Systematics and phylogenetics (6)
   - BIOL3303 Conservation ecology (6)
   - BIOL3313 Freshwater ecology (6)
   - BIOL3314 Plant structure and evolution (6)
   - BIOL3318 Experimental intertidal ecology (6)
   - BIOL3319 Terrestrial ecology (6)
   - BIOL3320 The biology of marine mammals (6)
   - BIOL3419 Insect ecology; the little things that run the world (6)
   - BIOL4301 Fish and fisheries (6)
   - BIOL4302 Environmental impact assessment (6)
   - BIOL4303 Animal behaviour (6)

Take either BIOL3101 or BIOL4303 to fulfill this 24 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

**Offered to students**  
admitted to Year 1 in 2014

**Objectives:**  
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

**Learning Outcomes:**

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

- **PLO 1:** appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2:** understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3:** appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

**Impermissible Combinations:**

Major in Ecology & Biodiversity

**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 ecology (6)
     - BIOL3313  Freshwater ecology (6)
     - BIOL3314  Plant structure and evolution (6)
     - BIOL3318  Experimental intertidal ecology (6)
     - BIOL3319  Terrestrial ecology (6)
     - BIOL3320  The biology of marine mammals (6)
     - BIOL3419  Insect ecology: the little things that run the world (6)
     - BIOL4301  Fish and fisheries (6)
     - BIOL4302  Environmental impact assessment (6)
     - BIOL4303  Animal behaviour (6)

*Take either BIOL3101 or BIOL4303 to fulfill this 24 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.*

**Notes:**

1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

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

PLO 1: appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 2: understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 3: appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Ecology & Biodiversity

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)
   Take either BIOL3101 or BIOL4303 to fulfill this 24 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.
   BIOL3101 Animal behaviour (6)
   BIOL3301 Marine biology (6)
   BIOL3302 Systematics and phylogenetics (6)
   BIOL3303 Conservation ecology (6)
   BIOL3313 Freshwater ecology (6)
   BIOL3314 Plant structure and evolution (6)
   BIOL3318 Experimental intertidal ecology (6)
   BIOL3319 Terrestrial ecology (6)
   BIOL3320 The biology of marine mammals (6)
   BIOL3419 Insect ecology: the little things that run the world (6)
   BIOL4301 Fish and fisheries (6)
   BIOL4302 Environmental impact assessment (6)
   Take either BIOL3101 or BIOL4303 to fulfill this 24 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.
   BIOL4303 Animal behaviour (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

### Offered to students
2012

### Objectives:
This Minor in Ecology & Biodiversity is an ideal introduction to the natural world, the species and ecosystems it comprises and the biological rules it follows. It aims to allow students to learn about general ecological principles and the local flora and fauna of the region, and the conservation challenges that will need to be addressed in a rapidly-changing world. Students will be able to build upon this basic knowledge developed at the introductory level by selecting from among a wide range of courses that offer learning opportunities through practical and field work, as well as traditional and virtual teaching, in more specialized areas of ecology and biodiversity.

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

- **PLO 1:** appreciate and describe the importance of ecology and biodiversity, and the importance of the variety of life to humans (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2:** understand and describe the impacts of environmental change and the causes and consequences of biodiversity loss (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3:** appreciate and describe the ecological principles underlying different policies and plans for biodiversity conservation and sustainable development in Hong Kong and elsewhere (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

### Impermissible Combinations:
Major in Ecology & Biodiversity

#### 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 ecology (6)
     - BIOL3313 Freshwater ecology (6)
     - BIOL3314 Plant structure and evolution (6)
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     - BIOL4301 Fish and fisheries (6)
     - BIOL4302 Environmental impact assessment (6)
     - BIOL4303 Animal behaviour (6)

   *Take either BIOL3101 or BIOL4303 to fulfill this 24 credits requirement, but not both. BIOL3101 and BIOL4303 are mutually exclusive.*

### Notes:
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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 admitted to Year 1 in 2016

**Objectives:**
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help students understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

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

- **PLO 1:** identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)
- **PLO 2:** observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)
- **PLO 3:** appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)
- **PLO 4:** gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/laboratory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

**Impermissible Combinations:**
Major in Environmental Science

<table>
<thead>
<tr>
<th>Required courses (42 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (18 credits)</strong></td>
</tr>
<tr>
<td><strong>Disciplinary Core Courses (6 credits)</strong></td>
</tr>
<tr>
<td>ENVS1401 Introduction to environmental science (6)</td>
</tr>
<tr>
<td><strong>Disciplinary Electives (12 credits)</strong></td>
</tr>
</tbody>
</table>
| 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 Environmental field and lab course (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 ecology (6) |
| BIOL4302 Environmental impact assessment (6) |
| CHEM3141 Environmental chemistry (6) |
| CHEM3241 Analytical chemistry II: chemical instrumentation (6) |
| CHEM3242 Food and water analysis (6) |
| EASC3020 Global change: anthropogenic impacts (6) |
| EASC3405 Environmental remote sensing (6) |
| ENVS3006 Environmental radiation (6) |
| ENVS3007 Natural hazards and mitigation (6) |
| ENVS3010 Sustainable energy and environment (6) |
| ENVS3019 Urban ecology (6) |
| ENVS3020 Global change ecology (6) |
| ENVS3042 Pollution (6) |
| ENVS3313 Environmental oceanography (6) |
| ENVS4110 Environmental remediation (6) |

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help student understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

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

PLO 1: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 2: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 3: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)

PLO 4: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Major in Environmental Science

Required courses (42 credits)
1. Introductory level courses (18 credits)
   Disciplinary Core Courses (6 credits)
   ENVS1401 Introduction to environmental science (6)

   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses (Level 1 & 2):
   CHEM1042 General chemistry I (6)
   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 Environmental field and lab course (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 ecology (6)
   BIOL4302 Environmental impact assessment (6)
   CHEM3114 Environmental chemistry (6)
   CHEM3241 Analytical chemistry II: chemical instrumentation (6)
   CHEM3242 Food and water analysis (6)
   EASC3020 Global change: anthropogenic impacts (6)
   EASC3405 Environmental remote sensing (6)
   ENVS3006 Environmental radiation (6)
   ENVS3007 Natural hazards and mitigation (6)
   ENVS3010 Sustainable energy and environment (6)
   ENVS3019 Urban ecology (6)
   ENVS3020 Global change ecology (6)
   ENVS3042 Pollution (6)
   ENVS3313 Environmental oceanography (6)
   ENVS4110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help students understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

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

- **PLO 1**: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)
- **PLO 2**: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)
- **PLO 3**: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/laboratory/team-based learning in the curriculum)
- **PLO 4**: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/laboratory/team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Major in Environmental Science

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| 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 ecology (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) |
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| ENVS3313 Environmental oceanography (6) |
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Notes:
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Remarks:
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courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Environmental Science

Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help student understand certain aspects of the environment and possible ways to solving environmental problems which will be useful to students to enhance their career prospects.

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

- **PLO 1**: identify and describe different components of the environmental systems and key issues in environmental science (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 2**: observe, describe, measure and analyze physical, biological and chemical characteristics of natural and man-made environments (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 3**: appropriately use and critically analyze a range of forms and sources of environmental data, and assess environmental problems (by means of lectures, coursework, tutorial classes and field/ laboratory/ team-based learning in the curriculum)
- **PLO 4**: gain skills in scientific inquiry and effective communication of global environmental problems, issues of resource management, policies and management methods (by means of field/ laboratory/ team-based learning, research projects, presentation opportunities and capstone experiences in the curriculum)

Impermissible Combinations:
Major in Environmental Science

### Required courses (42 credits)

#### 1. Introductory level courses (18 credits)
**Disciplinary Core Courses (6 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVS1401</td>
<td>Introduction to environmental science</td>
<td>6</td>
</tr>
</tbody>
</table>

**Disciplinary Electives (12 credits)**

At least 12 credits selected from the following courses (Level 1 & 2):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM1042</td>
<td>General chemistry I (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM2041</td>
<td>Principles of chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM2241</td>
<td>Analytical chemistry I (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM2442</td>
<td>Fundamentals of organic chemistry (6)</td>
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</tr>
<tr>
<td>EASC1020</td>
<td>Introduction to climate science (6)</td>
<td></td>
</tr>
<tr>
<td>EASC1401</td>
<td>Blue Planet (6)</td>
<td></td>
</tr>
<tr>
<td>EASC2404</td>
<td>Introduction to atmosphere and hydrosphere (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS1301</td>
<td>Environmental life science (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS2001</td>
<td>Environmental field and lab course (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS2002</td>
<td>Environmental data analysis (6)</td>
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</table>

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

**Disciplinary Core Courses (6 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENVS3004</td>
<td>Environment, society and economics (6)</td>
<td></td>
</tr>
</tbody>
</table>

**Disciplinary Electives (18 credits)**

At least 18 credits selected from the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3110</td>
<td>Environmental toxicology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL3303</td>
<td>Conservation ecology (6)</td>
<td></td>
</tr>
<tr>
<td>BIOL4302</td>
<td>Environmental impact assessment (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM3141</td>
<td>Environmental chemistry (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM3241</td>
<td>Analytical chemistry II: chemical instrumentation (6)</td>
<td></td>
</tr>
<tr>
<td>CHEM3242</td>
<td>Food and water analysis (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3020</td>
<td>Global change: anthropogenic impacts (6)</td>
<td></td>
</tr>
<tr>
<td>EASC3405</td>
<td>Environmental remote sensing (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3006</td>
<td>Environmental radiation (6)</td>
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</tr>
<tr>
<td>ENVS3007</td>
<td>Natural hazards and mitigation (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3010</td>
<td>Sustainable energy and environment (6)</td>
<td></td>
</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>
<tr>
<td>ENVS3042</td>
<td>Pollution (6)</td>
<td></td>
</tr>
<tr>
<td>ENVS3313</td>
<td>Environmental oceanography (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
Science Minors

courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Environmental Science
Offered to students admitted to Year 1 in 2012

Objectives:
The Minor in Environmental Science aims to provide students with an introduction to some complex environmental issues. Students will gain ecological and physical knowledge of the environment, become literate in issues related to environmental sustainability, monitoring and management, and be able to explore interdisciplinary solutions to these problems. This training will help 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 6 credits selected from the following courses (Level 1) in List A:
   List A
   CHEM1042 General chemistry I (6)
   EASC1401 Blue Planet (6)
   ENVS1301 Environmental life science (6)
   At least 6 credits selected from the following courses (Level 2) in List B:
   List B
   BIOL2102 Biostatistics (6)
   CHEM2041 Principles of chemistry (6)
   CHEM2241 Analytical chemistry I (6)
   CHEM2442 Fundamentals of organic chemistry (6)
   EASC2404 Introduction to atmosphere and hydrosphere (6)
   ENVS2001 Environmental field and lab course (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 ecology (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)
   ENV3006 Environmental radiation (6)
   ENV3007 Natural hazards and mitigation (6)
   ENV3010 Sustainable energy and environment (6)
   ENV3019 Urban ecology (6)
   ENV3020 Global change ecology (6)
   ENV3042 Pollution (6)
   ENV3313 Environmental oceanography (6)
   ENV4110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors...
Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses 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 2016

**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>
<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>BIOL2220</td>
<td>Principles of biochemistry</td>
<td>6</td>
</tr>
</tbody>
</table>

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

**Disciplinary Electives (24 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3201</td>
<td>Food chemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3202</td>
<td>Nutritional biochemistry</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3203</td>
<td>Food microbiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3204</td>
<td>Nutrition and the life cycle</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3205</td>
<td>Human physiology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3206</td>
<td>Clinical nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3207</td>
<td>Food and nutritional toxicology</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3208</td>
<td>Food safety and quality management</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3209</td>
<td>Food and nutrient analysis</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3210</td>
<td>Grain production and utilization</td>
<td>6</td>
</tr>
<tr>
<td>BIOL3211</td>
<td>Nutrigenomics</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4201</td>
<td>Public health nutrition</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4204</td>
<td>Diet, brain function and behavior</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4205</td>
<td>Food processing and engineering</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4207</td>
<td>Meat and dairy sciences</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4209</td>
<td>Functional foods</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4210</td>
<td>Food product development</td>
<td>6</td>
</tr>
<tr>
<td>BIOL4411</td>
<td>Plant and food biotechnology</td>
<td>6</td>
</tr>
</tbody>
</table>

**Notes:**

1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**

Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
**Objective:**
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

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

- **PLO 1**: demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2**: recognize and describe the health risks associated with food and specific nutrients, and discuss how to prevent these risks (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3**: understand and describe ethical perspectives and practice in food product development, food safety and public health nutrition (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 4**: synthesize and summarize information from a wide range of sources and draw reasoned conclusions with particular reference to food and nutritional sciences and related global and commercial issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

**Impermissible Combinations:**
Major in Food & Nutritional Science

<table>
<thead>
<tr>
<th>Required courses (36 credits)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (12 credits)</td>
<td>Disciplinary Electives (12 credits)</td>
</tr>
<tr>
<td>At least 12 credits selected from the following courses:</td>
<td>BIOL1110 From molecules to cells (6)</td>
</tr>
<tr>
<td>BIOL1201 Introduction to food and nutrition (6)</td>
<td>BIOL2220 Principles of biochemistry (6)</td>
</tr>
<tr>
<td>2. Advanced level courses (24 credits)</td>
<td>Disciplinary Electives (24 credits)</td>
</tr>
<tr>
<td>At least 24 credits selected from the following courses:</td>
<td>BIOL3201 Food chemistry (6)</td>
</tr>
<tr>
<td>BIOL3202 Nutritional biochemistry (6)</td>
<td>BIOL3203 Food microbiology (6)</td>
</tr>
<tr>
<td>BIOL3204 Nutrition and the life cycle (6)</td>
<td>BIOL3205 Human physiology (6)</td>
</tr>
<tr>
<td>BIOL3206 Clinical nutrition (6)</td>
<td>BIOL3207 Food and nutritional toxicology (6)</td>
</tr>
<tr>
<td>BIOL3208 Food safety and quality management (6)</td>
<td>BIOL3209 Food and nutrient analysis (6)</td>
</tr>
<tr>
<td>BIOL3210 Grain production and utilization (6)</td>
<td>BIOL3211 Nutrigenomics (6)</td>
</tr>
<tr>
<td>BIOL4201 Public health nutrition (6)</td>
<td>BIOL4204 Diet, brain function and behavior (6)</td>
</tr>
<tr>
<td>BIOL4205 Food processing and engineering (6)</td>
<td>BIOL4207 Meat and dairy sciences (6)</td>
</tr>
<tr>
<td>BIOL4209 Functional foods (6)</td>
<td>BIOL4210 Food product development (6)</td>
</tr>
<tr>
<td>BIOL4411 Plant and food biotechnology (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 Food & Nutritional Science
Offered to students: 2014
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)

PLO 3: understand and describe ethical perspectives and practice in food product development, food safety and public health nutrition (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: synthesize and summarize information from a wide range of sources and draw reasoned conclusions with particular reference to food and nutritional sciences and related global and commercial issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Food & Nutritional Science

Required courses (36 credits)

1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits selected from the following courses:
- BIOL1110 From molecules to cells (6)
- BIOL1201 Introduction to food and nutrition (6)
- BIOL2220 Principles of biochemistry (6)

2. Advanced level courses (24 credits)
Disciplinary Electives (24 credits)
At least 24 credits selected from the following courses:
- BIOL3201 Food chemistry (6)
- BIOL3202 Nutritional biochemistry (6)
- BIOL3203 Food microbiology (6)
- BIOL3204 Nutrition and the life cycle (6)
- BIOL3205 Human physiology (6)
- BIOL3206 Clinical nutrition (6)
- BIOL3207 Food and nutritional toxicology (6)
- BIOL3208 Food safety and quality management (6)
- BIOL3209 Food and nutrient analysis (6)
- BIOL3210 Grain production and utilization (6)
- BIOL3211 Nutrigenomics (6)
- BIOL4201 Public health nutrition (6)
- BIOL4204 Diet, brain function and behavior (6)
- BIOL4205 Food processing and engineering (6)
- BIOL4207 Meat and dairy sciences (6)
- BIOL4209 Functional foods (6)
- BIOL4210 Food product development (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 | 2013  
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)

PLO 3: understand and describe ethical perspectives and practice in food product development, food safety and public health nutrition (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

PLO 4: synthesize and summarize information from a wide range of sources and draw reasoned conclusions with particular reference to food and nutritional sciences and related global and commercial issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

Impermissible Combinations:  
Major in Food & Nutritional Science  

Required courses (36 credits)  
1. Introductory level courses (12 credits)  
Disciplinary Electives (12 credits)  
At least 12 credits selected from the following courses:  
BIOL1110 From molecules to cells (6)  
BIOL1201 Introduction to food and nutrition (6)  
BIOL2220 Principles of biochemistry (6)  

2. Advanced level courses (24 credits)  
Disciplinary Electives (24 credits)  
At least 24 credits selected from the following courses:  
BIOL3201 Food chemistry (6)  
BIOL3202 Nutritional biochemistry (6)  
BIOL3203 Food microbiology (6)  
BIOL3204 Nutrition and the life cycle (6)  
BIOL3205 Human physiology (6)  
BIOL3206 Clinical nutrition (6)  
BIOL3207 Food and nutritional toxicology (6)  
BIOL3208 Food safety and quality management (6)  
BIOL3209 Food and nutrient analysis (6)  
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BIOL4201 Public health nutrition (6)  
BIOL4204 Diet, brain function and behavior (6)  
BIOL4205 Food processing and engineering (6)  
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BIOL4209 Functional foods (6)  
BIOL4210 Food product development (6)  
BIOL4411 Plant and food biotechnology (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 in Food & Nutritional Science

**Objectives:**
The Minor in Food and Nutritional Science aims to provide a comprehensive education in food, nutrition and related sociological and technological topics, enabling graduates to develop their interest in food and nutrition and have a wide range of employment and progression options.

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

- **PLO 1:** demonstrate broad knowledge in the field of food and nutritional science (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 2:** recognize and describe the health risks associated with food and specific nutrients, and discuss how to prevent these risks (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 3:** understand and describe ethical perspectives and practice in food product development, food safety and public health nutrition (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)
- **PLO 4:** synthesize and summarize information from a wide range of sources and draw reasoned conclusions with particular reference to food and nutritional sciences and related global and commercial issues (by means of coursework, tutorial classes and laboratory-based learning in the curriculum)

**Impermissible Combinations:**
Major in Food & Nutritional Science

## Required courses (36 credits)

<table>
<thead>
<tr>
<th>Level</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory</td>
<td><strong>Disciplinary Electives (12 credits)</strong></td>
</tr>
<tr>
<td></td>
<td>At least 12 credits selected from the following courses:</td>
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<tr>
<td>Advanced</td>
<td><strong>Disciplinary Electives (24 credits)</strong></td>
</tr>
<tr>
<td></td>
<td>At least 24 credits selected from the following courses:</td>
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<tr>
<td></td>
<td>BIOL3208 Food safety and quality management (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL3209 Food and nutrient analysis (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL3210 Grain production and utilization (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL3211 Nutrigenomics (6)</td>
</tr>
<tr>
<td></td>
<td>BIOL4201 Public health nutrition (6)</td>
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<td></td>
<td>BIOL4204 Diet, brain function and behavior (6)</td>
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<td>BIOL4205 Food processing and engineering (6)</td>
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<tr>
<td></td>
<td>BIOL4207 Meat and dairy sciences (6)</td>
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<td>BIOL4209 Functional foods (6)</td>
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<td></td>
<td>BIOL4210 Food product development (6)</td>
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<tr>
<td></td>
<td>BIOL4411 Plant and food biotechnology (6)</td>
</tr>
</tbody>
</table>

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

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 ecology (6)
   - BIOL3318 Experimental intertidal ecology (6)
   - BIOL3320 The biology of marine mammals (6)
   - BIOL4301 Fish and fisheries (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g. business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

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

- PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
- PLO 2: gain a comprehensive foundation for pursuing marine-orientated studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
- PLO 3: have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
- PLO 4: understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)
- PLO 5: appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

**Required courses (36 credits)**

1. Introductory level courses (12 credits)
   - Disciplinary Electives (12 credits)
     - At least 12 credits selected from the following courses:
       - BIOL1309 Evolutionary diversity (6)
       - ENVS1301 Environmental life science (6)
       - BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   - Disciplinary Core Courses (12 credits)
     - BIOL3301 Marine biology (6)
     - ENVS3313 Environmental oceanography (6)
   - Disciplinary Electives (12 credits)
     - At least 12 credits selected from the following courses:
       - BIOL3303 Conservation ecology (6)
       - BIOL3318 Experimental intertidal ecology (6)
       - BIOL3320 The biology of marine mammals (6)
       - BIOL4301 Fish and fisheries (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g. business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

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

PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 2: gain a comprehensive foundation for pursuing marine-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:

<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>ENVS1301</td>
<td>Environmental life science</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL2306</td>
<td>Ecology and evolution</td>
<td>(6)</td>
</tr>
</tbody>
</table>

2. Advanced level courses (24 credits)

Disciplinary Core Courses (12 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL3301</td>
<td>Marine biology</td>
<td>(6)</td>
</tr>
<tr>
<td>ENVS3313</td>
<td>Environmental oceanography</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>BIOL3303</td>
<td>Conservation ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3318</td>
<td>Experimental intertidal ecology</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL3320</td>
<td>The biology of marine mammals</td>
<td>(6)</td>
</tr>
<tr>
<td>BIOL4301</td>
<td>Fish and fisheries</td>
<td>(6)</td>
</tr>
</tbody>
</table>

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

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

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g. business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

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

PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 2: gain a comprehensive foundation for pursuing marine-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 ecology (6)
      BIOL3318 Experimental intertidal ecology (6)
      BIOL3320 The biology of marine mammals (6)
      BIOL4301 Fish and fisheries (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Objectives:
The field of marine biology has become increasingly popular as interest in and awareness of our marine environment grows. Hong Kong already has strong cultural and historical links with the sea as well as a strong economic and societal interest in natural marine resources. This Minor aims to introduce students to the field of marine biology from species, habitat and ecosystem levels, ranging from the deep ocean to intertidal environments, and from both theoretical and practical perspectives. Material will be global and include organisms and their physical, behavioral and physiological adaptations to the marine environment, as well as techniques for marine study. Major marine issues will be covered including benefits derived from the marine environment and possible implications of climate change for marine systems. Particularly relevant examples from Hong Kong and the Southeast Asia region will be highlighted. This minor will provide students from diverse backgrounds (e.g., business, engineering and social science) an excellent opportunity to enter into a career or research in marine environment-related fields such as coastal ecosystem management, fisheries, marine environmental protection, marine resource management, etc.

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

PLO 1: appreciate the requirements and constraints to life in different marine environments (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 2: gain a comprehensive foundation for pursuing marine-orientated studies (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 3: have a general insight into an ecosystem that covers two-thirds of the planet and supports the only remaining natural resource harvested on a large scale (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 4: understand the major marine issues both locally and globally (by means of coursework, laboratory-based, and tutorial classes and project-based learning in the curriculum)

PLO 5: appreciate the possible implications of climate change on marine systems (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   - At least 12 credits selected from the following courses:
     - BIOL1309 Evolutionary diversity (6)
     - ENVIS1301 Environmental life science (6)
     - BIOL2306 Ecology and evolution (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - BIOL3301 Marine biology (6)
   - ENVIS3313 Environmental oceanography (6)
   Disciplinary Electives (12 credits)
   - At least 12 credits selected from the following courses:
     - BIOL3303 Conservation ecology (6)
     - BIOL3318 Experimental intertidal ecology (6)
     - BIOL3320 The biology of marine mammals (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 2016

Objectives:
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

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

PLO 1: understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

Impermissible Combinations:
- Major in Mathematics
- Major in Mathematics/Physics
- Minor in Computational & Financial Mathematics
- Minor in Operations Research & Mathematical Programming

<table>
<thead>
<tr>
<th>Required courses (36 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introductory level courses (18 credits) (note 4)</td>
</tr>
<tr>
<td>Disciplinary Core Courses (18 credits)</td>
</tr>
<tr>
<td>MATH1013</td>
</tr>
<tr>
<td>MATH2101</td>
</tr>
<tr>
<td>MATH2211</td>
</tr>
<tr>
<td>2. Advanced level courses (18 credits)</td>
</tr>
<tr>
<td>Disciplinary Electives (18 credits)</td>
</tr>
<tr>
<td>MATH3001</td>
</tr>
<tr>
<td>MATH3002</td>
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<tr>
<td>MATH3301</td>
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<td>MATH3303</td>
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<td>MATH3304</td>
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<tr>
<td>MATH3401</td>
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</tr>
<tr>
<td>MATH7202</td>
</tr>
<tr>
<td>MATH7217</td>
</tr>
</tbody>
</table>
MATH7219 Topics in applied functional analysis (6)
MATH7224 Topics in advanced probability theory (6)
MATH7501 Topics in algebra (6)
MATH7502 Topics in applied discrete mathematics (6)
MATH7503 Topics in mathematical programming and optimization (6)
MATH7504 Geometric topology (6)
MATH7505 Real analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

3. If students would like to take more courses in analysis such as MATH3401 (Analysis I), they are advised to take the introductory course MATH2241 Introduction to mathematical analysis first.


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

### Offered to students admitted to Year 1 in 2015

**Objectives:**

The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

**Learning Outcomes:**

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

- **PLO 1**: understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2**: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3**: communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

**Impermissible Combinations:**

- Major in Mathematics
- Major in Mathematics/Physics
- Minor in Computational & Financial Mathematics
- Minor in Operations Research & Mathematical Programming

### Required courses (36 credits)

**1. Introductory level courses (18 credits) (note 4)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013</td>
<td>University mathematics II (6)</td>
<td></td>
</tr>
<tr>
<td>MATH2101</td>
<td>Linear algebra I (6)</td>
<td></td>
</tr>
<tr>
<td>MATH2211</td>
<td>Multivariable calculus (6)</td>
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</tr>
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</table>

**2. Advanced level courses (18 credits)**

#### Disciplinary Core Courses (18 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH3001</td>
<td>Development of mathematical ideas (6)</td>
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</tr>
<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>MATH3303</td>
<td>Matrix theory and its applications (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3304</td>
<td>Introduction to number theory (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3401</td>
<td>Analysis I (6)</td>
<td></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>MATH3408</td>
<td>Computational methods and differential equations with applications (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3541</td>
<td>Introduction to topology (6)</td>
<td></td>
</tr>
<tr>
<td>MATH3600</td>
<td>Discrete mathematics (6)</td>
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</tr>
<tr>
<td>MATH3601</td>
<td>Numerical analysis (6)</td>
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</tr>
<tr>
<td>MATH3603</td>
<td>Probability theory (6)</td>
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</tr>
<tr>
<td>MATH3901</td>
<td>Operations research I (6)</td>
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<tr>
<td>MATH3904</td>
<td>Introduction to optimization (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.

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.


**Remarks:**

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

Objectives:
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

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

PLO 1: understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

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

Required courses (36 credits)
1. Introductory level courses (18 credits) (note 4)
Disciplinary Core Courses (18 credits)

- MATH1013 University mathematics II (6)
- MATH2101 Linear algebra I (6)
- MATH2211 Multivariable calculus (6)

2. Advanced level courses (18 credits)
Disciplinary Electives (18 credits)

At least 18 credits of advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), subject to pre-requisite requirements. The current course list includes courses in List A:

List A
- MATH3001 Development of mathematical ideas (6)
- MATH3002 Mathematics seminar (6)
- MATH3301 Algebra I (6)
- MATH3303 Matrix theory and its applications (6)
- MATH3304 Introduction to number theory (6)
- MATH3401 Analysis I (6)
- MATH3403 Functions of a complex variable (6)
- MATH3405 Differential equations (6)
- MATH3408 Computational methods and differential equations with applications (6)
- MATH3541 Introduction to topology (6)
- MATH3600 Discrete mathematics (6)
- MATH3601 Numerical analysis (6)
- MATH3603 Probability theory (6)
- MATH3901 Operations research I (6)
- MATH3904 Introduction to optimization (6)
- MATH3905 Queueing theory and simulation (6)
- MATH3906 Financial calculus (6)
- MATH3911 Game theory and strategy (6)
- MATH3943 Network models in operations research (6)
- MATH3999 Directed studies in mathematics (6)
- MATH4302 Algebra II (6)
- MATH4402 Analysis II (6)
- MATH4404 Functional analysis (6)
- MATH4406 Introduction to partial differential equations (6)
- MATH4501 Geometry (6)
- MATH4511 Introduction to differentiable manifolds (6)
- MATH4602 Scientific computing (6)
- MATH4902 Operations research II (6)
- MATH4907 Numerical methods for financial calculus (6)
- MATH4910 Senior mathematics seminar (6)
- MATH4911 Mathematics capstone project (6)
- MATH4966 Mathematics internship (6)
- MATH4999 Mathematics project (12)
- MATH7101 Intermediate complex analysis (6)
- MATH7201 Topics in geometry (6)
- MATH7202 Complex manifolds (6)
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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.


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

Objectives:
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

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

PLO 1: understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

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

Required courses (36 credits)

1. Introductory level courses (18 credits) (note 4)
   Disciplinary Core Courses (18 credits)
   MATH1013 University mathematics II (6)
   MATH2101 Linear algebra I (6)
   MATH2211 Multivariable calculus (6)

2. Advanced level courses (18 credits)
   Disciplinary Electives (18 credits)
   At least 18 credits of advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), subject to pre-requisite requirements. The current course list includes courses in List A:
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   MATH3405 Differential equations (6)
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   MATH3600 Discrete mathematics (6)
   MATH3601 Numerical analysis (6)
   MATH3603 Probability theory (6)
   MATH3901 Operations research I (6)
   MATH3904 Introduction to optimization (6)
   MATH3905 Queueing theory and simulation (6)
   MATH3906 Financial calculus (6)
   MATH3911 Game theory and strategy (6)
   MATH3943 Network models in operations research (6)
   MATH3999 Directed studies in mathematics (6)
   MATH4302 Algebra II (6)
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   MATH4404 Functional analysis (6)
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   MATH4501 Geometry (6)
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   MATH4602 Scientific computing (6)
   MATH4902 Operations research II (6)
   MATH4907 Numerical methods for financial calculus (6)
   MATH4910 Senior mathematics seminar (6)
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   MATH4999 Mathematics project (12)
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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 Mathematics  
**Offered to students admitted to Year 1 in**: 2012

**Objectives:**
The Minor in Mathematics provides students with fundamental knowledge in the subject. It is specifically designed for students who are interested in the subject and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving, and capability to tackle novel situations and ill-defined problems.

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

- **PLO 1**: understand and describe fundamental concepts of mathematics (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2**: apply mathematical methods and analysis to real life problems (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3**: communicate and discuss scientific issues related to mathematics. (by means of coursework, tutorial classes and presentation opportunities in the curriculum)

**Impermissible Combinations:**
Major in Mathematics  
Major in Mathematics/Physics  
Minor in Computational & Financial Mathematics

**Required courses (36 credits)**

1. **Introductory level courses (18 credits) (note 4)**
   **Disciplinary Core Courses (18 credits)**
   - MATH1013 University mathematics II (6)
   - MATH2101 Linear algebra I (6)
   - MATH2211 Multivariable calculus (6)

2. **Advanced level courses (18 credits)**
   **Disciplinary Electives (18 credits)**
   At least 18 credits of advanced level Mathematics courses (MATH3XXX or MATH4XXX or MATH7XXX level), subject to pre-requisite requirements. The current course list includes courses in List A:
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   - MATH4902 Operations research II (6)
   - MATH4907 Numerical methods for financial calculus (6)
   - MATH4910 Senior mathematics seminar (6)
   - MATH4911 Mathematics capstone project (6)
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   - MATH7101 Intermediate complex analysis (6)
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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.


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

Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

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

PLO 1: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)

PLO 3: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Molecular Biology & Biotechnology

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<td>BIOL2102 Biostatistics (6)</td>
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<td>BIOL2103 Biological sciences laboratory course (6)</td>
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<tr>
<td>BIOL2220 Principles of biochemistry (6)</td>
</tr>
<tr>
<td>BIOL2306 Ecology and evolution (6)</td>
</tr>
<tr>
<td>May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.</td>
</tr>
<tr>
<td>May take either BIOL2220 or BIOC2600 to fulfill this 12 credits requirement, but not both.</td>
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<tr>
<td>May take either BIOL2220 or BIOC2600 to fulfill this 12 credits requirement, but not both.</td>
</tr>
<tr>
<td>May take either BIOL1309 or BIOL2306 to fulfill this 12 credits requirement, but not both.</td>
</tr>
</tbody>
</table>

| 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) |
| ENV54110 Environmental remediation (6) |
| May take either BIOL3402 or BIOL3403 to fulfill this 6 credits requirement, but not both. |
| May take either BIOL3403 or BIOL3409 to fulfill this 6 credits requirement, but not both. |
| May take either BIOL3409 or BIOL3508 to fulfill this 6 credits requirement, but not both. |
| May take either BIOL4401 or BIOL4411 to fulfill this 6 credits requirement, but not both. |
| May take either BIOL4415 or BIOL4416 to fulfill this 6 credits requirement, but not both. |
| May take either BIOL4416 or BIOL4417 to fulfill this 6 credits requirement, but not both. |
| May take either BIOL4417 or ENV54110 to fulfill this 6 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 Molecular Biology & Biotechnology
Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

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

PLO 1: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)

PLO 3: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Molecular Biology & Biotechnology

Required courses (36 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
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   - 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)
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   - BIOL4401 Medical microbiology and applied immunology (6)
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   - BIOL4415 Healthcare biotechnology (6)
   - BIOL4416 Stem cells and regenerative biology (6)
   - BIOL4417 'Omics' and systems biology (6)
   - ENVS4110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Molecular Biology & Biotechnology aims to provide students with a fundamental understanding of molecular biology and biotechnology which are relevant to many other disciplines of study and our daily life. Students will learn the principles underlying current molecular and cell biology advances, and biotechnological applications and will become literate in biotechnology business and advancements.

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

PLO 1: develop and apply basic technical and knowledge-based skills in molecular and cell biology, and biotechnology (by means of coursework and laboratory-based learning in the curriculum)

PLO 2: develop and apply skills of critical inquiry, teamwork, and effective communication (by means of group projects, tutorial classes and presentation opportunities in the curriculum)

PLO 3: understand and describe the issues and concerns fundamental to the field (by means of coursework and laboratory-based learning in the curriculum)

Impermissible Combinations:
Major in Molecular Biology & Biotechnology

Required courses (36 credits)
1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL1110 From molecules to cells (6)
   - BIOL1309 Evolutionary diversity (6)
   - BIOL2220 or BIOC2600 Basic biochemistry (6)
   - BIOL2102 Biostatistics (6)
   - BIOL2103 Biological sciences laboratory course (6)
   - BIOL2220 Principles of biochemistry (6)
   - BIOL2306 Ecology and evolution (6)
   - 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 or BIOC2600 are mutually exclusive.

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (6 credits)
   - BIOL3401 Molecular biology (6)
   Disciplinary Electives (18 credits)
   At least 18 credits selected from the following courses:
   - BIOL3402 Cell biology and cell technology (6)
   - BIOL3403 Immunology (6)
   - BIOL3409 Business aspects of biotechnology (6)
   - BIOL3508 Microbial physiology and biotechnology (6)
   - BIOL4401 Medical microbiology and applied immunology (6)
   - BIOL4402 Microbial biotechnology (6)
   - BIOL4411 Plant and food biotechnology (6)
   - BIOL4415 Healthcare biotechnology (6)
   - BIOL4416 Stem cells and regenerative biology (6)
   - BIOL4417 ‘Omics’ and systems biology (6)
   - ENVS4101 Environmental remediation (6)

   Take either BIOL3508 or BIOL4402 to fulfill this 18 credits requirement, but not both. BIOL3508 and BIOL4402 are mutually exclusive.

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

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

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)
   - BIOL1200 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)
   - BIOL4402 Microbial biotechnology (6)
   - BIOL4411 Plant and food biotechnology (6)
   - BIOL4415 Healthcare biotechnology (6)
   - BIOL4416 Stem cells and regenerative biology (6)
   - BIOL4417 ‘Omics’ and systems biology (6)
   - ENVS4110 Environmental remediation (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
<table>
<thead>
<tr>
<th>Minor Title</th>
<th>Minor in Molecular Biology &amp; Biotechnology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offered to students admitted to Year 1 in</td>
<td>2012</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Required courses (36 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Introductory level courses (12 credits)</strong></td>
</tr>
<tr>
<td>Disciplinary Electives (12 credits)</td>
</tr>
<tr>
<td>At least 12 credits selected from the following courses:</td>
</tr>
<tr>
<td>BIOL1110</td>
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<td>BIOL1309</td>
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<td>BIOC2600</td>
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<tr>
<td>BIOL2102</td>
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<td>BIOL2103</td>
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<tr>
<td>BIOL2220</td>
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<tr>
<td>BIOL2306</td>
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<tr>
<td><strong>2. Advanced level courses (24 credits)</strong></td>
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<tr>
<td>Disciplinary Core Courses (6 credits)</td>
</tr>
<tr>
<td>BIOL3401</td>
</tr>
<tr>
<td>Disciplinary Electives (18 credits)</td>
</tr>
<tr>
<td>At least 18 credits selected from the following courses:</td>
</tr>
<tr>
<td>BIOL3402</td>
</tr>
<tr>
<td>BIOL3403</td>
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<td>BIOL3409</td>
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<tr>
<td>BIOL3508</td>
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<td>BIOL4401</td>
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<td>BIOL4402</td>
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<td>BIOL4416</td>
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<tr>
<td>BIOL4417</td>
</tr>
<tr>
<td>ENVSC4110</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 Operations Research & Mathematical Programming

Offered to students: 2016

admitted to Year 1 in

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 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/Physics
Minor in Mathematics
Minor in Computational & Financial Mathematics

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Courses (18 credits)
   - MATH1013 University mathematics II (6)
   - MATH2101 Linear algebra I (6)
   - MATH2211 Multivariable calculus (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - MATH3901 Operations research I (6)
   - MATH3904 Introduction to optimization (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - MATH3405 Differential equations (6)
   - MATH3600 Discrete mathematics (6)
   - MATH3905 Queueing theory and simulation (6)
   - MATH3911 Game theory and strategy (6)
   - MATH3943 Network models in operations research (6)
   - MATH4902 Operations research II (6)
   - MATH7502 Topics in applied discrete mathematics (6)
   - MATH7503 Topics in mathematical programming and optimization (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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


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

Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithms, 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 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/Physics
Minor in Mathematics
Minor in Computational & Financial Mathematics

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Courses (18 credits)
   - MATH1013 University mathematics II (6)
   - MATH2101 Linear algebra I (6)
   - MATH2211 Multivariable calculus (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - MATH3901 Operations research I (6)
   - MATH3904 Introduction to optimization (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - MATH3405 Differential equations (6)
   - MATH3600 Discrete mathematics (6)
   - MATH3905 Queueing theory and simulation (6)
   - MATH3911 Game theory and strategy (6)
   - MATH3943 Network models in operations research (6)
   - MATH4902 Operations research II (6)
   - MATH7502 Topics in applied discrete mathematics (6)
   - MATH7503 Topics in mathematical programming and optimization (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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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 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.

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Impermissible Combinations:
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Major in Mathematics/Physics
Minor in Mathematics
Minor in Computational & Financial Mathematics

Required courses (42 credits)

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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)
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MATH3911 Game theory and strategy (6)
MATH3943 Network models in operations research (6)
MATH4902 Operations research II (6)
MATH7502 Topics in applied discrete mathematics (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 minor. Students who do not fulfill this requirement are required to take MATH1011 University mathematics I.


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

Offered to students admitted to Year 1 in 2013

Objectives:
The Minor in Operations Research & Mathematical Programming provides students with fundamental knowledge in optimization, computational algorithm, mathematical modeling, and decision making. It is specifically designed for students who are interested in the above subjects and those whose majors require sophisticated mathematical skills. It aims to nurture quantitative reasoning, logical, analytical and critical thinking, innovative imagination, meticulous care to work, ability to conceptualize, skills for problem-solving and skills to tackle novel situations and ill-defined problems. It is particularly useful for solving mathematical problems arising from decision sciences and logistic industry.

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

PLO 1: describe and demonstrate understanding of fundamental concepts in 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/Physics
Minor in Mathematics
Minor in Computational & Financial Mathematics

Required courses (42 credits)

1. Introductory level courses (18 credits) (note 3)
   Disciplinary Core Courses (18 credits)
   - MATH1013 University mathematics II (6)
   - MATH2101 Linear algebra I (6)
   - MATH2211 Multivariable calculus (6)

2. Advanced level courses (24 credits)
   Disciplinary Core Courses (12 credits)
   - MATH3901 Operations research I (6)
   - MATH3904 Introduction to optimization (6)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - MATH3005 Differential equations (6)
   - MATH3600 Discrete mathematics (6)
   - MATH3905 Queueing theory and simulation (6)
   - MATH3911 Game theory and strategy (6)
   - MATH3943 Network models in operations research (6)
   - MATH4902 Operations research II (6)
   - MATH7502 Topics in applied discrete mathematics (6)
   - MATH7503 Topics in mathematical programming and optimization (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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


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

Objectives:
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

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

PLO 1: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics/Physics
Major in Physics

Required courses (42 credits)

1. Introductory level courses (18 credits)
   Disciplinary Core Courses (18 credits)
   - PHYS1250 Fundamental physics (6)
   - PHYS2250 Introductory mechanics (6)
   - PHYS2265 Modern physics (6)

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

List A
- PHYS3150 Theoretical physics (6)
- PHYS3350 Classical mechanics (6)
- PHYS3351 Quantum mechanics (6)
- PHYS3450 Electromagnetism (6)
- PHYS3550 Statistical mechanics & thermodynamics (6)
- PHYS3551 Introductory solid state physics (6)
- PHYS3650 Observational astronomy (6)
- PHYS3651 The physical universe (6)
- PHYS3652 Principles of astronomy (6)
- PHYS3750 Laser and spectroscopy (6)
- PHYS3751 Physics of nanomaterials (6)
- PHYS3850 Waves and optics (6)
- PHYS3851 Atomic and nuclear physics (6)
- PHYS3999 Directed studies in physics (6)
- PHYS4150 Computational physics (6)
- PHYS4151 Data analysis and modeling in physics (6)
- PHYS4350 Advanced classical mechanics (6)
- PHYS4351 Advanced quantum mechanics (6)
- PHYS4450 Advanced electromagnetism (6)
- PHYS4550 Advanced statistical mechanics (6)
- PHYS4650 Stellar physics (6)
- PHYS4651 Selected topics in astrophysics (6)
- PHYS4652 Planetary science (6)
- PHYS4653 Cosmology (6)
- PHYS4654 General relativity (6)
- PHYS4655 Interstellar medium (6)
- PHYS4750 Experimental physics (6)
- PHYS4850 Particle physics (6)
- PHYS4966 Physics internship (6)
- PHYS4999 Physics project (12)
- PHYS7350 Graduate classical mechanics (6)
- PHYS7351 Graduate quantum mechanics (6)
- PHYS7450 Graduate electromagnetism (6)
- PHYS7550 Graduate statistical mechanics (6)
- PHYS7551 Solid state physics (6)
- PHYS7650 Stellar atmospheres (6)
- PHYS7750 Nanophysics (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking
replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this 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.
Minor Title: Minor in Physics
Offered to students admitted to Year 1 in 2015

Objectives:
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

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

- **PLO 1**: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)
- **PLO 2**: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)
- **PLO 3**: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
- Major in Mathematics/Physics
- Major in Physics

### Required courses (42 credits)

1. **Introductory level courses (18 credits)**

#### Disciplinary Core Courses (18 credits)
- PHYS1250: Fundamental physics (6)
- PHYS2250: Introductory mechanics (6)
- PHYS2265: 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>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS3150: Theoretical physics (6)</td>
</tr>
<tr>
<td>PHYS3350: Classical mechanics (6)</td>
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<td>PHYS3351: Quantum mechanics (6)</td>
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<td>PHYS3652: Principles of astronomy (6)</td>
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<td>PHYS3999: Directed studies in physics (6)</td>
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<td>PHYS4650: Stellar physics (6)</td>
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<td>PHYS4651: Selected topics in astrophysics (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.

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

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Objectives:
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

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

PLO 1: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)

PLO 2: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)

PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:
Major in Mathematics/Physics
Major in Physics

Required courses (42 credits)

1. Introductory level courses (18 credits)
   Disciplinary Core Courses (18 credits)
   - PHYS1250 Fundamental physics (6)
   - PHYS2250 Introductory mechanics (6)
   - PHYS2265 Modern physics (6)

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

   List A
   - PHYS3150 Theoretical physics (6)
   - PHYS3350 Classical mechanics (6)
   - PHYS3351 Quantum mechanics (6)
   - PHYS3450 Electromagnetism (6)
   - PHYS3550 Statistical mechanics & thermodynamics (6)
   - PHYS3551 Introductory solid state physics (6)
   - PHYS3650 Observational astronomy (6)
   - PHYS3651 The physical universe (6)
   - PHYS3652 Principles of astronomy (6)
   - PHYS3750 Laser and spectroscopy (6)
   - PHYS3751 Physics of nanomaterials (6)
   - PHYS3850 Waves and optics (6)
   - PHYS3851 Atomic and nuclear physics (6)
   - PHYS3999 Directed studies in physics (6)
   - PHYS4150 Computational physics (6)
   - PHYS4151 Data analysis and modeling in physics (6)
   - PHYS4350 Advanced classical mechanics (6)
   - PHYS4351 Advanced quantum mechanics (6)
   - PHYS4450 Advanced electromagnetism (6)
   - PHYS4550 Advanced statistical mechanics (6)
   - PHYS4650 Stellar physics (6)
   - PHYS4651 Selected topics in astrophysics (6)
   - PHYS4652 Planetary science (6)
   - PHYS4653 Cosmology (6)
   - PHYS4654 General relativity (6)
   - PHYS4655 Interstellar medium (6)
   - PHYS4750 Experimental physics (6)
   - PHYS4850 Particle physics (6)
   - PHYS4966 Physics internship (6)
   - PHYS4999 Physics project (12)
   - PHYS7350 Graduate classical mechanics (6)
   - PHYS7351 Graduate quantum mechanics (6)
   - PHYS7450 Graduate electromagnetism (6)
   - PHYS7550 Graduate statistical mechanics (6)
   - PHYS7551 Solid state physics (6)
   - PHYS7650 Stellar atmospheres (6)
   - PHYS7750 Nanophysics (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking
replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this 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.
### Minor in Physics

**Objectives:**
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

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

- **PLO 1:** identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)
- **PLO 2:** analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)
- **PLO 3:** communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

**Impermissible Combinations:**
- Major in Mathematics/Physics
- Major in Physics

**Required courses (42 credits)**

1. **Introductory level courses (18 credits)**
   - **Disciplinary Core Courses (18 credits)**
     - PHYS1250: Fundamental physics (6)
     - PHYS2250: Introductory mechanics (6)
     - PHYS2265: Modern physics (6)

2. **Advanced level courses (24 credits)**
   - **Disciplinary Electives (24 credits)**
     - At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A:

   **List A**
   - PHYS3150: Theoretical physics (6)
   - PHYS3350: Classical mechanics (6)
   - PHYS3351: Quantum mechanics (6)
   - PHYS3450: Electromagnetism (6)
   - PHYS3550: Statistical mechanics & thermodynamics (6)
   - PHYS3551: Introductory solid state physics (6)
   - PHYS3650: Observational astronomy (6)
   - PHYS3651: The physical universe (6)
   - PHYS3652: Principles of astronomy (6)
   - PHYS3750: Laser and spectroscopy (6)
   - PHYS3751: Physics of nanomaterials (6)
   - PHYS3850: Waves and optics (6)
   - PHYS3851: Atomic and nuclear physics (6)
   - PHYS3999: Directed studies in physics (6)
   - PHYS4150: Computational physics (6)
   - PHYS4151: Data analysis and modeling in physics (6)
   - PHYS4350: Advanced classical mechanics (6)
   - PHYS4351: Advanced quantum mechanics (6)
   - PHYS4450: Advanced electromagnetism (6)
   - PHYS4550: Advanced statistical mechanics (6)
   - PHYS4650: Stellar physics (6)
   - PHYS4651: Selected topics in astrophysics (6)
   - PHYS4652: Planetary science (6)
   - PHYS4653: Cosmology (6)
   - PHYS4654: General relativity (6)
   - PHYS4655: Interstellar medium (6)
   - PHYS4750: Experimental physics (6)
   - PHYS4850: Particle physics (6)
   - PHYS4966: Physics internship (6)
   - PHYS4999: Physics project (12)
   - PHYS7350: Graduate classical mechanics (6)
   - PHYS7351: Graduate quantum mechanics (6)
   - PHYS7450: Graduate electromagnetism (6)
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   - PHYS7650: Stellar atmospheres (6)
   - PHYS7750: Nanophysics (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking
replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

2. Students must have level 3 or above in HKDSE Physics or equivalent to take this 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.
Minor Title: Minor in Physics  
Offered to students admitted to Year 1 in 2012

Objectives:  
The Minor in Physics is intended to provide interested students with a fundamental outlook on the subject. Students would acquire a taste of the subject through a large selection of elective courses which provides them to pursue a wide range of topics from the very small scale of nanomaterials to the large scale of astrophysics.

Learning Outcomes:  
By the end of this programme, students should be able to:  
- PLO 1: identify and describe physical systems with fundamental knowledge in physics (by means of coursework and tutorial classes in the curriculum)  
- PLO 2: analyze some physics problems qualitatively and quantitatively (by means of coursework, tutorial classes and laboratory works in the curriculum)  
- PLO 3: communicate and collaborate with people effectively in scientific issues (by means of group projects, tutorial sessions and presentation opportunities in the curriculum)

Impermissible Combinations:  
Major in Mathematics/Physics  
Major in Physics

Required courses (42 credits)  
1. Introductory level courses (18 credits)  
Disciplinary Core Courses (18 credits)  
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS1250</td>
<td>Fundamental physics</td>
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<tr>
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<td>6</td>
</tr>
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2. Advanced level courses (24 credits)  
Disciplinary Electives (24 credits)  
At least 24 credits of advanced level Physics courses (PHYS3XXX or PHYS4XXX or PHYS7XXX level), subject to prerequisite requirements. The current course list includes courses in List A:  

List A:  
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<tr>
<th>Course</th>
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<td>PHYS3350</td>
<td>Classical mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3351</td>
<td>Quantum mechanics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3450</td>
<td>Electromagnetism</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3550</td>
<td>Statistical mechanics &amp; thermodynamics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3551</td>
<td>Introductory solid state physics</td>
<td>6</td>
</tr>
<tr>
<td>PHYS3650</td>
<td>Observational astronomy</td>
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</tr>
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<td>The physical universe</td>
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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 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.
Minor Title: Minor in Plant Science
Offered to students admitted to Year 1 in 2016

Objectives:
The Minor in Plant Science is offered to students who are fascinated by the diversity and beauty of plants and the molecular mechanisms underlying their growth and development. Knowledge in plant science is essential for tackling daily-life issues such as the production of high-quality food, utilization of plant products as biofuels and extraction of beneficial phytochemicals. Recent advances in plant genetic engineering have also allowed scientists to manipulate plant growth and development for nutritional and environmental benefits. This minor aims to provide broad training in the biology of plants from the molecular to the organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

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

PLO 1: appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 2: understand and describe the fundamental concepts of plant evolution, anatomy, biochemistry, physiology and biotechnology (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

PLO 3: acquire necessary academic and practical skills for careers in government agencies, secondary school teaching and postgraduate research in different disciplines of plant science (by means of coursework, laboratory-based, and tutorial class and project-based learning in the curriculum)

Impermissible Combinations:
NIL

Required courses (36 credits)

1. Introductory level courses (12 credits)
   Disciplinary Electives (12 credits)
   At least 12 credits selected from the following courses:
   - BIOL1110 From molecules to cells (6)
   - BIOL1309 Evolutionary diversity (6)
   - BIOL2103 Biological sciences laboratory course (6)
   - BIOL2220 Principles of biochemistry (6)

2. Advanced level courses (24 credits)
   Disciplinary Electives (24 credits)
   At least 24 credits selected from the following courses:
   - BIOL3107 Plant physiology (6)
   - BIOL3210 Grain production and utilization (6)
   - BIOL3314 Plant structure and evolution (6)
   - BIOL3408 Genetics (6)
   - BIOL4209 Functional foods (6)
   - BIOL4411 Plant and food biotechnology (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

<table>
<thead>
<tr>
<th>Required courses (36 credits)</th>
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</thead>
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<tr>
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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) |
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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 Plant Science

### Offered to students
admitted to Year 1 in
2012

### Objectives:
The Minor in Plant Science is offered to students who are fascinated by the diversity and beauty of plants and the molecular mechanisms underlying their growth and development. Knowledge in plant science is essential for tackling daily-life issues such as the production of high-quality food, utilization of plant products as biofuels and extraction of beneficial phytochemicals. Recent advances in plant genetic engineering have also allowed scientists to manipulate plant growth and development for nutritional and environmental benefits. This minor aims to provide broad training in the biology of plants from the molecular to the organism level as well as the agricultural and nutritional applications of plants and plant-derived products.

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

**PLO 1:** appreciate plants as an important part in our culture and their functions and roles in food, nutrition, and environment (by means of coursework, 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, 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 2016

Objectives:
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

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

PLO 1: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

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

Required courses (42 credits)
1. Introductory level courses (12 credits)
   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)

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 Data mining (6)
   STAT3614 Business forecasting (6)
   STAT3615 Practical mathematics for investment (6)
   STAT3618 Derivatives and risk management (6)
   STAT4601 Time-series analysis (6)
   STAT4603 Current topics in risk management (6)
   STAT4606 Risk management and Basel Accords in banking and finance (6)
   STAT4607 Credit risk analysis (6)
   STAT4608 Market risk analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Objectives:
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

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

PLO 1: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)
PLO 2: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)
PLO 3: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

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

Required courses (42 credits)
1. Introductory level courses (12 credits)
2. Advanced level courses (30 credits)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

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

Offered to students admitted to Year 1 in 2014

Objectives:
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

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

PLO 1: acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 3: acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
- Major in Computing and Data Analytics
- Major in Risk Management
- Major in Statistics
- Minor in Statistics

Required courses (42 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:

List A
- STAT1601 Elementary statistical methods (6)
- STAT1602 Business statistics (6)
- STAT1603 Introductory statistics (6)
- STAT2601 Probability and statistics I (6)

List B
- STAT2602 Probability and statistics II (6)
- STAT2603 Data management with SAS (6)

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 Data mining (6)
- STAT3614 Business forecasting (6)
- STAT3615 Practical mathematics for investment (6)
- STAT3618 Derivatives and risk management (6)
- STAT4601 Time-series analysis (6)
- STAT4603 Current topics in risk management (6)
- STAT4606 Risk management and Basel Accords in banking and finance (6)
- STAT4607 Credit risk analysis (6)
- STAT4608 Market risk analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

**Objectives:**  
The Minor in Risk Management aims to provide interested students with basic concepts of risk management and fundamental skills of employing various statistical techniques for managing risk. The minor curriculum is particularly designed for students from different majors to enhance their interests in Risk Management or to complement their major of study.

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

- **PLO 1:** acquire basic understanding and identify the generic risk management issues and techniques (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2:** apply elementary methods and models for risk assessment and management (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 3:** acquire and interpret relevant data and information for risk management (by means of coursework, tutorial classes and project-based learning in the curriculum)

**Impermissible Combinations:**  
Major in Risk Management  
Major in Statistics  
Minor in Statistics

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### 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)

#### 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  
  Data mining (6)  
- STAT3614  
  Business forecasting (6)  
- STAT3615  
  Practical mathematics for investment (6)  
- STAT3618  
  Derivatives and risk management (6)  
- STAT4601  
  Time-series analysis (6)  
- STAT4603  
  Current topics in risk management (6)  
- STAT4606  
  Risk management and Basel Accords in banking and finance (6)  
- STAT4607  
  Credit risk analysis (6)  
- STAT4608  
  Market risk analysis (6)

**Notes:**  
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Required courses (42 credits)

1. Introductory level courses (12 credits)
2. Advanced level courses (30 credits)

Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:

List A
STAT1601 Elementary statistical methods (6)
STAT1602 Business statistics (6)
STAT1603 Introductory statistics (6)
STAT2601 Probability and statistics I (6)

List B
STAT2602 Probability and statistics II (6)
STAT2603 Data management with SAS (6)

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 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 Statistics  
**Offered to students admitted to Year 1 in**: 2016

**Objectives:**
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

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

- **PLO 1**: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)
- **PLO 2**: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)
- **PLO 3**: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

**Impermissible Combinations:**
- Major in Computing and Data Analytics  
- Major in Decision Analytics  
- Major in Risk Management  
- Major in Statistics  
- Minor in Risk Management

**Required courses (42 credits)**

1. **Introductory level courses (12 credits)**
   
   **Disciplinary Electives (12 credits)**
   
   **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)
   - 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: Probability modelling (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: Data mining (6)
   - STAT3613: Marketing engineering (6)
   - STAT3614: Business forecasting (6)
   - STAT3616: Advanced SAS programming (6)
   - STAT3617: Sample survey methods (6)
   - STAT3620: Modern nonparametric statistics (6)
   - STAT3621: Statistical data analysis (6)
   - STAT3955: Survival analysis (6)
   - STAT4601: Time-series analysis (6)
   - STAT4602: Multivariate data analysis (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

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

**Objectives:**  
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

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

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

**Impermissible Combinations:**  
- Major in Computing and Data Analytics  
- Major in Decision Analytics  
- Major in Risk Management  
- Major in Statistics  
- Minor in Risk Management

**Required courses (42 credits)**

1. **Introductory level courses (12 credits)**
   - **Disciplinary Electives (12 credits)**
   
   At least 12 credits from List A and List B, with at least 6 credits from List B:

   **List A**
   - STAT1601: Elementary statistical methods (6)
   - STAT1602: Business statistics (6)
   - STAT1603: Introductory statistics (6)
   - STAT2601: Probability and statistics I (6)

   **List B**
   - STAT2602: Probability and statistics II (6)
   - STAT2603: Data management with SAS (6)
   - 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: Probability modelling (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: Data mining (6)
   - STAT3613: Marketing engineering (6)
   - STAT3614: Business forecasting (6)
   - STAT3616: Advanced SAS programming (6)
   - STAT3617: Sample survey methods (6)
   - STAT3620: Modern nonparametric statistics (6)
   - STAT3621: Statistical data analysis (6)
   - STAT3955: Survival analysis (6)
   - STAT4601: Time-series analysis (6)
   - STAT4602: Multivariate data analysis (6)

**Notes:**
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

**Remarks:**
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Minor Title: Minor in Statistics
Offered to students: 2014
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
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)
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 Probability modelling (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 Data mining (6)
STAT3613 Marketing engineering (6)
STAT3614 Business forecasting (6)
STAT3616 Advanced SAS programming (6)
STAT3617 Sample survey methods (6)
STAT3620 Modern nonparametric statistics (6)
STAT3621 Statistical data analysis (6)
STAT3955 Survival analysis (6)
STAT4601 Time-series analysis (6)
STAT4602 Multivariate data analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

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

Objectives:
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

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

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Decision Analytics
Major in Risk Management
Major in Statistics
Minor in Risk Management

Required courses (42 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:
List A
STAT1601 Elementary statistical methods (6)
STAT1602 Business statistics (6)
STAT1603 Introductory statistics (6)
STAT2601 Probability and statistics I (6)
List B
STAT2602 Probability and statistics II (6)
STAT2603 Data management with SAS (6)
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 Probability modelling (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 Data mining (6)
STAT3613 Marketing engineering (6)
STAT3614 Business forecasting (6)
STAT3616 Advanced SAS programming (6)
STAT3617 Sample survey methods (6)
STAT3620 Modern nonparametric statistics (6)
STAT3621 Statistical data analysis (6)
STAT3955 Survival analysis (6)
STAT4601 Time-series analysis (6)
STAT4602 Multivariate data analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course (“disciplinary core”) in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to “Students taking double Majors, Major-Minor or double Minors with overlapping course requirements” in the BSc syllabuses.

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

Objectives:
The curriculum of the Minor in Statistics is structured specifically to cater for the general need of non-statistical disciplines and provide basic training in statistical methodologies and their applications to practical problems. It aims to provide students with a strong and rigorous sense of quantitative reasoning that has become an indispensable skill in nearly all disciplines.

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

PLO 1: acquire basic statistical knowledge alongside their major disciplines, with emphases on correct applications of statistical methods and insightful interpretations of statistical findings (by means of coursework, tutorial classes and project-based learning in the curriculum)

PLO 2: equip with computational skills essential to conducting complete data analyses (by means of coursework, tutorial classes, project-based learning and presentation opportunities in the curriculum)

PLO 3: participate proactively in large-scale, multi-disciplinary studies, determine objective findings, and provide guidance on all aspects of data collection and analyses (by means of coursework, tutorial classes and project-based learning in the curriculum)

Impermissible Combinations:
Major in Decision Analytics
Major in Risk Management
Major in Statistics
Minor in Risk Management

Required courses (42 credits)
1. Introductory level courses (12 credits)
Disciplinary Electives (12 credits)
At least 12 credits from List A and List B, with at least 6 credits from List B:

List A
- STAT1601 Elementary statistical methods (6)
- STAT1602 Business statistics (6)
- STAT1603 Introductory statistics (6)
- STAT2601 Probability and statistics I (6)

List B
- STAT2602 Probability and statistics II (6)
- STAT2603 Data management with SAS (6)
- 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 Probability modelling (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 Data mining (6)
- STAT3613 Marketing engineering (6)
- STAT3614 Business forecasting (6)
- STAT3616 Advanced SAS programming (6)
- STAT3617 Sample survey methods (6)
- STAT3620 Modern nonparametric statistics (6)
- STAT3621 Statistical data analysis (6)
- STAT3955 Survival analysis (6)
- STAT4601 Time-series analysis (6)
- STAT4602 Multivariate data analysis (6)

Notes:
1. Double counting of credits is not permissible for major-minor or double-minors combinations. For a course appears as a core course ("disciplinary core") in the major-minor or double-minors, students have to make up the credits by taking replacement course in the minor. For details, please refer to "Students taking double Majors, Major-Minor or double Minors with overlapping course requirements" in the BSc syllabuses.

Remarks:
Important! Ultimate responsibility rests with students to ensure that the required pre-requisites and co-requisite of selected courses are fulfilled. Students must take and pass all required courses in the selected primary science major in order to satisfy the degree graduation requirements.
Students taking double Majors, Major-Minor or double Minors with overlapping course requirements
1. Double-counting of courses up to a maximum of 24 credits is permissible with double majors. The double-counted courses in both Science majors must include SCNC1111 and SCNC1112. Additional credits to be double-counted must be for courses required (‘disciplinary core’) by both majors. For cases with 24 or less double-counted credits, the student must make up an equivalent number of credits by taking other courses offered by any Faculty.

2. The following list shows the major-major combinations that have more than 24 credits of the same ‘disciplinary core’ courses that appear in both majors and is subject to the rule of double counting:

<table>
<thead>
<tr>
<th>Major-Major combination</th>
<th>Admission Year (Year 1)</th>
<th>No. of common ‘disciplinary core’ courses (credits) appear in both majors including SCNC1111 and SCNC1112</th>
<th>No. of replacement courses (credits) to be taken in the 2nd major (‘Major 2’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major in Astronomy, Major in Mathematics/Physics</td>
<td>All years</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Astronomy, Major in Physics</td>
<td>All years</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Biochemistry, Major in Chemistry</td>
<td>2015, 2016</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Biochemistry, Major in Molecular Biology &amp; Biotechnology</td>
<td>2012, 2013, 2014</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Biological Sciences, Major in Ecology &amp; Biodiversity</td>
<td>All years</td>
<td>7 (42 credits)</td>
<td>3 (18 credits)</td>
</tr>
<tr>
<td>Major in Biological Sciences, Major in Food &amp; Nutritional Science</td>
<td>2012, 2014</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td></td>
<td>2015, 2016</td>
<td>7 (42 credits)</td>
<td>3 (18 credits)</td>
</tr>
<tr>
<td>Major in Biological Sciences, Major in Molecular Biology &amp; Biotechnology</td>
<td>2012, 2013, 2014</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td></td>
<td>2015, 2016</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Earth System Science, Major in Geology</td>
<td>All years</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Ecology &amp; Biodiversity, Major in Food &amp; Nutritional Science</td>
<td>2013</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td></td>
<td>2012, 2014, 2015, 2016</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
<tr>
<td>Major in Ecology &amp; Biodiversity, Major in Molecular Biology &amp; Biotechnology</td>
<td>All years</td>
<td>5 (30 credits)</td>
<td>1 (6 credits)</td>
</tr>
<tr>
<td>Major in Food &amp; Nutritional Science, Major in Molecular Biology &amp; Biotechnology</td>
<td>All years</td>
<td>6 (36 credits)</td>
<td>2 (12 credits)</td>
</tr>
</tbody>
</table>

If more than 24 credits (including SCNC1111 & SCNC1112) are listed as ‘disciplinary core’ courses required in both the first (‘Major 1’) and second (‘Major 2’) majors undertaken by a student, the student must make up the number of credits above the 24 permissible by taking replacement course(s) in the second major (‘Major 2’). The replacement course(s) must be the disciplinary elective course in the second major (‘Major 2’) and have the same prefix and at the same or higher level as the double-counted course(s). The double counted credits should count the following courses in this order: (1) SCNC1111 and SCNC1112, (2) introductory level (levels 1 and 2) courses, and (3) advanced level (level 3 or above) courses. For example, if a student takes a first major in Ecology & Biodiversity (‘Major 1’) and the 2nd major in Molecular Biology & Biotechnology (‘Major 2’), SCNC1111, SCNC1112, BIOL1110, BIOL2102 and BIOL2103 are the common ‘disciplinary core’ courses that appear in both majors. The first 3 courses SCNC1111, SCNC1112, and BIOL1110 would first be counted plus either BIOL2102 or BIOL2103 for the major in Molecular Biology & Biotechnology. The student has to take a replacement ‘disciplinary elective’ course (with a prefix of BIOL at level 2 or above) in the 2nd major in Molecular Biology & Biotechnology to make up for BIOL2102 or BIOL2103.
3. Double counting of credits is not permissible for major–minor or double-minors combinations. When a course is required ('disciplinary core') both by the major and minor or by both minors, the student must take a replacement course for the minor. The replacement course must be the disciplinary elective in the minor and have the same prefix and at the same or higher level as the course to be replaced.

4. For students taking the Mathematics related majors/minors should note the following exemption and replacement arrangement:

Students who fall into the following exemption situation for the introductory level Disciplinary Core Mathematics courses in Science Majors/Minors are required to take the specified replacement course(s) as prescribed in the table:

<table>
<thead>
<tr>
<th>Exempted Course</th>
<th>Exemption granted under the following circumstances</th>
<th>Specified Replacement Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH1013 University mathematics II</td>
<td>For students taking Minor with an overlap of Disciplinary Core Course : MATH1013</td>
<td>Select 6 credits from the following to replace MATH1013:</td>
</tr>
<tr>
<td></td>
<td>For students taking Programme / Major / Minor with Disciplinary Core Courses : MATH1851 and MATH1853 (which are together deemed equivalent to MATH1013)</td>
<td>• MATH2012 Fundamental concepts of mathematics (6)</td>
</tr>
<tr>
<td></td>
<td>For students taking Professional Core in Bachelor of Science in Actuarial Science with Disciplinary Core Course : MATH1821 (which is equivalent to MATH1013)</td>
<td>• MATH2241 Introduction to mathematical analysis (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Any 6-credit advanced level Mathematics Disciplinary Elective chosen from the Programme/Major/Minor structure in which MATH1013 is the disciplinary core course</td>
</tr>
<tr>
<td>MATH2014 Multivariable calculus and linear algebra</td>
<td>For students taking Professional Core in Bachelor of Science in Actuarial Science with Disciplinary Core Course : MATH2822 (which is equivalent to MATH2014)</td>
<td>Select 6 credits from the following to replace MATH2014:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MATH2012 Fundamental concepts of mathematics (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MATH2241 Introduction to mathematical analysis (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Any 6-credit advanced level Mathematics Disciplinary Elective chosen from the Major/Minor structure in which MATH2014 is the disciplinary core course</td>
</tr>
<tr>
<td>MATH2101 Linear algebra I</td>
<td>For students taking Minor with an overlap of Disciplinary Core Course : MATH2101</td>
<td>Select 6 credits from the following to replace MATH2101:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MATH2012 Fundamental concepts of mathematics (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MATH2241 Introduction to mathematical analysis (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Any 6-credit advanced level Mathematics Disciplinary Elective chosen from the Minor structure in which MATH2101 is the disciplinary core course</td>
</tr>
<tr>
<td>MATH2211 Multivariable calculus</td>
<td>For students taking Minor with an overlap of Disciplinary Core Course : MATH2211</td>
<td>Select 6 credits from the following to replace MATH2211:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MATH2012 Fundamental concepts of mathematics (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MATH2241 Introduction to mathematical analysis (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Any 6-credit advanced level Mathematics Disciplinary Elective chosen from the Minor structure in which MATH2211 is the disciplinary core course</td>
</tr>
<tr>
<td></td>
<td>18 credits of Introductory level courses requirement of the Minor: MATH1013, MATH2101, &amp; MATH2211</td>
<td>Select 18 credits from the following to replace the credit requirement of MATH1013, MATH2101 &amp; MATH2211:</td>
</tr>
<tr>
<td></td>
<td>For students taking Professional Core in Bachelor of Science in Actuarial Science with Disciplinary Core courses : MATH1821 and MATH2822 (which are together deemed to have satisfied MATH1013, MATH2101 &amp; MATH2211)</td>
<td>• MATH2012 Fundamental concepts of mathematics (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(if not the disciplinary core course in the structure); and/or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MATH2241 Introduction to mathematical analysis (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(if not the disciplinary core course in the structure); and/or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Equivalent credits of advanced level Mathematics Disciplinary Elective(s) chosen from the Major/Minor structure in which MATH1013, MATH2101 &amp; MATH2211 are the disciplinary core courses</td>
</tr>
</tbody>
</table>

5. For the situations of 2, 3 and 4 above, students have to complete the application form, seek the written endorsement from the Course Selection Adviser of the second major ('Major 2') / minor and then return it to the Faculty Office by the closing dates of course selection or add/drop periods.
### BIOC1600
#### Perspectives in biochemistry (6 credits)

**Offering Department:** Biomedical Sciences  
**Quota:** —

**Course Co-ordinator:** Dr J Tanner, Biomedical Sciences

**Teachers Involved:**  
Dr C Ho, Biomedical Sciences  
Dr L Y L Cheng, Biomedical Sciences  
Dr J Tanner, Biomedical Sciences  
Dr B C W Wong, 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 Biochemical Perspective on the Basic Sciences  
A. Chemistry for Biochemistry  
The elements and bonding (from carbon to Coenzyme A); Resonance and orbital theory (a focus on the electron); Structure and conformation (thinking in 3 dimensions); Isomerism (from minors 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, thereby integrating the basic sciences of biology, chemistry and physics into a biochemical perspective  
- CLO 2 apply knowledge of biomolecular structure to review major discoveries and contemporary issues in molecular biology  
- CLO 3 interpret scientific data and discuss major issues in biochemistry using the scientific literature  
- CLO 4 demonstrate skills in working and collaborating together with colleagues in practicals and in presentation of scientific ideas  
- CLO 5 relate how biochemistry intersects with the three basic sciences of biology, chemistry and physics, and recognize the transition from school to university level study

**Pre-requisites (and Co-requisites and Impermissible combinations):**  
Level 3 or above in HKDSE Biology, Chemistry, or Combined Science with Biology or Chemistry component, or equivalent

**Offer in 2016 - 2017:** Y  
1st sem

**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.

**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>or workshops</td>
<td>36</td>
</tr>
<tr>
<td>Group work</td>
<td>Practical classes</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Tasks and preparation</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>including practical writeups</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Project reports</td>
<td>group communication project</td>
<td>30</td>
<td>CLO 2,3,4,5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials:** TBC

**Additional Course Information:** Also offered as ENGG1207 "Foundations of biochemistry for medical engineering" to students of the Faculty of Engineering. Students who have passed ENGG1207 is considered to have passed BIOC1600.

### BIOC2600
#### Basic biochemistry (6 credits)

**Offering Department:** Biomedical Sciences  
**Quota:** 300

**Course Co-ordinator:** Prof D K Y Shum, Biomedical Sciences

**Teachers Involved:**  
Prof D K Y Shum, Biomedical Sciences  
Dr C M Qian, Biomedical Sciences  
Dr A S L Wong, Biomedical Sciences  
Dr C W Lee, Biomedical Sciences

**Course Objectives:** This course is designed to present an overview of biochemistry of fundamental importance to the life process. We aim to develop appreciation of the basics in biochemistry as a common ground for science and non-science
students to progress into their areas of specialization. Students intending to pursue further studies in Biochemistry and Molecular Biology will find this course particularly helpful.

Course Contents & Topics
Structure and functions of carbohydrates, lipids, nucleic acids, amino acids and proteins; enzymes and co-enzymes; basic bioenergetics; key metabolic processes in a living cell; signaling across cell membranes; flow of genetic information.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 explain the significance of individual steps in a metabolic pathway
- CLO 2 recognize the importance and the need for regulation of metabolic pathways
- CLO 3 discuss the roles of enzymes in the regulation of metabolic pathways
- CLO 4 describe how metabolic processes are integrated under different physiological and pathological conditions.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC1600 or BIOL1110 or ENGG1207; and Not for students who have passed in BIOC2220 or MEDE2301, or have already enrolled in these courses.

Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Y</th>
<th>1st sem</th>
<th>Offer in 2017 - 2018: Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>Examination</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Course Type
Lecture-based course

Required/recommended reading and online materials

Additional Course Information
Also offered as MEDE2301 "Life Sciences I (Biochemistry)" to students of the Faculty of Engineering. Students who have passed MEDE2301 is considered to have passed BIOC2600.

BIOC3601
Basic metabolism (6 credits)

Offering Department
Biomedical Sciences

Quota
80

Course Co-ordinator
Dr N S Wong, Biomedical Sciences (nswong@hku.hk)

Teachers Involved
Dr N S Wong, Biomedical Sciences Dr L Y L Cheng, Biomedical Sciences

Course Objectives
This course aims to provide foundation concepts of metabolism. It will enable students of this course to see how some of the basic concepts in biochemistry (specifically those learned in BIOC1600 and BIOC2600) could be applied to explain one of the most important and cardinal issues of biological life: the acquisition of metabolic energy. The course will lay the foundation for the more advanced courses offered in the Biochemistry Major and will also serve as a useful complement to courses on nutrition.

Course Contents & Topics
This course focuses on the central metabolic pathways involved in the provision of energy needed by living organisms. Major metabolic pathways covered in this course include those that are involved in the synthesis and breakdown of glucose, glycogen, triacylglycerol, and amino acids. The metabolism of purines and pyrimidines will also be considered. Emphasis is on the understanding of the metabolic reactions involved and how they are regulated in relation to environmental cues. Metabolic derangements as a basis of diseases will also be discussed.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 explain the significance of individual steps in a metabolic pathway
- CLO 2 recognize the importance and the need for regulation of metabolic pathways
- CLO 3 discuss the roles of enzymes in the regulation of metabolic pathways
- CLO 4 describe how metabolic processes are integrated under different physiological and pathological conditions.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC2600 or BIOL2220 or MEDE2301

Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Y</th>
<th>1st sem</th>
<th>Offer in 2017 - 2018: Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>Examination</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 1,2,3,4
Examination 60 CLO 1,2,3,4
Test 20 CLO 1,2,3,4

Grade Descriptors
A: Demonstrates thorough and extensive knowledge and skills required for attaining all the course learning outcomes. Displays a strong analytical ability and logical thinking and is able to apply knowledge to a wide range of complex situations. Consistently able to communicate sophisticated ideas confidently and clearly.
B: Demonstrates substantial knowledge and skills required for attaining most of the course learning outcomes. Shows evidence of analytical ability and logical thinking and is sometimes able to apply knowledge to complex situations. Often communicates complex ideas clearly.
C: Demonstrates general but incomplete knowledge and skills required for attaining most of the course learning outcomes. Shows evidence of some analytical ability and logical thinking and is sometimes able to apply knowledge to familiar or uncomplicated situations. Sometimes communicates ideas clearly.
D: Demonstrates limited knowledge and skills required for attaining some of the course learning outcomes. Shows poor analytical ability and logical thinking and is rarely able to apply knowledge to solve problems. Has difficulty in expressing ideas coherently.
Fail: Demonstrates little or no evidence of command of knowledge and analytical skills as required for attainment of the course learning outcomes; lacking in critical thinking towards application of the knowledge in a range of contexts.

Course Co-ordinator
Dr N S Wong, Biomedical Sciences (nswong@hku.hk)
### BIOC3604
#### Essential techniques in biochemistry and molecular biology (6 credits)

**Offering Department**
Biomedical Sciences

**Quota**
70

**Teachers Involved**
Prof D K Y Shum, Biomedical Sciences
Dr B C W Wong, Biomedical Sciences
Dr N S Wong, Biomedical Sciences
Dr K M Yao, Biomedical Sciences
Dr L A Osorio Da Silva, Biomedical Sciences

**Pre-requisites**
Pass in BIOC2600 or BIOL2220 or MEDE2301

**Offer in 2016 - 2017**
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 appraise data to draw appropriate conclusions.

- **C**
  - Demonstrates general but incomplete knowledge and skills required for attaining most of the course learning outcomes. Shows some evidence of critical thinking and analytical skills. Conducts laboratory skills and techniques to a satisfactory level of competence and can sometimes correctly appraise data and draw appropriate conclusions.

- **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.

**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>12</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>76</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 1.2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1.2,3</td>
</tr>
</tbody>
</table>

**Course Objectives**

- CLO 1: Explain the basic principles of various biochemical and molecular techniques
- CLO 2: Describe different experimental approaches for achieving defined experimental aims
- CLO 3: Apply different techniques to biochemical and molecular analyses
- CLO 4: Write and maintain a scientific laboratory notebook satisfactorily

**Required/recommended reading and online materials**

**Academic Year**
2016

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### BIOC3605
#### Sequence bioinformatics (6 credits)

**Offering Department**
Biomedical Sciences

**Quota**
50

**Course Co-ordinator**
Dr B C W Wong, Biomedical Sciences (bcwwong@hku.hk)

**Teachers Involved**
Dr B C W Wong, Biomedical Sciences

**Course Objectives**

This course will examine existing bioinformatics tools for DNA and protein sequence analysis. The underlying principles of these analysis programs and services will be presented. Students will learn how to retrieve, analyze, and compare protein and DNA sequences using bioinformatics tools available on the World Wide Web.

**Course Contents & Topics**

This course will introduce and discuss the following topics:

- DNA and protein sequence databases, protein family databases; information searching and retrieval - Entrez and SRS: Simple sequence analysis; sequence alignment: pair-wise alignment, multiple sequence alignment, substitution matrices; sequence database searching: algorithm and parameters; sequence patterns and motifs, and profiles; phylogenetic analysis; gene prediction.

On successful completion of this course, students should be able to:

**Academic Year**
2016

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### Table: Assessment Methods and Weighting

<table>
<thead>
<tr>
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<th>Methods</th>
<th>Details</th>
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### Table: Course Learning Outcomes

- CLO 1: Explain the basic principles of various biochemical and molecular techniques
- CLO 2: Describe different experimental approaches for achieving defined experimental aims
- CLO 3: Apply different techniques to biochemical and molecular analyses
- CLO 4: Write and maintain a scientific laboratory notebook satisfactorily

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### Table: Required/recommended reading and online materials

### Course Learning Outcomes

- CLO 1: Search and retrieve sequence information from biological databases
- CLO 2: Describe the algorithms for pairwise and multiple alignments, BLAST search, and phylogenetic tree construction
- CLO 3: Perform sequence analysis using EMBOSS package and other web-based analysis tools
- CLO 4: Interpret results from sequence alignments and BLAST database searches
- CLO 5: Use results from various sequence analysis tools to annotate a biological sequence

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOC2600 or BIOL2220 or BBMS2003 or BBMS2007 or MEDE2301

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### Examination

- CLO 2, 4

### Course Type

Lecture-based course

### Assessment Methods and Weighting

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### Reading / Self study


### Course Objectives

To provide up-to-date knowledge of the molecular and cellular basis of human diseases including skeletal disorders, 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 molecular basis of skeletal disorders, cancer and viral diseases, and molecular therapeutics.
- Specific topics may include mouse model of human diseases, molecular basis of selected skeletal disorders, oncogenes and tumour suppressor genes, genome instability, HIV science, genetics and pathogenesis of influenza viruses, molecular approaches to vaccine development, therapeutic proteins and antibodies, stem cells, gene therapy, and nucleic acid therapeutics. Basic knowledge of biochemistry and molecular cell 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 skeletal diseases, cancer and viral diseases
- CLO 2: Illustrate the application of molecular biology in medicine with examples
- CLO 3: Integrate and translate knowledge in molecular biology to new approaches in disease prevention and intervention

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOC2600 or BIOL2220 or MEDE2301

### Offer in 2016 - 2017

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### Course Type

Lecture-based course

### Assessment Methods

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### Methods Details

- Lecture-based course

### Course Teaching & Learning Activities

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<td>Reading / Self study</td>
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BIOC3999

Directed studies in biochemistry (6 credits)

Offering Department
Biomedical Sciences

Course Co-ordinator
Prof J D Huang, Biomedical Sciences (jduang@hku.hk)

Teachers Involved
Prof J D Huang, Biomedical Sciences
Dr K M Yao, Biomedical Sciences

Course Objectives
To enhance students knowledge of a particular topic and the students self-directed learning and critical thinking skills.

Course Contents & Topics
The student undertakes a self-managed study on a topic in biochemistry under the supervision of a staff member. The topic is preferably one not sufficiently covered in the regular curriculum. The directed study can be a critical review or a synthesis of published work on the subject. A laboratory or field study may also be involved that would enhance the student's understanding of the subject.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: critically appraise research literature in a specific area of biochemistry and molecular biology
- CLO 2: examine the theoretical or experimental basis for existing concepts
- CLO 3: identify questions and evaluate issues for further research development

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in at least 24 credits of advanced level (level 3 or 4) discipline core/elective courses in Biochemistry Major including BIOC2600 and BIOC3401.

Offer in 2016 - 2017
Y 1st sem 2nd sem Summer Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors (A+ to F)

A
Produces a sophisticated and detailed appraisal of the biochemical literature, displaying a comprehensive and deep understanding of the selected topic. Able to contextualize all the ideas within a personal framework of knowledge and evaluate relevant issues emerging from the study. Works proactively with a supervisor to enhance understanding and scientific writing skills. Communicates the findings to a broader audience in an effective way and responds knowledgeably to questions. Excellent time-management skills and able to reflect honestly on one's own learning.

B
Produces a coherent appraisal of the biochemical literature, displaying a sound understanding of the selected topic. Able to contextualize many of the ideas within a personal framework of knowledge and identify some relevant issues emerging from the study. Works constructively with a supervisor to enhance understanding and scientific writing skills. Clearly communicates the findings to a broader audience and responds knowledgeably to most questions. Able to time-manage effectively and reflect on one's own learning.

C
Produces a reasonable appraisal of the biochemical literature, displaying an adequate understanding of the selected topic. Able to contextualize a few of the ideas within a personal framework of knowledge and makes some attempt to identify some relevant issues emerging from the study. Works with a supervisor and other co-workers to improve understanding and scientific writing skills. Communicates the findings to a broader audience with reasonable clarity and responds to most questions. Acceptable time-management and self-reflection skills. Displays weak communication skills when presenting the findings to a broader audience. Poor time-management and self-reflection skills.

D
Produces a superficial appraisal of the biochemical literature, displaying a limited understanding of the selected topic. Able to contextualize a few of the ideas within a personal framework of knowledge but unable to identify any relevant issues emerging from the study. Works reluctantly with a supervisor and other co-workers to develop understanding and scientific writing skills. Displays weak communication skills when presenting the findings to a broader audience. No time-management skills or ability to self-reflect.

Fail
Fails to appraise the biochemical literature and thus unable to display any understanding of the selected topic. Unable to contextualize the ideas within a personal framework of knowledge or identify any relevant issues emerging from the study. Works in isolation, thus failing to make progress in understanding and scientific writing skills. Unable to communicate effectively when presenting the findings to a broader audience. No time-management or self-reflection skills.

Course Type
Project-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Reading / Self study at least 120 hours on the project 120

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Dissertation including mind map (10%) 60 CLO 1,2,3
Oral presentation 25 CLO 1,2,3
Research report Supervisor comments 15 CLO 1,2,3

Required/recommended reading and online materials
as suggested by project supervisors

BIOC4610

Advanced biochemistry (6 credits)

Offering Department
Biomedical Sciences

Course Co-ordinator
Dr K M Yao, Biomedical Sciences (kmyao@hku.hk)

Teachers Involved
Prof D Chan, Biomedical Sciences
Dr K O Lai, Biomedical Sciences
Dr K M Yao, Biomedical Sciences

Course Objectives
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; roles of the cytoskeleton in vesicular trafficking

C. Protein trafficking and sorting pathways

School of Biomedical Sciences
### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1**: describe the molecular and cellular signal transduction mechanisms that mediate cellular communication to achieve a plethora of cellular responses.
- **CLO 2**: illustrate the controls of the metabolic and cellular regulation based on their understanding of cytoskeleton as target of signal transduction, protein trafficking and sorting pathways, and cell-cell and cell-matrix adhesion.
- **CLO 3**: develop critical thinking and analytical skills.

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOC3601 or BIOL3401 or BIOL3402 or BIOL3404

### Offer in 2016 - 2017

<table>
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### Required/recommended reading and online materials


### Assessment Methods and Weighting

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### Course Type

Lecture-based course

### Course Teaching & Learning Activities

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<td>Reading / Self study</td>
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### Course Objectives

- **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.

### 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; clear 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 systematic organization of information for presentation and communication.
- **CLO 2**: recognize the roles of enzyme kinetics in cellular functions; clear description of how protein structure informs function; evidence of ability to recognize mechanisms of enzyme function and interpretation of data; some capable demonstration of applying knowledge to the design of scientific methodologies and systematic organization of information for presentation and communication.
- **CLO 3**: 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 2016 - 2017

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### Required/recommended reading and online materials


### Assessment Methods and Weighting

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### Course Type

Lecture-based course

### Course Teaching & Learning Activities

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BIOC4612 Molecular biology of the gene (6 credits)  Academic Year 2016

Offering Department Biomedical Sciences
Quota 50

Course Co-ordinator Prof K S E Cheah, Biomedical Sciences (hrmbdkc@hku.hk)

Teachers Involved Prof K S E Cheah, Biomedical Sciences Dr R K Ng, Biomedical Sciences Dr K M Yao, Biomedical Sciences Dr L A Osorio Da Silva, Biomedical Sciences

Course Objectives To provide an up-to-date knowledge of molecular biology, especially with respect to the regulation of eukaryotic gene expression, molecular embryology.

Course Contents & Topics This is a comprehensive course covering many detailed molecular aspects of gene regulation and gene function. Through this course an understanding of how gene expression can be regulated at levels of transcription and post transcription will be gained.

Course Learning Outcomes On successful completion of this course, students should be able to:

- CLO 1 describe the mechanisms for regulation of transcription, RNA processing and translation in eukaryotes
- CLO 2 explain how cellular homeostasis can be maintained by a combination of controls of gene expression at multiple levels
- CLO 3 illustrate the hierarchy of gene expression regulation in stem cells and developmental processes
- CLO 4 interpret experimental results in gene regulation studies

Pre-requisites (and Co-requisites and Impermissible combinations) Pass in BIOC3601 or BIOL3401 or BIOL3402 or BIOL3404 or BBMS2007


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.
Fail 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.

Course Type Lecture-based course

Course Teaching & Learning Activities

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Assessment Methods and Weighting

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Required/recommended reading and online materials


BIOC4613 Advanced techniques in biochemistry & molecular biology (6 credits)  Academic Year 2016

Offering Department Biomedical Sciences
Quota 70

Course Co-ordinator Prof D Chan, Biomedical Sciences (chand@hku.hk)

Teachers Involved Prof D Chan, Biomedical Sciences Dr J A Tanner, Biomedical Sciences Dr B C W Wong, 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
- CLO 4 design alternative approaches to test or validate hypotheses
- CLO 5 write a concise experimental report using correct terminologies and nomenclatures

Grade Descriptors (A+ to F) A Demonstrates a complex understanding of advanced techniques in biochemistry and molecular biology and is able to apply these techniques in various experimental settings. Uses skill and insight to critically evaluate experimental data.
B Demonstrates a comprehensive understanding of advanced techniques in biochemistry and molecular biology and is able to apply these techniques in specific experimental settings. Displays strong analytical skills and is able to interpret experimental data from biochemistry and molecular biology.
C Demonstrates a competent grasp of advanced techniques in biochemistry and molecular biology and is able to apply these techniques in well-defined experimental settings. Displays a limited capacity to critically evaluate experimental data from biochemistry and molecular biology.
D Demonstrates a basic understanding of advanced techniques in biochemistry and molecular biology and is sometimes able to apply these techniques in specific experimental settings. Displays weak analytical skills and is rarely able to interpret experimental data from biochemistry and molecular biology.
Fail Demonstrates incomplete or incorrect knowledge of advanced techniques in biochemistry and molecular biology and is unable to apply these techniques to experimental settings. Unable to analyse or interpret experimental data from biochemistry and molecular biology.

Assessment Methods and Weighting

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<tbody>
<tr>
<td>CLO 1,2,3,4</td>
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## Course Learning Objectives

On successful completion of this course, students should be able to:

1. Recognize the strengths and limitations of their area of training or expertise (CLO 1).
2. Examine the role of science in our society (CLO 2).
3. Acquire problem-solving skills to solve novel and ill-defined problems (CLO 3).

## Pre-requisites and Co-requisites

Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Biochemistry Major including BIOC3604.

## Offer in 2016 - 2017

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## Course Type

Internship

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<td>Internship work</td>
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## Assessment Methods and Weighting

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<tr>
<td>Written report</td>
<td>written report, employer's feedback and oral presentation</td>
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## Additional Course Information

Satisfactory completion of this course can be counted towards the Capstone requirement. Details of internship will be recorded on the student’s transcript. This course will be assessed on “Pass/Fail” basis. Students who are interested to enrol in this course should contact the Department to obtain the approval.

Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.
BIOC4999 Biochemistry project (12 credits)  Academic Year 2016
Offering Department Biomedical Sciences
Quota 25
Course Co-ordinator Dr N S Wong, Biomedical Sciences (nsuong@hku.hk)
Teachers Involved Dr N S Wong, Biomedical Sciences  All academic staff in Biochemistry Major, Biomedical Sciences
Course Objectives
To enable students to acquire the basic skills in scientific research: literature search, critical reasoning, communication (both orally and in writing), teamwork and time management. The course is particularly useful for those students who intend to pursue a career in life science.
Course Contents & Topics
Project-related topics in biochemistry, cell and molecular 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
Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Biochemistry Major including 4 of the following 5 courses: BIOL3401, BIOC3601, BIOC3604, BIOC4610 and BIOC4613. BIOC4610 and BIOC4613 can be taken concurrently with this course.
This capstone course is for Biochemistry Major students only.
The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2016 - 2017
Y Year long  Offer in 2017 - 2018 : Y
Examination No Exam

Grade Descriptors (A+ to F)

- A Plans and executes a sophisticated and imaginative 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 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 a flawed or simplistic experimental investigation, which lacks a valid scientific context. Shows no commitment when collecting data and produces an incoherent analysis and evaluation. Works in isolation, thus failing to improve practical and scientific writing skills. Displays weak communication skills when presenting the findings to a broader audience. No time-management skills.

Course Type Project-based course
Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading / Self study</td>
<td></td>
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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>
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<tr>
<td>Methods</td>
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<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Dissertation</td>
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<td>60</td>
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<tr>
<td>Oral presentation</td>
<td>including assessment (15%)</td>
<td>40</td>
<td>CLO 5</td>
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Required/recommended reading and online materials
None prescribed
BIOL110
From molecules to cells (6 credits)
Academic Year 2016
Quota 420

Offering Department Biological Sciences
Course Co-ordinator Prof B K C Chow, Biological Sciences (bkcc@hku.hk)
Teachers Involved Prof B K C Chow, Biological Sciences Dr C S C Lo, Biological Sciences Dr J W Zhang, Biological Sciences Dr K W Y Yuen, 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 investigation through the exploration of contemporary biological issues. The course is divided into 4 parts and the following is a list of some of the questions to be asked and discussed:

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?
Metabolism and Health: How are diets related to good health? Do all humans have the same dietary requirements? Why can’t we live without plants?

Cells and cell division: What are the common features in a cell? How do cells communicate and assemble themselves to form tissues and organs? What is a cell cycle and how is it regulated? What happens if cell-cycle control system goes wrong? How newly formed cells commit themselves for differentiation?

Genetic engineering and modern biology: To what extent can genes be modified? Is gene therapy the future of medicines? Is genetically modified food safe for consumption? What are the Genome Projects and why have they been important?

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the relationships between genes in a genome and the inherited phenotypes expressed in a living organism.
CLO 2 learn the underlying principle on how mutation of a gene can lead to the development of a genetic disease.
CLO 3 understand the importance of dietary intake of biomolecules in relationship to good health.
CLO 4 describe various stages in a cell division and that disturbance of this process may result in cancer development.
CLO 5 describe concepts used in genetic engineering.
CLO 6 know some applications of genetic engineering in gene therapy and production of genetically modified food.

Pre-requisites (and Co-requisites and Impermissible combinations)

Offer in 2016 - 2017: Y
Quota in 1st Semester: 210
Quota in 2nd Semester: 210

Grade Descriptors
(A+ to F)

A
Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills. Writings consistently demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.

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. Writings mostly demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.

C
Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills. Writings mostly indicate informed, intellectual engagement with concepts or theories but not always with sufficient depth, breadth or understanding.

D
Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, and ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills. Writings show some intellectual engagement with concepts or theories but not always with sufficient depth, breadth or understanding.

Fail
Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organizational skills are minimal and ineffective. Writings reveal an absence of intellectual engagement with concepts or theories. Writings are irrelevant or superficial.

Course Type Lecture-based course

Course Teaching & Learning Activities
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 60 CLO 1,2,3,4,5,6
Test 40 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: 210

BIOL1111
Introductory microbiology (6 credits)
Academic Year 2016
Quota 80

Offering Department Biological Sciences
Course Co-ordinator ---, Biological Sciences (/)
Teachers Involved ---, 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

80
BIOL1201 Introduction to food and nutrition (6 credits) Academic Year 2016

Offering Department Biological Sciences
Course Co-ordinator Prof N P Shah, Biological Sciences (npshah@hku.hk)
Teachers Involved Dr E T S Li, Biological Sciences Dr J W F Wan, Biological Sciences Prof N P Shah, Biological Sciences

Course Objectives
To enable student to appreciate the multidisciplinary nature of the study of Food and Nutrition. From the farmer's field to the dinner table, a basic understanding of food production, processing and storage will be covered. Food safety, food selection behaviour as well as balanced nutrition as part of lifestyle instrumental to good health will be discussed.

Topics will include food composition and functional properties of major components; food additives; food hygiene, safety and regulation; determinants of food choice; examples of complex processed foods; healthy eating-concepts and practice; essential nutrients; dietary supplements; fad diets.

This is an independent course which can be taken by students from various disciplines. It also prepares students for further studies in Food and Nutritional Science.

Course Contents & Topics
Topics will include food composition and functional properties of major components; food additives; food hygiene, safety and regulation; determinants of food choice; examples of complex processed foods; healthy eating-concepts and practice; essential nutrients; dietary supplements; fad diets.

Course Learning Outcomes
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 and identify quack or fast diets

Pre-requisites (and Co-requisites and Impermissible combinations) NIL

Offer in 2016 - 2017 Y 1st sem Offer in 2017 - 2018 : Y Examination Dec

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 generally 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.
Fail (<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.

Course Type Lecture-based course
Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 24
Laboratory 24
Tutorials 6
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 3

Required/recommended reading and online materials

Course Website http://moodle.hku.hk/
BIOL1309  Evolutionary diversity (6 credits)  Academic Year 2016
Offering Department  Biological Sciences  Quota 250
Course Co-ordinator  Prof R M K Saunders, Biological Sciences (saunders@hku.hk)
Teachers Involved  Prof R M K Saunders, Biological Sciences  Prof Y Sadovy, Biological Sciences  Dr M Yasuhara, 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, Anthocerophyta and Bryophyta); seedless vascular plants (Lycophyta, Psilophyta, Sphenophyta and Pterophyta); seed plants (Cycadophyta, Ginkgophyta, Coniferophyta, Gnetophyta and Anthophyta); invertebrates (Crinaria, Platyhelmintes, Annelida, Mollusca, Nematoidea, 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
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.
  E  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.
Course Type  Lecture with laboratory component course
Course Teaching & Learning Activities  
  Activities  Details  No. of Hours
  Lectures  24
  Laboratory  36
  Reading / Self study  100
Assessment Methods and Weighting  
  Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
  Examination  70  CLO 1,2,3
  Laboratory reports  30  CLO 1,2,3
Required/recommended reading and online materials  TBC
Course Website  http://www.biosch.hku.hk/ecology/lsc/

BIOL1501  Bioethics (6 credits)  Academic Year 2016
Offering Department  Biological Sciences  Quota 40
Course Co-ordinator  ---  Biological Sciences ()
Teachers Involved  ---  Biological Sciences
Course Objectives  The aim is to explore the ethical implications of the latest major advances in biology and medicine.
Course Contents & Topics  The course will discuss research ethic between student and mentor, and ethical implications in recent major advancements in biological and medical sciences. Major areas to be discussed include but are not limited to: genetics, reproduction, disease diagnosis and therapy, development, transplantation, aging, dying, environment, and the use of animals in research. Ethical and moral principles and implications for social framework and public policy raised by these advances will be discussed.
Course Learning Outcomes  On successful completion of this course, students should be able to:
  CLO 1 familiarize with the current ethical theories, discussions, and arguments taking place in the field of bioethics specifically related to the advancement of modern molecular biology and genomics
  CLO 2 reflect upon and formulate in a professional manner their own opinions on these matters as well as to understand and enter into a respectful dialogue with those who possess another point of view
  CLO 3 understand the basis of one’s own position, as well as the basis of another person’s opinion
  CLO 4 deal with the quandaries that arise when facing modern medical technology and advancements
Pre-requisites (and Co-requisites)  NIL

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335
### BIOL1502

#### Course Details
- **Offering Department**: Biological Sciences
- **Course Co-ordinator**: ---, Biological Sciences
- **Teachers Involved**: ---, Biological Sciences
- **Course Objectives**: The objective is to expose students to the impacts of genes to the society. Recent completion of the human genome and many agricultural crops and animals genomes, it brings not only promises of a better quality of life as well as lots of technical and ethical issues/challenges that general public need to deal with. The goal of this course is to open up students from all backgrounds to this basic unit of inheritance called the gene and its impact on various scientific and social disciplines.
- **Course Contents & Topics**: Content/topics include: Introduction and review of basic cell biology Basic genetic - The gene Basic Molecular Biology and Biotechnology - Recombinant DNA and cloning Bacterial Genes - Gene and Environment Human Genes/Human genome - history and its Impacts! Human Genome - The Amazing discovery! Genes and Biotechnology Genes and Disease Genes and Cancer Animal and Plant Cloning Genes and Agricultural/Food Biotechnology Genes and Human Behavior
- **Course Learning Outcomes**: On successful completion of this course, students should be able to:
  - CLO 1: demonstrate understanding and to explain the principle of inheritance, recombinant DNA and cloning
  - CLO 2: gain deep understanding about the advancement of biotechnology
  - CLO 3: determine and explain the benefits and shortcomings of the application of biotechnology knowledge
- **Pre-requisites**: NIL
- **Offer in 2016 - 2017**: 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 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 presentional skills.
- **B**: Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use communication skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective individual as well as collaborative-based organizational and presentional 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 sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate moderately individual as well as collaborative-based organizational and presentional 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, and minimal competence in professional-level problem solving. Use communication skills and techniques and analysis of data and results not effectively, loading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness individual as well as collaborative-based organizational and presentional 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 communication skills and techniques and analysis of data and results not effectively, loading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness individual as well as collaborative-based organizational and presentional skills.

#### Assessment
- **Methods**: Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
  - Assignments | continuous assessment of essays, presentation and debate exercises | 60 | CLO 1,2,3,4
  - Examination | | 40 | CLO 1,2,3,4

#### Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.
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. Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use communication skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness individual as well as collaborative-based organizational and presentational skills.

### Course Type
Lecture-based course

### 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>36</td>
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<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>
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### Assessment Methods and Weighting
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<th>Details</th>
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<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>discussion forum</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>Essay</td>
<td>essays &amp; written reports</td>
<td>25</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Presentation</td>
<td>poster &amp; oral presentation</td>
<td>30</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Test</td>
<td>in-class participation &amp; quizzes</td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
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</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.

### BIOL2102 Biostatistics (6 credits)

#### Academic Year
2016

#### Offering Department
Biological Sciences

#### Course Co-ordinator
Dr J K Y Chan, Biological Sciences (chanjky@hku.hk)

#### Teachers Involved
Dr J K Y Chan, Biological Sciences

#### Course Objectives
The purpose of this course is to familiarise students with probability and statistics. The course will give to students the skills to read, interpret, and critically evaluate the statistics used in medical and bioinformatic studies. The course will also introduce the students to the fundamental principles and planning techniques to be able to analyze their own data, choose the correct statistical test and avoid common statistical pitfalls.

#### Course Contents & Topics
Introduction to Statistics; Describing, Exploring and Comparing Data; Probability; Probability Distributions; Normal Probability Distribution; Relations between Distributions; Interval estimation; Hypothesis Testing; Correlation and Regression; Statistical tests; Non-Parametric Inference.

#### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1: formulate biological questions into statistical questions
- CLO 2: design experiments effectively
- CLO 3: make quantitative estimation of biologically meaningful parameters
- CLO 4: use R to carry out some of the statistical computations
- CLO 5: understand the assumptions of commonly used statistical methods
- CLO 6: use Virtual Laboratories for Next Generation Sequencing experiments
- CLO 7: evaluate critically the literature

#### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC1600 or BIOL1110 or BIOL2306 or ENVS1301 or ENVS2002

#### Offer in 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : Y

#### Grade Descriptors (A+ to F)

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<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>A</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 skills and techniques for basic statistical analyses. Be able to critically use data and statistical results to draw appropriate and insightful conclusions. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>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.</td>
</tr>
<tr>
<td>C</td>
<td>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.</td>
</tr>
<tr>
<td>D</td>
<td>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.</td>
</tr>
<tr>
<td>Fail</td>
<td>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.</td>
</tr>
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</table>

#### Course Type
Lecture-based course

#### Course Teaching & Learning Activities
<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
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<td>36</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>including projects</td>
<td>100</td>
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#### Assessment Methods and Weighting
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5,6,7</td>
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<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,3,5,7</td>
</tr>
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</table>

#### Required/recommended reading and online materials
The Practice of Statistics in the Life Sciences by Baldi and Moore and Fundamentals of Biostatistics by Rosner.

#### Course Website
http://moodle.hku.hk/
BIOL2103 Biological sciences laboratory course (6 credits) Academic Year 2016

Offering Department Biological Sciences
Course Co-ordinator Dr W Y Lui, Biological Sciences (wylui@hku.hk)
Teachers Involved Dr W Y Lui, Biological Sciences; Prof B K C Chow, Biological Sciences; Dr A Yan, Biological Sciences

Course Objectives
The objective is to provide students a comprehensive training in basic laboratory techniques used in modern biological studies. The course will cover a number of techniques used by molecular biologists and microbiologists to conduct scientific research.

Course Contents & Topics
This course will be divided into three modules and each module will have 3 laboratory sessions.

Module one: Nucleic acid analysis
DNA & RNA isolation, spectrometry, gel electrophoresis, restriction enzyme analysis and DNA sequence analysis.

Module two: Protein analysis
Centrifugation, chromatography and SDS-PAGE electrophoresis.

Module three: Microbiology
Microscopy, observation of microorganisms and staining of bacteria, isolation of pure cultures by streaking and serial dilution, enumeration of microbial cells by Petroff-Hauser counting chamber, and turbidity. Identification and classification of microbes from natural source and statistical analysis.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 demonstrate knowledge in proper use of simple research equipment
CLO 2 demonstrate knowledge and understanding of how and why certain techniques are used in a research setting
CLO 3 master some basic laboratory techniques for carrying out experiments
CLO 4 understand the different ways that microorganisms were categorized according to their size, shape, colour and response to dye etc. and how they were counted

Pre-requisites and Impermissible combinations
Pass in BIOL1110

Offer in 2016 - 2017
Y 1st sem 2nd sem Offer in 2017 - 2018 : Y Examination Dec 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 logic, 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 required for attaining at least most of the course learning outcomes. Evidence of analytical and critical abilities and logical thinking. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

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 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. 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.

Course Type Laboratory and workshop 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>Laboratory</td>
<td>11 laboratory sessions (4 hours each)</td>
<td>44</td>
</tr>
<tr>
<td>Tutorials</td>
<td>lecture/tutorials</td>
<td>18</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>Laboratory reports</td>
<td>plus lab performance</td>
<td>60</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td>1 hour final examination</td>
<td>40</td>
<td>CLO 1</td>
</tr>
</tbody>
</table>

Course Website http://moodle.hku.hk/

Additional Course Information

Quota 80 - 1st Semester
Lab A on Wed. with 40 students and Lab. B on Thurs. with 40 students
Quota 135 - 2nd Semester
Lab C on Wed. with 25 students; Lab. D on Thurs. with 65 students and Lab. E on Fri. with 45 students

BIOL2220 Principles of biochemistry (6 credits) Academic Year 2016

Offering Department Biological Sciences
Course Co-ordinator Dr C S C Lo, Biological Sciences (cliveloa@hku.hk)
Teachers Involved Dr C S C Lo, Biological Sciences

Course Objectives
This course is designed to provide undergraduate (non-biochemistry major) an overview of fundamental concepts in biochemistry as well as hands-on experience in biochemical techniques.

Course 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
BIOL2306 Ecology and evolution (6 credits) Academic Year 2016

Offering Department Biological Sciences Quota 80

Course Co-ordinator Prof D Dudgeon, Biological Sciences (ddudgeon@hku.hk)

Teachers Involved Prof D Dudgeon, Biological Sciences Prof G A Williams (Field course component only), Biological Sciences

Course Objectives The interaction between organisms and their environment is addressed using an issue-based approach in order to explains 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. Lectures are complemented by a 5-day residential field course during the Reading Week when students visit a variety of Hong Kong habitats to study their biodiversity, community composition and the relationship between organisms and their environment.

Course Learning Outcomes On successful completion of this course, students should be able to:

CLO 1 understand how scientific methods (hypotheses, experiments, comparisons) are used to investigate ecological and evolutionary processes

CLO 2 understand the basic mechanism of natural selection, and how interactions with the environment lead to adaptation and generate biodiversity

CLO 3 understand that ecology and behaviour can be interpreted in the light of selective pressures from the environment upon individual organisms

CLO 4 understand the ecological factors influencing evolution, using the human evolutionary tree as an example

CLO 5 understand the community ecology and biodiversity of selected Hong Kong habitats, and typical adaptations of organisms found there

Pre-requisites (and Co-requisites and Impermissible combinations) Pass in BIOL1110 or BIOL1309 or ENV51301 or ENV51401

Offer in 2016 - 2017 Y 1st sem Offer in 2017 - 2018 : Y Examination Dec

Grade Descriptors (A+ to F)

A Evidence of complete or near-complete understanding and a thorough grasp of the subject as demonstrated by attainment of all learning outcomes, and excellent use of named (organism) examples, including local species and habitats. Show excellent organizational, presentational and/or analytical skills and fieldwork techniques. Excellent or outstanding (for A+) work relative to what is required at degree level.

B Evidence of substantial understanding and a good grasp of the subject as demonstrated by attainment of the majority of learning outcomes, and use of named (organism) examples, including local species and habitats. Show good organizational, presentational and/or analytical skills and fieldwork techniques. Work more than sufficient for what is required at degree level.

C Evidence of general understanding with an adequate (but incomplete) grasp of the subject, as demonstrated by general but incomplete attainment of most of the learning outcomes, with limited use of named (organism) examples. Show fair
### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>24 hours lectures, plus 10 hours of lectures during residential field course.</td>
<td>34</td>
</tr>
<tr>
<td>Laboratory</td>
<td>at least 36 hours field and laboratory work, as groups and individuals.</td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>during the semester in the form of internet tutorials, assigned reading and a laboratory workshop.</td>
<td>80</td>
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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 5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials


An up-to-date list of references to the primary scientific literature, background reading and/or internet resources relevant to each lecture will be provided on the course website.

### Course Website
http://www.biosch.hku.hk/ecology/

### Additional Course Information
A compulsory 5-day residential field component during the reading week.

Details of the location and cost of the residential 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 and B&B. Cost per head in 2015-2016 was $850 (not refundable).

### Course Contents & Topics
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.

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 BIOL3206; and Pass in one of the following courses: BIOL3301, BIOL3313, BIOL3319, BIOL3320 or BIOL3419

### Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F )</th>
<th>Academic Year</th>
<th>Offer in 2017 - 2018</th>
<th>Grade Descriptors</th>
<th>Exam Weighting</th>
<th>Grade Descriptors</th>
<th>Exam Weighting</th>
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</thead>
<tbody>
<tr>
<td>A</td>
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<td>Y 1st sem A</td>
<td>B</td>
<td></td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>D</td>
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</tbody>
</table>

### 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)
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### Offer in 2016 - 2017

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<th>Grade Descriptors</th>
<th>Exam Weighting</th>
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<tbody>
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<td>A</td>
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<td>Y 1st sem A</td>
<td>B</td>
<td></td>
<td>C</td>
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<td>D</td>
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</table>
Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>including field trips, site visits, interactive practical/visual sessions, classroom debates</td>
<td>32</td>
</tr>
<tr>
<td>Project work</td>
<td>project work review</td>
<td>8</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>60</td>
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</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>active 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>
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</tbody>
</table>

Required/recommended reading and online materials


Course Website

http://www.biosch.hku.hk/ecology/lsc

Additional Course Information

This course is offered in alternate year. This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3105 Animal physiology and environmental adaptation (6 credits)

Offering Department: Biological Sciences

Quota: 50

Course Co-ordinator: Prof A O L Wong, Biological Sciences (owong@hku.hk)

Teachers Involved: Prof A O L Wong, Biological Sciences Prof A S T Wong, Biological Sciences Dr W Y Lui, Biological Sciences

Course Objectives

The course covers the major aspects of animal physiology for environmental adaptation in terrestrial & aquatic habitats. Stress will be given to the functional interactions between animals and the environment, especially on the mechanisms by which animals obtain resources for survival from the environment, detect environmental changes via sensory structures, and respond to adversities in the environment by altering their body forms & functions.

Course Contents & Topics

Basic concepts of animal adaptation to environmental changes/extreme environment; Modification of energy metabolism according to oxygen availability; Different models of gaseous exchange for aquatic, inter-tidal, and terrestrial habitats; Cross-adaptation to different environment: air-breathing fish vs diving adaptations in mammals; Visual signals & differential levels of photoreception from protozoa to mammals; Background adaptation: functions & mechanisms for color presentation; Sound wave as environmental signals; functions & mechanisms of detection in aquatic & terrestrial habitats; Echo sounding in bats for navigation without visual signals; Behavioral, morphological & physiological adaptations in hostile environment: extreme hot vs freezing cold; salinity changes in aquatic habitats & water availability in terrestrial habitats on osmoregulation, water balance & nitrogenous metabolism.

Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: have a broad understanding on functional interactions between animals and their environment
- CLO 2: appreciate the role of the environment in shaping the evolution of animal structures & functions
- CLO 3: comprehend a wide range of physiological adaptations (both structurally & functionally) in coping with environmental stress and environmental changes

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2102 or BIOL2103 or BIOL2220 or BIOL2306

Offer in 2016 - 2017

- Y 2nd sem
- Offer in 2017 - 2018: 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. Writings consistently demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.

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. Writings mostly demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.

C: Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills. Writings mostly indicate informed, intellectual engagement with concepts or theories but not always with sufficient depth, breadth or understanding.

D: Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills. Writings indicate some intellectual engagement with concepts or theories. Writings are irrelevant or superficial.

Fail: Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organizational skills are minimally effective or ineffective. Writings reveal an absence of intellectual engagement with concepts or theories. Writings are irrelevant or superficial.

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>Reading / Self study</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examinations</td>
<td></td>
<td>45</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Assignments</td>
<td></td>
<td>45</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Mapping</td>
<td></td>
<td>35</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

School of Biological Sciences
BIOL3107

**Course Learning Objectives**
On successful completion of this course, students should be able to:

- CLO 1 understand the study of plant biology using mutants in model plant Arabidopsis
- CLO 2 understand biotechnological opportunities by manipulating plant gene expression
- CLO 3 understand the regulation of plant growth and development by various plant hormones

**Pre-requisites (and Co-requisites and impermissible combinations)**
Pass in BIOL2103

**Offer in 2016 - 2017**
Y 1st sem  Offer in 2017 - 2018 : Y

**Graduate School**
Academic Year 2016

**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>
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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>Examination</td>
<td></td>
<td>75</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>25</td>
<td>CLO 3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

**Additional Course Information**
This course will be offered subject to a minimum enrollment number and availability of teachers.

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BIOL3108

**Course Learning Objectives**

- CLO 1 appreciate the diversity of microbial metabolisms and the strategies for their adaptive responses
- CLO 2 comprehend the principles underlying the dynamic nature of microbial physiology
- CLO 3 relate knowledge to practical application of microbes in industry and medicine
- CLO 4 develop abilities to read and assess scientific literature in microbiology area

**Pre-requisites (and Co-requisites and impermissible combinations)**
Pass in BIOL2103

**Offer in 2016 - 2017**
Y 1st sem  Offer in 2017 - 2018 : Y

**Graduate School**
Academic Year 2016

**Course Type**
Lecture with laboratory component course

**Course Teaching & Learning Activities**
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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</tbody>
</table>

**Assessment Methods and Weighting**

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<tr>
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<th>Details</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>75</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>25</td>
<td>CLO 3</td>
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</tbody>
</table>

**Required/recommended reading and online materials**

**Additional Course Information**
This course will be offered subject to a minimum enrollment number and availability of teachers.
### BIOL3109

#### Environmental microbiology (6 credits)

**Academic Year**: 2016  
**Quota**: 40

**Offering Department**: Biological Sciences  
**Teachers Involved**: Dr J D Gu, Biological Sciences (jdgu@hku.hk)

#### Course Objectives

To familiarize students with the role of various microorganisms in natural processes that affect our environment, such as the cycling of chemical elements, interactions with plants and animals, and the way in which they carry out biodegradation of environmentally important pollutants. Selective groups of microorganisms will be examined in detail for their biochemical processes. Key concepts are illustrated with known examples and cases.

#### Course Contents & Topics

1. Advanced aspects of microbial diversity, ecology and growth  
2. Contribution of microbial metabolism to biogeochemical processes important in cycling of nutrients  
3. Microbial interactions with plants and animals  
4. Microrganismal metabolism of organic compounds, metals and man-made polymers  
5. Training in laboratory and field microbiological research techniques

#### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand a range of microorganisms in the environment in terms of their roles and function as well as biochemical capability and host range
- CLO 2 know the specific biochemical processes, enzymes involved and reactions carried by selective microorganisms and their distribution in the environment
- CLO 3 apply the appropriate techniques in environmental and microbial research

#### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2103

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>A Thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Through 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>May</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>
<td></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>
<td></td>
<td></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>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>Little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Course Type
Lecture with laboratory component course

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Teaching &amp; Learning Activities</strong></td>
<td><strong>Lectures</strong></td>
<td>24</td>
<td></td>
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<tr>
<td></td>
<td><strong>Laboratory</strong></td>
<td>24</td>
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<tr>
<td></td>
<td><strong>Field work</strong></td>
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<td></td>
<td><strong>Project work</strong></td>
<td>2</td>
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<tr>
<td></td>
<td><strong>Tutorials</strong></td>
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<td><strong>Reading / Self study</strong></td>
<td>100</td>
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<tr>
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<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td></td>
<td></td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td></td>
<td></td>
<td>CLO 1,2,3</td>
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<tr>
<td>Laboratory reports</td>
<td>25</td>
<td></td>
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<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Presentation including report</td>
<td>10</td>
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<td></td>
<td>CLO 1,2,3</td>
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<tr>
<td>Test</td>
<td>5</td>
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<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
- Additional Course Information:
  - This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3110
**Environmental toxicology (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Co-ordinator</strong></td>
<td>Dr J D Gu, Biological Sciences (<a href="mailto:jdgu@hku.hk">jdgu@hku.hk</a>)</td>
</tr>
<tr>
<td><strong>Teachers Involved</strong></td>
<td>Dr J D Gu, 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. |

<table>
<thead>
<tr>
<th>Course Contents &amp; Topics</th>
<th>Environmental chemistry of pollutants and their toxicity and factors governing toxic effects, bioaccumulation and biomagnification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Partitioning and transformation of environmental pollutants</td>
</tr>
<tr>
<td></td>
<td>Quantitative toxicology using dose-response approaches</td>
</tr>
<tr>
<td></td>
<td>Emerging endocrine-disrupting chemicals and carcinogens at molecular levels</td>
</tr>
<tr>
<td></td>
<td>Elimination of pollutants from the environments</td>
</tr>
<tr>
<td></td>
<td>Laboratory testing of toxicity and review various adsorption isotherm models</td>
</tr>
</tbody>
</table>

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand fate and distribution of chemicals in various compartments of the ecosystem
- CLO 2 understand toxicity through adsorption, metabolism, elimination and target site and quantitative analysis
- CLO 3 understand mechanism of toxicity from specific pollutants of choice
- CLO 4 understand specific biochemical processes and enzymes involved in pollutants transformation and mineralization
- CLO 5 understand appropriate techniques in environmental cleaning up

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL2103 or CHEM3141 or ENVS3042

### Offer in 2016 - 2017
- Offer in 2017 - 2018: Y

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<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 conclusions. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Substantial grasp of the subject. Show evidence of analytical and critical abilities and logical thinking. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>General but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. General but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
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</table>

### Course Type
Lecture with laboratory component course

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>Course Teaching &amp; Learning Activities</strong></td>
<td><strong>Lectures</strong></td>
<td>24</td>
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<td></td>
<td><strong>Laboratory</strong></td>
<td>36</td>
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<tr>
<td></td>
<td><strong>Reading / Self study</strong></td>
<td>100</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</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
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<tr>
<td>Examination</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>Laboratory reports</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>Presentation including report</td>
<td>10</td>
<td></td>
<td></td>
<td>CLO 1,2,3</td>
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<tr>
<td>Test</td>
<td>5</td>
<td></td>
<td></td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>
### BIOL3201 Food chemistry (6 credits)

#### Academic Year
2016

#### Quota
75

#### 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.
- 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.

#### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand the functions and properties of major and minor food components
- CLO 2 understand the basic chemistry behind food processing
- CLO 3 have integrated their knowledge of biological and chemical principles into a food science and nutrition context

#### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC2600 or BIOL2103 or BIOL2220

#### Offer in 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : Y

#### Examination
May

### BIOL3202 Nutritional biochemistry (6 credits)

#### Academic Year
2016

#### Quota
100

#### 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
Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 explain the concept of nutrient requirements
CLO 2 understand how different organs coordinate to achieve metabolic control of glucose homeostasis
CLO 3 understand the metabolic pathways of various polyunsaturated fatty acids
CLO 4 understand the theoretical constructs of nitrogen requirement and the importance of the urea cycle
CLO 5 assess the impacts of dietary inadequacy

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOC2600 or BIOC2220 or MEDE2301

Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade</th>
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<tr>
<td>Y</td>
<td>1st sem</td>
<td>Y</td>
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</table>

Grade Descriptors (A+ to F)

A  Demonstrate thorough grasp of the subject matter covered. Show exceptional ability on knowledge integration, problem identification and solving. Show outstanding ability to critically analyze and interpret scientific data and draw appropriate conclusions. Demonstrate highly effective organization / writing skills.

B  Demonstrate substantial grasp of the subject matter covered. Show full ability on knowledge integration, problem identification and solving. Show reasonable ability to critically analyze and interpret scientific data and draw appropriate conclusions. Demonstrate effective organization / writing skills.

C  Demonstrate general but incomplete grasp of the subject matter covered. Might show misunderstanding of the materials. Show some ability on knowledge integration, problem identification and solving. Show some ability to analyze and interpret scientific data and draw proper conclusions. Demonstrate adequate organization / writing skills.

D  Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Misunderstanding of the materials is not uncommon. Show limited ability on knowledge integration, problem identification and solving. Use elementary approaches to analyze and interpret scientific data and draw sometimes erroneous conclusions. Demonstrate basic organization / writing skills.

Fail  Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in problem solving. Fail to integrate information and identify problems. Seriously deficient in ability to analyze and interpret scientific data and draw conclusions. Demonstrate poor organization / writing skills.

Course Type

Lecture-based course

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>tutorials/guided studies</td>
<td>12</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>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
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<td>15</td>
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<td>Examination</td>
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<td>70</td>
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<tr>
<td>Test</td>
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<td>15</td>
<td>CLO 1,2,3,4</td>
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</table>

Course Website

http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIO3203 Food microbiology (6 credits)

Offering Department Biological Sciences

Academic Year 2016

Quota 80

Course Co-ordinator Dr H S El-Nezami, Biological Sciences (elnezami@hku.hk)

Teachers Involved Dr H S El-Nezami, Biological Sciences

Course Objectives

This course provides the key concepts and principles of food microbiology with special emphasis on the interaction between microorganisms and food. Microbial food spoilage and foodborne diseases will be discussed in detail.

Course Contents & Topics

Detection and enumeration of microbes in foods, Factors that influence microbes in foods, Spores and their significance, Physical methods of food preservation, Chemical preservation and natural antimicrobials, Foodborne pathogens.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 describe methods for evaluating microorganisms and their products in foods
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 BIOC2220

Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade</th>
<th>Offer in 2017 - 2018</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>2nd sem</td>
<td>Y</td>
</tr>
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</table>

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 sometimes 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.
## BIOL3204 Nutrition and the life cycle (6 credits)

### Offering Department
Biological Sciences

### Quota
70

### Course Co-ordinator
Dr E T S Li, Biological Sciences (etsli@hku.hk)

### Teachers Involved
Dr E T S Li, Biological Sciences      Dr J C Y Louie, Biological Sciences

### Course Objectives
Nutritional needs vary throughout different stages of the life cycle. This course aims to cover the functional roles of essential nutrients and highlight the nutritional concerns during specific times of growth, development, and aging.

### Course Contents & Topics
Teaching and learning will take place through an evidence-based approach and will be organized around key issues: vitamin and mineral needs and their metabolism; physiological and psychological determinants that influence nutrient requirements at different stages of the human life cycle; socio-economic factors that influence dietary habit and nutritional status.

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- **CLO 1**: Have fundamental knowledge of essential micronutrient metabolism
- **CLO 2**: Be able to critically assess and identify the specific needs at different stages of the life cycle
- **CLO 3**: Relate the concept of requirement to physiological needs
- **CLO 4**: Understand the impact of socio-cultural factors on nutritional status

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOC2600 or BIOL2220 or BIOL3202

### 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 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.</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 team-based organization and presentation 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 adequately effective team-based 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 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 team-based organization and presentation 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 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 and presentation skills.</td>
</tr>
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</table>

### Course Type
Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td>Student-centered learning</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>
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<tr>
<td>Assignments</td>
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<td>20</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Essay</td>
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<td>20</td>
<td>CLO 2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

### Course Website
http://moodle.hku.hk/
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; Cardiovascular 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:
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.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2600 or BIOL2103 or BIOL2220

Grade Descriptors (A+ to F)

A: Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills.
B: Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational skills.
C: Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills.
D: Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills.
Fail: Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organizational skills are minimally effective or ineffective.

Offer in 2016 - 2017

Y 1st sem  Offer in 2017 - 2018 : Y  Examination Dec

Course Type

Lecture-based course

Course Objectives

On successful completion of this course, students should have acquired a fundemental principles of how the body works. Students interested in nutrition and human biology will find this course most useful.

Course Contents

Overview of the physiological systems and homeostasis; Neural and hormonal communication; Nervous system physiology; The digestive system; Cardiovascular 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:

1. Comprehend the essence of how the body meets changing conditions while maintaining a relatively constant internal environment.
2. Understand the functions of various body systems.
3. Explain normal body functions through integration of basic physiologic concepts.

Pre-requisites

Pass in BIOL2600 or BIOL2103 or BIOL2220

Grade Descriptors (A+ to F)

A: Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills.
B: Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational skills.
C: Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills.
D: Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills.
Fail: Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organizational skills are minimally effective or ineffective.

Offer in 2016 - 2017

Y 1st sem  Offer in 2017 - 2018 : Y  Examination Dec

Course Type

Lecture-based course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
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<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
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</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

Mulroney S. E. & Myers A.K. Netter's Essential Physiology (Saunders, 2009)

Course Website

http://moodle.hku.hk/
### 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>
<td></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 Weighing

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</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Presentation</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
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</table>

### Required/recommended reading and online materials
Selected readings will also be available on the class website.

- S. Rodwell, Williams, Nutrition and Diet Therapy (11th ed.)
- S. Rodwell, Williams, Nutrition and Diet Therapy (10th ed.)
- W. Hunter, Nutrition: Principles and Applications 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.

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**BIOL3207 Food and nutritional toxicology (6 credits)**

**Offering Department** Biological Sciences

**Quota** 80

**Course Co-ordinator** Dr H S El-Nezami, Biological Sciences (elnezami@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 interpretation of toxicological data. Students will also be introduced to the basic concepts behind toxicological evaluation, and the criteria for setting guidance values for dietary and 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 effects, the actions and types of carcinogens. A survey of the health effects of common classes of toxic substances is also presented.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- **CLO 1** demonstrate an understanding of the processes involved in absorption, distribution, metabolism and excretion of toxicants, including an understanding of the toxicokinetic behavior of toxicants in mammals
- **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 BIOC2600 or BIOL2220 or BIOL3205

**Offer in 2016 - 2017**
Y 2nd sem Offer in 2017 - 2018 : Y

**Grade Descriptors (A+ to F)**

- **A** Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presential 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 appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presential 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 moderate effectiveness in team-based organizational and presential skills.
- **D** Demonstrate partial but limited grasp 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 presential 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 presential skills.
## Course: BIOL3208 Food safety and quality management (6 credits)

### 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>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>seminars &amp; continuous assessment</td>
<td>40</td>
<td>CLO 2,4</td>
</tr>
<tr>
<td>Examination</td>
<td>Laboratory reports</td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>CLO 2</td>
</tr>
</tbody>
</table>

### 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.

#### Course Contents & Topics
- The regulatory, social, and business imperative for food safety.
- Basic concepts in TQM
- Statistical Process Control
- Quality Function Deployment
- Quality management standards (ISO 9000)
- Development and implementation of a Hazard Analysis Critical Control Point (HACCP) plan (within an ISO 22000 food safety management system/ supply chain approach)
- Role of environmental management systems (ISO 14000) in the food industry
- Intellectual Property issues in the food industry
- Religious, ethical, and cultural food choices
- Illustrative business case studies on food safety management

#### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand the historical development of government regulation of food safety
- CLO 2 be familiar with a set of management techniques applicable in the food industry
- CLO 3 be able to analyze food production problems and make recommendations for action to improve quality and safety

#### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL3201 or BIOL3203

#### Offer in 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : Y

#### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use quality management skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.</td>
</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 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.</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 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.</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 quality management skills and techniques and analysis of data and results to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate moderate to low effectiveness in team-based organizational and presentational 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 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.</td>
</tr>
</tbody>
</table>

### Course Type
Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Group work</td>
<td></td>
<td>30</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 2</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td>30</td>
<td>CLO 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.

**BIOL3209**

**Course Type**: Lecture with laboratory component course

**Offering Department**: Biological Sciences

**Course Co-ordinator**: Dr M F Wang, Biological Sciences (mfwang@hku.hk)

**Teachers Involved**: Dr M F Wang, Biological Sciences, Dr J C Y Lee, Biological Sciences

**Course Objectives**: To introduce basic principles and provide practical training in food and nutrient analysis. To help students to understand the principles behind analytical instruments used in food analysis. To train students to analyze major and minor food components as well as some food adulterants.

**Course Contents & Topics**: The key concepts in professional food analysis in an industry context will be introduced. Basic analytical techniques for macronutrients (e.g. protein, carbohydrate and fats), micronutrients (vitamins and minerals) and adulterants in food will be covered. A variety of classical and instrumental techniques used in food analysis will be discussed: rheology and texture measurement, thermal analysis, color, spectroscopy, chromatography and electrophoresis.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- CLO 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 be able to apply their knowledge and laboratory skills in novel situations to measure and analyze the macronutrient and micronutrient of food products
- CLO 5 be able to select and justify an appropriate analytical technique to solve practical food analysis problems

**Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in BIOL3201

**Offer in 2016 - 2017**: Y 1st sem Offer in 2017 - 2018 : Y

**Grade Descriptors (A+ to F)**

- **A**: Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.

- **B**: Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use 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 competence in team-based organizational and presentational skills.

- **Fail**: Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results 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**

<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>practical work &amp; assignment</td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>practical work &amp; assignment</td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Assessment Methods to CLO Mapping**

<table>
<thead>
<tr>
<th>CLO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Understand the basic principles of food and nutrient analysis</td>
</tr>
<tr>
<td>2</td>
<td>Be familiar with a variety of classical and instrumental analytical techniques</td>
</tr>
<tr>
<td>3</td>
<td>Understand the principles behind analytical instruments associated with food</td>
</tr>
<tr>
<td>4</td>
<td>Be able to apply their knowledge and laboratory skills in novel situations to measure and analyze the macronutrient and micronutrient of food products</td>
</tr>
<tr>
<td>5</td>
<td>Be able to select and justify an appropriate analytical technique to solve practical food analysis problems</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

- S. S. Nielsen: Introduction to the Chemical Analysis of Foods (Jones & Bartlett, 2000, 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.

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**BIOL3210**

**Course Type**: Lecture

**Offering Department**: Biological Sciences

**Course Co-ordinator**: Prof H Corke, Biological Sciences (harold@hku.hk)

**Teachers Involved**: Prof H Corke, Biological Sciences

**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

On successful completion of this course, students should be able to:

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Course Learning Outcomes

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 2016 - 2017

Grade Descriptors (A+ to F)

Y 2nd sem Offer in 2017 - 2018 : Y Examination May

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 organizational 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 organizational 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 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 ineffective team-based organizational and presentational skills.

Fail Demonstrate little or no grasp, with retention of little relevant information, of the subject of the 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 incorrectly, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Course Type

Lecture-based course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Reading / Self study 100
Tutorials 12
Lectures 36
Examination 70 CLO 1,2,3,4,5
Project reports including presentation 30 CLO 2,3

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL3211 Nutrigenomics (6 credits)

Offering Department Biological Sciences

Academic Year 2016

Quota 40

Course Co-ordinator Dr K C Tan-Un, Biological Sciences (kctanun@hku.hk)

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 Polysaturated fatty acid and their roles in the control of gene expression example lipogenesis and lipid oxidation pathways;

Birth 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

Offer in 2016 - 2017

Y 2nd sem Offer in 2017 - 2018 : Y Examination May
BIOL3215 Principles of dietary assessment (6 credits)

Offering Department Biological Sciences
Course Co-ordinator Dr J C Y Louie, Biological Sciences (jimmylj@hku.hk)
Teachers Involved Dr J C Y Louie, Biological Sciences

Course Objectives
This course examines the various methods used to measure dietary intake in populations and healthy individuals, how to assess these measurements against international standards, and how to make recommendations for improvement.

Course Contents & Topics
Topics covered will include the validity and reliability of different methods, estimations of energy requirements, the use of food composition databases, nutrition screening tools and the planning and use of national surveys for monitoring and evaluation. Students will conduct project work and produce and present professional-level reports using dietary assessment tools.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 understand the principles of dietary assessment methods, and the strengths of limitations of these methods
- CLO 2 evaluate the validity and reliability of dietary assessment tools
- CLO 3 choose the most appropriate nutrition assessment methods for different purposes
- CLO 4 explain the meaning and uses of Dietary Reference Intakes
- CLO 5 competently use dietary assessment software with local and international 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


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. 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 ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.

Course Type Laboratory and workshop course
Course Teaching & Learning Activities Activities Details No. of Hours
Laboratory 12
Workshops 48
Reading / Self study 90

Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Laboratory reports 40 CLO 1,3,4,5
Project reports 60 CLO 1,3,4,5,6

Required/recommended reading and online materials
Required:
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

### BIOL3301 Marine biology (6 credits) Academic Year 2016

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr M Yasuhara, Biological Sciences (yasuhara@hku.hk)

**Teachers Involved** Prof R M K Saunders, Biological Sciences

**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, bentho, nepton, marine mammals) and marine food web.
3. Major marine habitats and ecosystems (e.g., intertidal, benthic, pelagic, deep sea, coral reefs, mangroves)
4. Exploitation of marine biological resources (e.g., fisheries and bioactive compounds)
5. Contemporary issues (e.g. climate change, marine pollution, sustainable use of marine living resources, invasive species)

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1 demonstrate a basic understanding of the diversity and function of marine biota
- CLO 2 recognize the interactions of marine biota and their environments
- CLO 3 appreciate the importance of marine ecosystems and the threats of human activities on their long-term sustainability as well as possible solutions

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in BIOL2306 or ENVS2002

**Offer in 2016 - 2017**
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 most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

**D**
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

**Fail**
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**
Lecture with laboratory component course

**Course Teaching & Learning Activities**
- **Activities**
  - **Lectures**: 24
  - **Field work**: field trip, laboratory practical & tutorials: 30
  - **Reading / Self study**: 100

**Assessment Methods and Weighting**
- **Methods**
  - **Assignments**: 20
  - **Examination**: 80

**Weighting in final course grade (%)**

**Assessment Methods to CLO Mapping**

**Required/recommended reading and online materials**


H. V. Thurman and E. A. Burton: Introductory Oceanography (Prentice Hall, 2001, 9th ed.)

J. W. Nybakken: Marine Biology: An Ecological View (Benjamin Cummings, 2000)

TBC

**Course Website**
http://www.biosch.hku.hk/ecology/lsc/

### BIOL3302 Systematics and phylogenetics (6 credits) Academic Year 2016

**Offering Department** Biological Sciences

**Course Co-ordinator** Prof R M K Saunders, Biological Sciences (saunders@hku.hk)

**Teachers Involved** Prof R M K Saunders, Biological Sciences

**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 classificatory theories: phenetic systematics (classifications based on overall resemblances) and cladistics (evolutionary reconstruction). The species concept. Sources of taxonomic data: morphology & anatomy, biochemistry, chemistry, molecular biology, cytology, and ethology. Causes of taxonomies complexity; environmental factors; hybridization; breeding systems. Principles of nomenclature. Laboratory sessions will be aimed at illustrating taxonomic procedures and problems; students will not be expected to memorize large numbers of scientific names.

On successful completion of this course, students should be able to:
Course Learning Outcomes

CLO 1 explain taxon concepts (with particular reference to species) 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 principles of nomenclature in order to interpret the previous application of scientific names are validly publish new names.

Pre-requisites (and Co-requisites and impermissible combinations)

Pass in BIOL1302; and Any level 2 BIOL course

Offer in 2016 - 2017

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 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>B</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>C</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>D</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>Fail</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. Presentational skills are minimally effective or ineffective. Misuse of data or 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>
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<td>24</td>
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<tr>
<td>Laboratory</td>
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<tr>
<td>Project work</td>
<td></td>
<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>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>15</td>
<td>CLO 1,3,4,5</td>
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<tr>
<td>Examination</td>
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<td>70</td>
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<tr>
<td>Laboratory reports</td>
<td></td>
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<td>CLO 1,3</td>
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</table>

Required/recommended reading and online materials

TBC

Course Website

http://www.biosch.hku.hk/ ecology/lisc/

BIOL3303 Conservation ecology (6 credits) Academic Year 2016

Offering Department Biological Sciences

Quota 60

Course Co-ordinator Dr T C Bonebrake, Biological Sciences (tbone@hku.hk)

Teachers Involved Dr T C Bonebrake, Biological Sciences Prof Y Sadovy, Biological Sciences Dr L G Gibson, Biological Sciences

Course Objectives

To introduce students to the theory and practice of conservation and to provide students with a thorough understanding of practical, economic and management skills required for proficiency in conservation biology. Our ultimate aim is to promote an understanding of the natural biodiversity, the threats to it, and the best ways to manage them. We hope these will be your aims too, and that you will be able to use the skills and knowledge you learn from the course to reduce the local, regional and global loss of biodiversity.

Course Contents & Topics

Among the many environmental issues, the most serious is the increasingly rapid loss of biodiversity. This loss is irreversible on a human timescale and will reduce the options available to all future human generations. Conservation Biology/Ecology is the science of preserving biological diversity. This course also provides insights to the many benefits and services that nature offers and explores strategies for management options to sustain ecological integrity and production. It is an inexact, applied, mission-orientated, 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 emphasis on the integration of knowledge, skills and abilities that are required to practice conservation. Our problem based learning approach will require students to actively participate in their group project/class room debate by researching.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 develop a framework for critical thinking about biodiversity, environment and human interaction.

CLO 2 understand why species are becoming extinct and predict which ones will be most vulnerable.

CLO 3 understand the importance of the threat of tropical deforestation, marine and coastal degradation, and habitat fragmentation in species extinction, and explain the main forces behind habitat and biodiversity loss.

CLO 4 understand the principles of population viability analysis, the basis of single-species conservation management and the role of ex situ conservation, ecological restoration and reintroduction in conservation.

CLO 5 understand the principles of nomenclature in order to interpret the previous application of scientific names are validly publish new names.
### Course Type
- **Lecture with laboratory component course**

### Course Teaching & Learning Activities

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<tr>
<td>Field work</td>
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<tr>
<td>Group work</td>
<td></td>
<td>8</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>14</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
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<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
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<tr>
<td>Presentation</td>
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<tr>
<td>Test</td>
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<td>CLO 1,2,3</td>
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</table>

### Required/recommended reading and online materials

- V. D. Fred: Conservation biology [electronic resource]: foundations, concepts, applications (Springer, 2008)
- NIL

### Course Website

### BIOL3305

- **Tropical and temperate marine ecology field course (6 credits)**
- **Offering Department**: Biological Sciences
- **Course Co-ordinator**: Dr B Russell, Biological Sciences (brussell@hku.hk)
- **Teachers Involved**: Dr B Russell, Biological Sciences; Dr S Cannicci, 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 compare these ecosystems in Hong Kong and Australia, experiencing their similarities and differences.
- **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 online modules before travelling to northern and southern Australia to experience the ecosystems in the field. The online modules will consist of videos, reading and activities to 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. These concepts will be drawn together in the field with students quantifying species richness, observing system structure and testing the strength of trophic relationships with experiments.
- **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 marine ecosystems.
    - CLO 2 explain the role of physical and biological processes in shaping marine ecosystems.
    - CLO 3 understand the similarities and differences among marine ecosystems in tropical and temperate regions.
    - CLO 4 demonstrate skills for field sampling in marine and estuarine habitats.
    - CLO 5 identify a range of marine species and their role in ecosystems.
    - CLO 6 demonstrate an understanding of how human activities reduce the function of marine and estuarine ecosystems.
- **Pre-requisites (and Co-requisites and Impermissible combinations)**
  - Pass in BIOL2306 or BIOL3301 or BIOL3951
- **Offer in 2016 - 2017**
  - Y 2nd sem Offer in 2017 - 2018: Y
- **Grade Descriptors (A+ to F)**
  - A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, ability to integrate and synthesize information, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective presentational skills. Strong evidence of clear attention to thoughtful and reflective thinking.
  - B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, integration of materials and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate effective presentational skills. Evidence of clear attention to thoughtful and reflective thinking.
  - C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective presentational skills. Little evidence of clear attention to thoughtful and reflective thinking.
  - D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities and little attempt at integration. Show limited ability to apply knowledge to solve problems. Apply limited effectiveness in presentational skills. Lack of attention to thoughtful and reflective thinking.
  - Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

### BIOL3306

- **Academic Year**: 2016
- **Quota**: 15

### Test 10

<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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<td>D</td>
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### Examination

- **Methods**: Details of exam will be announced.
- **Assessment Methods to CLO Mapping**: Details of exam will be announced.

### Reading and Self Study

## Course Type & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<tr>
<td>Lectures</td>
<td>Pre-course online modules</td>
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<td>Field work</td>
<td>Reading / Self study</td>
<td>80</td>
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## Assessment Methods and Weighting

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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Popular media article (15%), Presentation (20%)</td>
<td>35</td>
<td>CLO 2,3,5,6</td>
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<td>Report</td>
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<td>Test</td>
<td></td>
<td>5</td>
<td>CLO 1,3,5,6</td>
</tr>
</tbody>
</table>

## Course Objectives

On successful completion of this course, students should be able to:

- **CLO 1** describe the global water cycle, the main sources and pathways of energy in freshwaters, and the influence of land-water interactions on aquatic productivity.
- **CLO 2** describe the composition of the freshwater biota (major groups) and their functional roles in aquatic ecosystems, and identify some of the common animals that occur in Hong Kong fresh waters.
- **CLO 3** describe the results of modification of freshwater ecosystems by humans, list the main threats to freshwater biodiversity in Asia, explain why freshwater biota are vulnerable to human impacts, and indicate the management strategies used to reduce or mitigate them.

## Pre-requisites (and Co-requisites and Impermissible combinations)

- Pass in BIOL2102 and BIOL2306

## Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</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 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>
</tr>
</tbody>
</table>

## Additional Course Information

This course involves a two week field course to Australia, one week in the Northern Territory and one week in South Australia. Students will be exposed to some harsh environmental conditions including working in contact with seawater, and potentially cold and rainy weather.

There will be extra costs involved in the course, including but not limited to airfares, accommodation and some meal costs.

This course will be offered subject to a minimum enrollment number and availability of teachers.
### Course Objectives

On successful completion of this course, students should be able to:

- **CLO 1**: Describe general but incomplete 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.
- **CLO 2**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes, with evidence of limited background reading and use of named examples. Show evidence of critical abilities and logical thinking.
- **CLO 3**: Demonstrate general but incomplete command of knowledge and skills required for attaining most 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.
- **CLO 4**: 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.

### Assessment Methods and Weighting

<table>
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<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td></td>
<td>30</td>
<td>CLO 2</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td>60</td>
<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td></td>
<td>10</td>
<td>CLO 3</td>
</tr>
</tbody>
</table>

### Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3314

**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>26</td>
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<tr>
<td>Laboratory</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

**Course Objectives**

- **CLO 1**: Describe general but incomplete 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.
- **CLO 2**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes, with evidence of limited background reading and use of named examples. Show evidence of critical abilities and logical thinking.
- **CLO 3**: Demonstrate general but incomplete 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.
- **CLO 4**: 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.

**Assessment Methods and Weighting**

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<tr>
<td>Laboratory reports</td>
<td></td>
<td></td>
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<td>CLO 3</td>
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</tbody>
</table>

**Required/recommended reading and online materials**


**Course Website**


**Additional Course Information**

This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3314

**Course Type**: Lecture with laboratory component course

**Course Teaching & Learning Activities**

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<td>24</td>
</tr>
<tr>
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<td>36</td>
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- **CLO 2**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes, with evidence of limited background reading and use of named examples. Show evidence of limited critical abilities and logical thinking.
- **CLO 3**: Demonstrate general but incomplete 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 some critical abilities and logical thinking.
- **CLO 4**: 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.

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<tr>
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**Required/recommended reading and online materials**


**Course Website**


**Additional Course Information**

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**Course Type**: Lecture with laboratory component course

**Course Teaching & Learning Activities**

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**Required/recommended reading and online materials**


**Course Website**


**Additional Course Information**

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**Course Type**: Lecture with laboratory component course

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**Course Objectives**

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- **CLO 2**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes, with evidence of limited background reading and use of named examples. Show evidence of limited critical abilities and logical thinking.
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**Required/recommended reading and online materials**


**Course Website**


**Additional Course Information**

This course will be offered subject to a minimum enrollment number and availability of teachers.
### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities

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<tr>
<td>Lectures</td>
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<tr>
<td>Field work</td>
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<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>

### Offered Department
Biological Sciences

### Quota
20

### Course Co-ordinator
Prof G A Williams, Biological Sciences

### Teachers Involved
Prof G A Williams, Biological Sciences

### Course Objectives

- **Course Contents & Topics**
  - 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 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 2016 - 2017
Y 2nd sem  Offer in 2017 - 2018 : 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.

### 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>40</td>
<td>CLO 1,2,3,4,5,6</td>
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<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

### Notes
- **Examination and Weighting**
  - Course grade (%): 20
  - Course grade (%): 20

- **Required/recommended reading and online materials**
  - A list of additional reading material will be provided during the course.

- **Course Website**

- **Additional Course Information**
  - This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3319
**Terrestrial ecology (6 credits)**

### Academic Year
2016
BIOL3320 The biology of marine mammals (6 credits) Academic Year 2016

Offering Department Biological Sciences Quota 30
Course Co-ordinator Dr L Karczmarski, Biological Sciences (leszek@hku.hk)
Teachers Involved Dr L Karczmarski, Biological Sciences

Course Objectives To enable motivated students to acquire the knowledge and skills needed to solve real problems in terrestrial ecology.

Course Content & Topics This course will focus on the ecology of terrestrial habitats. The emphasis will be on the tropics, especially Tropical East Asia, but the course will also include an overview of patterns and processes on a global scale. Students will first learn about the geological history of the land mass on earth, the biogeography and broad distribution of major terrestrial ecosystems, especially in Tropical East Asia. Then, students will begin to learn different important processes including herbivory, carnivory, pollination, seed dispersal and energy flow in terrestrial ecosystems. The second half of the course will start with the degraded terrestrial ecosystems nowadays and the important process of ecological succession. Restoration ecology and how tropical forests can be restored will then be introduced. Two other major threats to terrestrial ecosystems including alien invasive species and wildfire will also be addressed.

Two problem-based learning exercises are included to provide students with an alternative mode of learning.

The practical component of the course will introduce students to the basic field techniques used in terrestrial ecology. Students will participate to a group project, collect and analyze data, and write a short scientific paper.

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 BIOL3303


Grade Descriptors (A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, ability to integrate and synthesize information, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective presentational skills. Strong evidence of clear attention to thoughtful and reflective thinking.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, integration of materials and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate effective presentational skills. Evidence of clear attention to thoughtful and reflective thinking.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective presentational skills. Little evidence of clear attention to thoughtful and reflective thinking.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities and little attempt at integration. Show limited ability to apply knowledge to solve problems. Apply limited effectiveness in presentational skills. Lack of attention to thoughtful and reflective thinking.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type Lecture with laboratory component course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures
Laboratory laboratory & field work
Tutorials 14
Reading / Self study 100

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments CLO 1,2,3,4,5 10
Examination CLO 1,2,3,4,5 40
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)

Course Website http://www.biosch.hku.hk/ecology/lsc/ 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) Academic Year 2016

Offering Department Biological Sciences Quota 30
Course Co-ordinator Dr L Karczmarski, Biological Sciences (leszek@hku.hk)
Teachers Involved Dr L Karczmarski, Biological Sciences

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 (sirensians) and sea otters. Students will learn to understand the ecology of mammalian life in the aquatic environment, their role in the marine ecosystem, their behavioural complexity and socio-ecology, and the current threats to these animals in the human-dominated world.

Course Contents & Topics The course begins with an overview of marine mammal species and their global distribution, followed by a review of the various adaptations that have evolved to meet the challenges of the marine environment. Next, the course discusses the life history, reproductive strategies, ecology and population dynamics of marine mammals,
highlighting the similarities and differences between species in this taxonomically diverse group of animals. This is followed by sessions on behaviour and behavioural ecology; here we discuss animal movement, diving and ranging behaviour, foraging strategies, ecology of group living and social behaviour, behavioural complexity, cognition, and social strategies that guide the daily lives of these animals. The course concludes with a discussion of human influences on the fate of marine mammals, examples of critically endangered species and populations, and a review of conservation and management strategies; our emphasis is on the importance of applying the knowledge of population ecology, behaviour and behavioural ecology in ensuring long-term effective conservation of marine mammal populations. This course is designed for 3rd and 4th year students; it includes field trips, discussions of current scientific research, innovative research techniques and recent discoveries. Students will undertake independent literature-searches and will discuss their projects during classroom debates, training their skills in conceptual and analytical approaches to science.

### Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Evidence of a thorough grasp of the subject 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 presentation skills with generally weak logical argumentation and restricted ability of drawing appropriate conclusions. Work barely meets what is required at degree level.</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>
</tr>
</tbody>
</table>

### 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

### 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>
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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>including active participation/continuous assessment/presentation</td>
<td>55</td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Examination</td>
<td></td>
<td>45</td>
<td>CLO 1,2,3,4,5</td>
</tr>
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</table>

### Required/recommended reading and online materials

Reynolds JE & Rommel SA (eds). Biology of marine mammals (Smithsonian Institution Press 1999)

### Course Website

http://www.biosch.hku.hk/ecology/lsc/

### Additional Course Information

This course is offered in alternate year. This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3322

Marine invertebrate zoology (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quota</td>
<td>30</td>
</tr>
</tbody>
</table>

### Course Co-ordinator

Dr Š Cannicci, Biological Sciences (cannicci@hku.hk)

### Teachers Involved

Dr Š Cannicci, 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 costal, 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 Content & Topics

Invertebrates make up 95% of all animal species. While insects dominate the terrestrial landscapes, marine environments have a much broader phyletic diversity, with taxa such as Porifera (sponges), Polychaetes (marine worms), Coelenterata (corals and sea anemones) and Echinoderms (sea urchins and starfish) entirely confined to the seas. Together with marine molluscs and crustaceans, these groups play fundamental roles in the functioning of all marine ecosystems, and are a fundamental focus of evolutionary studies of extant taxa and their fossil
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.

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**
Pass in BIOL2306

**Offer in 2016 - 2017**
Y 2nd sem Offer in 2017 - 2018 : Y

**Examination**
May

**Grade Descriptors**
(A+ to F)

**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.** (A+)

**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.** (B+)

**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 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.** (C+)

**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.** (C)

**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.** (D)

**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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<tr>
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<tr>
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<td>Field work</td>
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<td>Project work</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>
<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>30</td>
<td>CLO 2, 4</td>
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<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1, 2, 4</td>
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<tr>
<td>Laboratory reports</td>
<td></td>
<td>20</td>
<td>CLO 1, 3</td>
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**Required/recommended reading and online materials**

Students will be directed to relevant scientific literature and websites

**Additional Course Information**
This course will be offered subject to a minimum enrollment number and availability of teachers

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**BIOL3401 Molecular biology (6 credits)**

<table>
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<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
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</thead>
<tbody>
<tr>
<td>Quota</td>
<td>130</td>
</tr>
</tbody>
</table>

**Course Co-ordinator**
Prof B K C Chow, Biological Sciences (bkcc@hku.hk)

**Teachers Involved**
Prof B K C Chow, Biological Sciences Dr K W Y Yuen, Biological Sciences Dr C B Chan, Biological Sciences

**Course Objectives**
To provide students with recent knowledge in molecular biology with special emphasis on the study of gene structure and function at the molecular level.

**Course Contents & Topics**
The course includes a detailed account of the molecular processes in eukaryotic and prokaryotic cells, from DNA replication, RNA transcription, protein translation, to post-translational modifications with special emphasis on the regulation of prokaryotic and eukaryotic gene expression. Recently developed biochemical techniques including oligonucleotide synthesis, DNA sequencing, complementary screening and DNA cloning, site-directed mutagenesis, polymerase chain reaction and transgenic technology will also be discussed.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

**CLO 1** know the basic structures of DNA, RNA and protein, and how DNA is package in the nucleus of eukaryotic cells

**CLO 2** understand the biochemical processes involved in DNA replication, transcription, translation and post-translational modifications in prokaryotes and eukaryotes

**CLO 3** explain and describe the regulation of gene transcription in prokaryotes and eukaryotes
**Pre-requisites**

Pass in BIOL2600 or BIOL2103 or BIOL2220 or MEDE2301

**Offer in 2016 - 2017**

Y 1st sem Offer in 2017 - 2018 : 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, 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 most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

**Course Type**

Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<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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<td>100</td>
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**Assessment Methods and Weighting**

<table>
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>assessment of practical work</td>
<td>20</td>
<td>CLO 1,2,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>80</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

R. Weaver: Molecular Biology (McGraw-Hill, 2005 or 2008)
B. Lewin: Gene IX (Jones and Bertlett, 2008)
Selected journal articles and web learning materials.
TBC

**Course Website**

http://moodle.hku.hk/

**BIOL3402**

Cell biology and cell technology (6 credits)

**Academic Year**

2016

**Offering Department**

Biological Sciences

**Quota**

120

**Course Co-ordinator**

Prof A S T Wong, Biological Sciences (awong1@hku.hk)

**Teachers Involved**

Prof A S T Wong, Biological Sciences      Dr J S H Tsang, Biological Sciences      Dr W Y Lui, Biological Sciences

**Course Objectives**

To provide a coherent understanding of the structure and function of cells, and the principles and applications of cell culture and instrumentation in biology and biotechnology

**Course Contents & Topics**

I. Cell Biology


II. Techniques in animal cell culture


III. Techniques in plant cell culture


**Course Learning Outcomes**

On successful completion of this course, students should be able to:

CLO 1 acquire fundamental knowledge on cell biology and cell technology

CLO 2 demonstrate basic laboratory techniques on cell culture

CLO 3 gain insight into real-life applications in cell biology and cell technology

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL2600 or BIOL2103 or BIOL2220 or MEDE2301

**Offer in 2016 - 2017**

Y 1st sem Offer in 2017 - 2018 : 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, 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.

B Demonstrate substantial command of a broad range of knowledge required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational skills. Writings mostly demonstrate informed, thoughtful intellectual engagement with broad range of relevant concepts.

C Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills. Writings mostly indicate informed, intellectual engagement with concepts or theories but not always with sufficient depth, breadth or understanding.
Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:
- Activities: Details
  - Lectures: 24
  - Laboratory: 24
  - Tutorials: 12
  - Reading / Self study: 100

Assessment Methods and Weighting:
- Methods: Details
  - Assignments: assessment of practical work 30
  - Examination: 70

Assessment Methods and Weighting:
- Weighting in final course grade (%): CLO 1,2,3
- Assessment Methods to CLO Mapping: CLO 1,3

Grade Descriptors (A+ to F)
- 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.
- 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.
- C: 1. Satisfactory performance demonstrating adequate understanding of the subject matter. 2. Some insight into the scientific literatures. 3. Adequate writing and communication skills.
- 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.
- Fail: 1. Poor understanding of subject matter. 2. Little to no insight into use of the scientific literatures. 3. Unable to write or communicate.

Course Objectives:
- To provide a broad understanding of the animal immune system. Topics will also include the application of a wide variety of immunological methods to research and disease diagnosis.

Course Contents & Topics:

Course Learning Outcomes:
- On successful completion of this course, students should be able to:
  - CLO 1: describe the structure and function of the immune molecules which are involved in the body defense mechanisms, including antibody, T-cell receptor, cytokines, MHC and complement proteins
  - CLO 2: describe the organization of the mammalian immune system in terms of genes, cells and tissues
  - CLO 3: explain the underlying mechanisms associated with transplant rejection, transfusion reaction and vaccination
  - CLO 4: explain how the immune system responds to infections by bacteria, viruses and parasites
  - CLO 5: understand antigen-antibody interaction and the principle of immunoassays

Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in BIOC2600 or BIOL2103 or BIOL2220 or MEDE2301

Offer in 2016 - 2017
- Y 2nd sem Offer in 2017 - 2018 : Y
- Examination: May

Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:
- Activities: Details
  - Lectures: 30
  - Laboratory: 16
  - Tutorials: 6
  - Reading / Self study: 100

Assessment Methods and Weighting:
- Methods: Details
  - Examination: 80
  - Laboratory reports: 20

Assessment Methods and Weighting:
- Weighting in final course grade (%): CLO 1,2,3,4,5
- Assessment Methods to CLO Mapping: CLO 1,2,3,4,5

Required/recommended reading and online materials:
- I. Rott, J. Brostoff and D. Male: Immunology (Mosby, latest 2 editions)
- http://moodle.hku.hk/
BIOL3405  Molecular microbiology (6 credits)

Offering Department  Biological Sciences  Quota  30
Offering Department  Biological Sciences  Quota  30
Offering Department  Biological Sciences  Quota  30
Teacher Involved  --, Biological Sciences
Course Objectives  This course is intended for biology, biotechnology and biochemistry students who would like to understand the modern fundamentals of microbiology. At the end of the course the students are expected to know the physiological, biochemical and molecular aspects of microbiology.
Course Contents & Topics  The basic biochemistry of microorganisms will be described. The intrinsic factors that affect the growth of microbes in the environment will be examined. The adaptation of the microbes to the environment by means of physiological changes and genetical alterations will be illustrated. The molecular biology of bacteria and viruses will be considered. The molecular biology of plasmids and transposable elements and their association with medical aspect will be discussed. The use of modern technology in studying microbial microorganisms will be explored.
Course Learning Outcomes  On successful completion of this course, students should be able to:
CLO 1  understand the intrinsic reorganization of microbes in response to the changing environments
CLO 2  comprehend the major modes of regulation in the microbe
CLO 3  explain the biology of bacteriophages and plasmids
CLO 4  realize the importance of transposable elements in the survival of the microbes
CLO 5  appreciate the development of modern techniques in studying microorganisms
Pre-requisites  Pass in BIOC2600 or BIOL2220 or MEDE2301
Offer in 2016 - 2017  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. Critical use of data and results 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. Demonstrate substantial grasp of the subject. Show evidence of 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 presentation skills.

--- School of Biological Sciences

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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 grasp 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.

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.

### 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></td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>20</td>
<td>CLO 3,4,5</td>
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<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 1,2,5</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

- 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, Biological Sciences

**Course Objectives**

To provide a comprehensive overview on modern concepts and recent advance 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.
- Environmental endocrine disruptors and recent advances in biotechnology for fertility control & assisted reproduction in human.
- Embryonic stem cells & induced pluripotent stem cells and their applications in regenerative medicine/therapeutic cloning.
- Germ line engineering & 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 neuroendocrine control of reproductive functions & reproductive cycle, sexual behavior, parental care, and pregnancy & giving birth to baby in human & mammalian models
- CLO 3 have a basic understanding on the concept of environmental endocrine disruptors for reproductive functions and the causes of human infertility & assisted reproduction
- CLO 4 comprehend a wide range of modern technologies for germ line engineering, 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 and Impermissible combinations)**

Pass in BIOL2102 or BIOL2103 or BIOL2220 or BIOL2306

**Grade Descriptors (A to F)**

<table>
<thead>
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<th>1st sem</th>
<th>Offer in 2017 - 2018 : Y</th>
<th>Examination</th>
<th>Dec</th>
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<tr>
<td>A</td>
<td></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. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></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. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></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 familiar and some unfamiliar situations. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.</td>
<td></td>
<td></td>
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<tr>
<td>D</td>
<td></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. Apply limited or barely effective organizational and presentational skills.</td>
<td></td>
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</tr>
<tr>
<td>Fail</td>
<td></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.</td>
<td></td>
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</tbody>
</table>
Course Type: Lecture with laboratory component course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<tr>
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<tr>
<td>Laboratory</td>
<td></td>
<td>24</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Reading / Self study</td>
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### Assessment Methods and Weighting

<table>
<thead>
<tr>
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<tr>
<td>Examination</td>
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<td>70</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Laboratory reports</td>
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<tr>
<td>Test</td>
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<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials


### Course Co-ordinator

Dr W B L Lim, Biological Sciences

### Teachers Involved

Dr C S C Lo, Biological Sciences
Dr J Zhang, Biological Sciences

### Course Objectives

This course will be offered subject to a minimum enrollment number and availability of teachers.

### Course Contents & Topics

Topics will include cellular reproduction, principles and chromosomal basis of Mendelian genetics, linkage analysis and mapping, concept and definition of the gene, molecular mechanisms of mutation, DNA repair and recombination, DNA transposition, extranuclear inheritance, developmental genetics, quantitative and population genetics. Students are strongly encouraged to take BIOL2303 Molecular Biology to get a more comprehensive coverage of topics in molecular genetics.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 appreciate the beauty of genetic organizations in nature
- CLO 2 use different genetic principles to explain hereditary traits observed in nature and laboratories
- CLO 3 apply qualitative and quantitative experimental methodologies for genetic analysis at individual and population levels

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL2103

### Offer in 2016 - 2017

Y 1st sem Offer in 2017 - 2018 : 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. 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

### Course Type

Lecture with laboratory component course

### Assessment Methods

<table>
<thead>
<tr>
<th>Activities</th>
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<td>CLO 1,2,3,4</td>
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<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
<td>CLO 1,2,3,4</td>
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### 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 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.

### 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 businesses
- **CLO 2** understand and demonstrate how discoveries and inventions are commercialized
- **CLO 3** navigate the various steps in the development of a biotechnology derived product: from bench, to scale-up, to market
- **CLO 4** gain technical and business knowledge of the biotechnology and bioprocessing industries
- **CLO 5** participate and contribute to the business side of scientific enterprises

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in any level 2 BIOL or BIOC course (A+ to F)

### Offer in 2016 - 2017

<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>Students acquire exceptional skills and knowledge from the course and are capable of independently analyzing the business and technological developments of various biotechnology ventures.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>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.</td>
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</tr>
<tr>
<td>Students demonstrate a broad and in-depth understanding of the current developments in biotechnology industry.</td>
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</tr>
<tr>
<td>Students demonstrate a moderate understanding of the current developments in biotechnology industry.</td>
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<tr>
<td>Students fail to demonstrate a moderate understanding of the current developments in biotechnology industry.</td>
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</table>

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Group work</td>
<td>group work/project/visit</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

Method: Assignments and Presentations | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |

| Assignments | patent (10%), licensing agreement (10%), business plan (35%) | 70 | CLO 1,2,3,4,5 |
| Presentation | learn yourself (5%), team building (10%) | 15 | CLO 1,2,3,4,5 |

### Required/recommended reading and online materials

TBC

### Course Website

http://moodle.hku.hk/

### Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

### BIOL3419

**Insect ecology: the little things that run the world** (6 credits)

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Quota</th>
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<tbody>
<tr>
<td>2016</td>
<td>25</td>
</tr>
</tbody>
</table>

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr B Guenard, Biological Sciences (bguenard@hku.hk)

**Teachers Involved** Dr B Guenard, 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, parasites, 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

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Course Descriptors (A+ to F)

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 studied. 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.

D: Demonstration of a limited understanding of the biological concepts and theories developed during the course. Identification skills and use of taxonomic keys of the different groups of arthropods inadequate and mostly inaccurate. No participation in class or unsettling. Poor curation and identification of the collection.

Fail: Fail to provide evidence of knowledge on the biological concepts and theories developed during the course. No identification skills and lack of knowledge on how to use taxonomic keys. No participation in class or unsettling. Curation and identification highly unsatisfactory or work not delivered on time.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities
- Lectures
- Laboratory
  - This part includes 4 hours of lectures about identification and curation of arthropod collection.
- Project work
  - Students will collect independently their own insect collection, curate and identify the specimen collected
- Reading / Self study

Assessment Methods and Weighting
- Methods
  - Assignments: 30
  - Examination: 40
  - Laboratory reports: 30
- Details
  - Weighting in final course grade (%)
  - CLO 1,2,3
  - CLO 1,2,3
  - CLO 1,2,3
- Assessment Methods to CLO Mapping
  - CLO 1,2,3

Required/recommended reading and online materials
- Course Website
- Additional Course Information
  - This course will be offered subject to a minimum enrollment number and availability of teachers

BIOL3501 Evolution (6 credits) Academic Year 2016

Offering Department Biological Sciences
Quota 50

Course Co-ordinator Dr M Sun, Biological Sciences (meisun@hku.hk)
Teachers Involved
Dr M Sun, Biological Sciences

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
- Speciation
- 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 describe Darwin's theory of evolution by natural selection and how the process of natural selection can lead to speciation

CLO 2 have an advanced understanding of the modern evolutionary theory

CLO 3 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 2016 - 2017
Y 1st sem
Offer in 2017 - 2018: Y
Examination Dec

Course 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.
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.

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.

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.

### Course Type
Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Tutorials</td>
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<td>Project work</td>
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<td>Reading / Self study</td>
<td></td>
<td>100</td>
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<tbody>
<tr>
<td>Assignments</td>
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<td></td>
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<tr>
<td>Essay</td>
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<td></td>
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<tr>
<td>Examination</td>
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<td>CLO 1,2,3,4</td>
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<tr>
<td>Presentation</td>
<td>10</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Project reports including computer lab</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>10</td>
<td>CLO 1,2,3,4</td>
<td></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)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr M Sun, Biological Sciences (<a href="mailto:meisun@hku.hk">meisun@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr M Sun, Biological Sciences</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Introduction to conservation genetics.</td>
</tr>
<tr>
<td></td>
<td>Part I. Evolutionary Genetics of Natural Populations:</td>
</tr>
<tr>
<td></td>
<td>- genetic diversity</td>
</tr>
<tr>
<td></td>
<td>- characterizing genetic diversity: single loci and quantitative variation;</td>
</tr>
<tr>
<td></td>
<td>- evolutionary impacts of natural selection, mutation, migration and their interactions in large populations;</td>
</tr>
<tr>
<td></td>
<td>- genetic consequences of small population sizes;</td>
</tr>
<tr>
<td></td>
<td>- maintenance of genetic diversity;</td>
</tr>
<tr>
<td></td>
<td>- population genomics.</td>
</tr>
<tr>
<td></td>
<td>Part II. Effects of Population Size Reduction:</td>
</tr>
<tr>
<td></td>
<td>- loss of genetic diversity in small populations;</td>
</tr>
<tr>
<td></td>
<td>- inbreeding;</td>
</tr>
<tr>
<td></td>
<td>- inbreeding depression;</td>
</tr>
<tr>
<td></td>
<td>- population fragmentation;</td>
</tr>
<tr>
<td></td>
<td>- genetically viable populations.</td>
</tr>
<tr>
<td></td>
<td>Part III. From Theory to Practice:</td>
</tr>
<tr>
<td></td>
<td>- resolving taxonomic uncertainties and defining management units;</td>
</tr>
<tr>
<td></td>
<td>- genetic management of wild populations;</td>
</tr>
<tr>
<td></td>
<td>- genetic issues in introduced and invasive species;</td>
</tr>
<tr>
<td></td>
<td>- genetic management of captive populations;</td>
</tr>
<tr>
<td></td>
<td>- genetic management for reintroduction;</td>
</tr>
<tr>
<td></td>
<td>- use of molecular genetics in forensics and understanding species biology;</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td></td>
<td>CLO 1 demonstrate an advanced understanding of the concepts of conservation genetics</td>
</tr>
<tr>
<td></td>
<td>CLO 2 understand the criteria for determining the conservation status of endangered, vulnerable, or threatened species</td>
</tr>
<tr>
<td></td>
<td>CLO 3 know the methods for characterizing genetic diversity at population and species levels</td>
</tr>
<tr>
<td></td>
<td>CLO 4 comprehend the relationships between genetic diversity, inbreeding, reproductive fitness, and evolutionary potential in wild populations</td>
</tr>
<tr>
<td></td>
<td>CLO 5 describe the effects of habitat fragmentation and population size reduction on genetic diversity and the implications in managing nature reserves</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in BIOL2306 or BIOL3303 or BIOL3408</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Y 2nd sem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer in 2017 - 2018</td>
<td>Y Examination May</td>
</tr>
</tbody>
</table>

370 School of Biological Sciences
Outcomes

Course Learning Objectives

1. Understand the definition and natures of hormones
2. Explain and describe secondary messenger pathways for hormones
3. Describe the connection between pituitary the master gland with higher brain centers and peripheral organs

Teachers Involved

Prof B K C Chow, Biological Sciences
Prof A S T Wong, Biological Sciences
Dr C B Chan, Biological Sciences

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>10</td>
<td>CLO 1,3,4,5,6</td>
</tr>
<tr>
<td>Essay</td>
<td></td>
<td>5</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,4,5,6</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>10</td>
<td>CLO 3</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 1,4,5,6</td>
</tr>
<tr>
<td>Project report</td>
<td></td>
<td>5</td>
<td>CLO 1,4,6</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1,4,5,6</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

e-book 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.

BIOL3503 Endocrinology: human physiology II (6 credits)

Offering Department

Biological Sciences

Quota

60

Course Co-ordinator

Prof B K C Chow, Biological Sciences (bkcc@hku.hk)

Prof A S T Wong, Biological Sciences

Dr C B Chan, Biological Sciences

Course Objectives

To provide an advanced course on hormones and how they regulate metabolism/growth, reproduction and water/salt homeostasis in our body.

Course Contents & Topics

- The hypothalamic pituitary axis
- Catecholamine effects and their pathways.
- 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

Pass in BIOL2103

Offer in 2016 - 2017

Y 2nd sem

Offer in 2017 - 2018 : Y

Examination

May

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, showing strong abilities in critical thinking and logical reasoning, with evidence of significant insight and original thought in dealing with the critical issues in the field.

B Good performance demonstrating capacity to use the appropriate concepts, a good understanding of the subject matter, and an ability to handle the problems and materials encountered in the subject, showing evidence of attaining most of the course learning outcomes.

C Adequate performance demonstrating some understanding of the subject matter, an ability to handle relatively simple problems, but showing incomplete command of knowledge required for attaining most of the expected course learning outcomes.

D Minimally acceptable performance demonstrating at least partial familiarity with the subject matter and some capacity to deal with relatively simple problems, but also demonstrating serious deficiencies in knowledge required for attaining most of the expected course learning outcomes.

Fail Poor performance in all aspects of the course, showing little evidence of learning, lacking real understanding of the subject matter, demonstrating deficiencies serious enough to make it inadvisable to proceed further without additional course work.
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>a 5-hour laboratory session per week for 5 weeks</td>
<td>25</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></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.

## BIOL3505

### Course Type

Field camps

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Field work</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Laboratory work</td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

### 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 means to restore oyster habitats. 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

### 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.

**Fail**

Evidence of meager or inadequate knowledge and understanding of marine life science issues. Show no evidence of knowledge and skills required for attaining all the course learning outcomes. Demonstrate no ability to apply what you have learned in the class room to critically analyze the real marine life science issues. Show no evidence of familiarity with relevant reading material and field trip demonstrations, or any knowledge of organizational and presentational skills.

### Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>2nd sem</td>
</tr>
</tbody>
</table>

| Examination | Y  |

Offer in 2017 - 2018 : Y
BIOL3508 Microbial physiology and biotechnology (6 credits)

Offering Department
Biological Sciences

Course Co-ordinator
Dr A Yan, Biological Sciences (ayan8@hku.hk)

Teachers Involved
Dr A Yan, Biological Sciences

Course Objectives
Microbes are amazing and important entities on earth. Knowledge of microbes is widely applied in food, pharmaceutics, biotechnologies, diseases control, and biogeochemical processes. Microbial Physiology and Biotechnology provides both molecular basis for understanding of these important processes and up-to-date applications in modern Biotechnology, and to serve as essential foundations for sub-disciplines of Microbiology, such as environmental, food, and medicinal Microbiology. Upon completion, students will acquire fundamental knowledge and 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 Biotechnological'. 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 relate knowledge to practical application of microbes in industry and medicine
- CLO 4 develop abilities to read and assess scientific literature in microbiology area

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL103 or BIOL2220 or BIOC2600 or BIOC3604; Not for students who have passed in BIOL3168 or BIOL4402.

Offer in 2016 - 2017
Y 1st sem Offer in 2017 - 2018 : Y

Examination
Dec

Grade Descriptors (A+ to F)
A 
Demonstrate thorough mastery at an advanced level of extensive knowledge required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational skills.

B 
Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational skills.

C 
Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately-effective organizational skills.

D 
Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational skills.

Fail 
Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organizational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 4
Project work 4
Reading / Self study 100

Assessment Methods and Weighing
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 25 CLO 3, 4
Report Presentation: developing innovative ideas for sustainable and economically viable aquaculture in Hong Kong 50 CLO 4
Test 25 CLO 1, 2

Additional Course Information
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 meals for 7 days).
This course will be offered subject to a minimum enrollment number and availability of teachers.

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)

Assessment Methods
Details
Weighting in final course grade (%)
Methods
Assessment to CLO Mapping

School of Biological Sciences
373
### BIOL3951 Ecology & biodiversity field course (6 credits)

**Offering Department**: Biological Sciences  
**Quota**: 20  
**Course Co-ordinator**: Dr L Karczmarski, Biological Sciences (leszek@hku.hk)  
**Teachers Involved**: Dr L Karczmarski, Biological Sciences  
**Course Objectives**: This course is offered as a capstone experience and will require intense study of a topic relevant to the Ecology & Biodiversity Major during a field course, inside or outside Hong Kong. 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 Contents & Topics**: 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**  
This capstone course is offered subject to a minimum enrollment number and availability of teachers. The earliest that a student is allowed to take this capstone course is their year 3 study.  
**Offer in 2016 - 2017**: N  
**Offer in 2017 - 2018**: N  
**Examination**: ---  
**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. A rare 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 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 grasp of the subject and relevant research techniques. Moderate familiarity with relevant background reading and case studies. Good handling of field data collection and commendable analytical skills. 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.  
- 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.  
**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>35</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Report</td>
<td>65 (35%), group investigation &amp; presentation (30%)</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Students will be directed to relevant scientific literature and websites  
**Course Website**: http://www.biosch.hku.hk/ecology/lsc/  
**Course Website**: http://moodle.hku.hk/
BIOL3991 Directed studies in ecology & biodiversity (6 credits) Academic Year 2016

Offering Department Biological Sciences Quota ---

Course Co-ordinator Prof G A Williams, Biological Sciences (hrsbwga@hku.hk)

Teachers Involved All academic staff in Ecology & Biodiversity Major, Biological Sciences

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.

Course Learning Outcomes On successful completion of this course, students should be able to:

- CLO 1 identify a relevant scientific question or knowledge gap
- CLO 2 establish a desk-top literature approach to test the question posed / address the knowledge gap
- CLO 3 undertake the appropriate research to test the question / address the knowledge gap using sound scientific principles; including statistical analyses where appropriate
- CLO 4 draw appropriate scientific conclusions from their research
- CLO 5 present their research as a scientific paper

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.

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.

Grade Descriptors (A+ to F)

- 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 scientific approach to test research hypothesis. Show excellent organizational and/or analytical skills. Demonstrate comprehensive, critical, assessment of findings 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 of relevant literature and identification of research hypothesis. Appropriately 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.

- 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 of relevant literature and identification of research hypothesis. Adequately designed scientific approach to test research hypothesis. Show organizational and/or analytical skills. Demonstrate adequate but not necessarily critical, assessment of findings and 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 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.

- 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 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.

Course Type Project-based course

Course Teaching & Learning Activities Assessment Methods and Weighting

- Activities Details No. of Hours
  - Reading / Self study at least 120 hours on the dissertation or project 120

- Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
  - Research report Mid-term written essay plan (20%), Written report, report 6000-7000 words (excluding figures and references) (80%) 100 CLO 1,2,3,4,5

Course Website http://www.biosch.hku.hk/ecology/lsc/

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.

BIOL3992 Directed studies in food & nutritional science (6 credits) Academic Year 2016

Offering Department Biological Sciences Quota ---

Course Co-ordinator Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)

Teachers Involved All academic staff in Food & Nutritional Science Major, Biological Sciences

Course Objectives The directed study can be a review of literature on a specific topic, or a lab or field study that enhances the student's understanding of the topic in the field of food & nutritional science. The student should obtain the commitment of a supervisor in the area of the dissertation topic before submitting the registration form for the course (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 Contents & Topics On successful completion of this course, students should be able to:

- CLO 1 acquaint with the process of scientific enquiry
- 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

Course Learning Outcomes

Recommended reading may be assigned.
Course Type
- Project-based course

Course Teaching & Learning Activities
- Activities: Reading / Self study
  - Details: at least 120 hours on the dissertation or project
  - No. of Hours: 120

Assessment Methods and Weighting
- Methods: Oral presentation, Research report
  - Details: 15 minutes (Plus 5 minutes for questions and answers), Written report 6000-8000 words (excluding figures and references)
  - Weighting in final course grade (%): 20 (CLO 1,2,3,4), 80 (CLO 1,2,3,4)

Course Website
- http://moodle.hku.hk/

Additional Course Information
- Regular meetings between the supervisor and student. Guidance from the supervisor on the scientific methods, and on how to think and write scientifically. Students should spend at least 120 hours on the dissertation or project. Recommended reading may be assigned.

BIOL3993
- Directed studies in Molecular biology & biotechnology (6 credits)
- Academic Year: 2016

Offering Department
- Biological Sciences

Course Co-ordinator
- Dr W K Yip, Biological Sciences (wkyip@hku.hk)

Teachers Involved
- All academic staff in Molecular Biology & Biotechnology Major, Biological Sciences

Course Objectives
- This course aims to provide a stimulating capstone experience for all Molecular Biology & Biotechnology 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 molecular biology & biotechnology. The student should obtain the commitment of a supervisor in the area of the dissertation topic before submitting the registration form for the course.

Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1: acquaint with the process of science
  - CLO 2: have a better understanding of the nature of molecular biology & biotechnology
  - CLO 3: apply scientific methods to address important issues in various biological disciplines
  - CLO 4: develop the key intellectual skills that will be valuable for all scientific studies

Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Molecular Biology & Biotechnology Major.
- This capstone course is for Molecular Biology & Biotechnology Major students only.

Offer in 2016 - 2017
- Grade Descriptors (A+ to F)
  - A: Work displaying a high level of scholarship and originality; virtually flawless presentation with excellent introduction to dissertation topic, showing a thorough grasp of the topic from background reading and analysis; clear statement of the objectives of the research; comprehensive exploration of the topic, personal synthesis of the issues with detailed support from the literature; comprehensive and up-to-date references integrated into argument or logical reasoning; critical evaluations of the main points or problems and their solutions and implications; thought-provoking discussions; accurate summary. All chapters/paragraphs are well-connected and presented logically with clarity of goals, demonstrating excellent organizational, rhetorical and presentational skills. The length of the dissertation meet the specified requirements. All other aspects of the dissertation conform to a high academic standard.
  - B: Work showing some evidence of originality and insight in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; demonstrating substantial understanding of fundamental concepts of the field of study; adequate grasp of the topic from background reading and analysis; a systematic exploration of the topic which may include an attempt at critical comment or appraisal; regular support provided from the literature; comprehensive and up-to-date references included; main points fully elaborated; summary given in the final chapter/paragraphs; communicating information and ideas clearly and fluently, demonstrating good organizational, rhetorical and presentational skills. The length of the dissertation meet the specified requirements. Most aspects conform to a high academic standard.
  - C: Work showing no evidence of originality and insight, but the presentation demonstrated adequate understanding and comprehension of most aspects of the dissertation topic; essential topic materials have been read and acknowledged; the main points presented in logically sequential paragraphs; reasonably balanced discussion of the major issues; acceptable interpretation of the topic; some explanation, illustration and support provided from the literature; summary given in the final chapter/paragraphs; most presentation details met (front page, margin, legibility, citations correctly reported and tabulated, etc.); few 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 inappropriate or unsupported; lack of clarity or structure in communicating information or ideas; dissertation topic not fully covered; discussion too brief or just repeats data or findings; undue 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; unconvincing; incomplete 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.

Course Website
- http://moodle.hku.hk/
Course Type
Project-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Reading / Self study at least 120 hours on the dissertation or project 120

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assesment Methods to CLO Mapping
Oral presentation 15 minutes (Plus 5 minutes for questions and answers). 20 CLO 1,2,3,4
Research report Written report 6000-8000 words (excluding figures and references). 80 CLO 1,2,3,4

Course Website
http://moodle.hku.hk/

Additional Course Information
Recommended reading may be assigned.

BIOL3994
Directed studies in biological sciences (6 credits)

Offering Department
Biological Sciences

Course Co-ordinator
Prof W W M Lee, Biological Sciences (hrswlwm@hku.hk)

Teachers Involved
All academic staff in Biological Sciences Major, Biological Sciences

Course Objectives
This course aims to provide a stimulating capstone experience for all Biological Sciences Major undergraduates to integrate and apply their knowledge and skills obtained from the Major.

Course Contents & Topics
The directed study can be a review of literature on a specific topic, or a lab or field study that enhances the student's understanding of the topic in the field of biological sciences. The student should obtain the commitment of a supervisor in the area of the dissertation topic before submitting the registration form for the course (available from the General Office of School of Biological Sciences). Supervisor will introduce various methodologies/techniques and guide students to completion of the dissertation. Teaching will be informal and students will gain knowledge through discussion and feedback from their supervisors.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 acquaintance with the process of science
CLO 2 have a better understanding of the nature of biological sciences
CLO 3 apply scientific methods to address important issues in various biological disciplines
CLO 4 develop the key intellectual skills that will be valuable for all scientific studies

Pre-requisites (and Co-requisites and Impermissible Combinations)
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Biological Sciences Major.

Co-requisites
This capstone course is for Biological Sciences Major students only.

Offer in 2016 - 2017
Y Year long Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors (A+ to F)

A Work displaying a high level of scholarship and originality; virtually flawless presentation with excellent introduction to dissertation topic; showing a thorough grasp of the topic from background reading and analysis; clear statement of the objectives of the research; comprehensive exploration of the topic; personal synthesis of the issues with detailed support from the literature; comprehensive and up-to-date references integrated into argument or logical reasoning; critical evaluations of the main points or problems and their solutions and implications; thoughtful provocations and 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; some major points missed. Minimum conform to an acceptable academic standard.

D Demonstrating superficial or partial or faulty understanding of the fundamental concepts of the field of study; showing the bare minimum of information, poorly digested and not very well organized in presentation; irrelevant material; showing no evidence of critical thinking; arguments undeveloped or inappropriate or unsupported; lack of clarity or structure in communicating information or ideas; dissertation topic not fully covered; discussion too brief or just repeating the data or findings; overuse quotations with little explanation; insufficient support from literature; reading not well incorporated into the text; limited acknowledgements and 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.
Course Teaching & Learning Activities
Reading / Self study at least 120 hours on the dissertation or project 120

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>20</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>80</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.

BIOL4201
Public health nutrition (6 credits) Academic Year 2016

Offering Department: Biological Sciences
Co-ordinator: Dr J M F Wan, Biological Sciences (jmfwan@hku.hk)

Course Objectives
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 Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1: have a broad knowledge of the scope and methodologies of public health nutrition
- CLO 2: have a clear understanding of the range of selected examples of public health nutrition cases in less-developed and developed countries
- CLO 3: be able to formulate recommendations for action for nutritional interventions at the community level
- CLO 4: have a broad understanding of socio-cultural factors on community food choices and consequently on health outcomes

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL3201 or BIOL3202

Examination: May

Grade Descriptors (A+ to F)
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective laboratory/fieldwork skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
- B: Demonstrate sufficient 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 laboratory/fieldwork skills and techniques. Mostly correct but some erroneous use of data and results to draw approximate 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.

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>30 hours student investigative report, &amp; 12 hours of tutorials/presentations</td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>70</td>
<td></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
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 2016

School of Biological Sciences

378
Outcomes

Course Objectives
To highlight the impact of nutrient provision on brain structure and function, and to discuss various effects of nutrition and diet on mental function and behaviour.

Course Contents & Topics
Fundamentals of the central nervous system; Nutrition & brain development; Diet, learning & memory function; Dietary CNS stimulants; Neurotransmitters, drugs & behaviour; Physiological and socio-cultural determinants of dietary behaviour.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 understand the basic structure and functions of the brain and how nutrition influences its development
- CLO 2 be able to explain the consequences of malnutrition on cognition
- CLO 3 Appreciate appetite control as a function of food-gut-brain interaction
- CLO 4 understand the differences between bioactive food ingredients and drugs
- CLO 5 critically evaluate and interpret the internal and external cues that determine dietary behaviour

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL3204, or already enrolled in this course

Offer in 2016 - 2017
N

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 on knowledge integration, problem identification and solving. Show some ability to analyze and interpret scientific data and draw proper conclusions. Demonstrate adequate organization / writing skills.

D
- Demonstrate partial but limited grasp, with retention of some relevant information. Show misunderstanding of the subject matter covered. Misunderstanding of the materials is not uncommon. Show limited ability on knowledge integration, problem identification and solving. Use elementary approaches to analyze and interpret scientific data and draw sometimes erroneous conclusions. Demonstrate basic organization / writing skills.

Fail
- Demonstrate little or no grasp, with retention of little relevant information, of the subject matter covered. Show lack of coherent and logical thinking, and minimal competence in problem solving. Fail to integrate information and identify problems. Seriously deficient in ability to analyze and interpret scientific data and draw conclusions. Demonstrate poor organization / writing skills.

Course Type
Lecture-based course

Assessment Methods and Weighing
<table>
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<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1.2, 4</td>
</tr>
<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 2.4</td>
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Required/recommended reading and online materials
Nutritional Neuroscience (Journal)
Physiology and Behavior (Journal)
Appetite (Journal)
Journal of Nutritional Biochemistry (Journal)
http://moodle.hku.hk/

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.
**School of Biological Sciences**

**Course Type**  
Lecture with laboratory component course

**Grade Descriptors (A+ to F)**

- **A**  
  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.

- **B**  
  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.

- **C**  
  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.

- **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 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 appropriate conclusions occasionally.

- **Fail**  
  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. With guidance, demonstrates limited skills in designing, producing and evaluating solutions for specific food purposes. Use lab skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions.

**Course Type**  
Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
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<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>laboratory/field trip/seminar</td>
<td>24</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>6</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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</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</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Offering Department**  
Biological Sciences

**Academic Year**  
2016

**Quota**  
50

**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**  
2016

**Quota**  
50

**Course Co-ordinator**  
Prof N P Shah, Biological Sciences (npshah@hku.hk)

**Teachers Involved**  
Prof N P Shah, Biological Science  Dr J C Y Lee, Biological Sciences

**Course Objectives**

To give students a broad understanding of modern practice and technologies used in meat and dairy production, processing and marketing.

**Course Contents & Topics**

- Principles of animal nutrition and feed formulation; genetic selection and breeding of farm animals; slaughter and carcass inspection; meat preservation and safety; sensory quality of meat. Dairy processing emphasizing fermented products such as cheese and yogurt; probiotics and health effects. Meat and dairy product marketing.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 understand modern practices in meat and dairy production
- CLO 2 demonstrate a knowledge and understanding of meat and dairy sensory quality, and the technologies used in processing, preservation or improvement of meat and dairy products
- CLO 3 demonstrate knowledge of selected issues related to meat and dairy safety

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL3201

**Offer in 2016 - 2017**  
Y 2nd sem

**Offer in 2017 - 2018**  
Y

**Grade Descriptors (A+ to F)**

- **A**  
  Demonstrate thorough grasp of the subject matter covered. Show strong analytical and critical abilities and logical thinking, with evidence of creative ability and competence in professional-level problem solving. Critically use lab skills and techniques and analysis of data and results to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.

- **B**  
  Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use 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 effectively 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 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. With guidance, demonstrates limited skills in designing, producing and evaluating solutions for specific food purposes. Use lab skills and techniques and analysis of data and results ineffectively, leading generally to inappropriate and usually erroneous conclusions.
**BIOL4209**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr M F Wang, Biological Sciences (mfwang@hku.hk)

**Course Objectives**

To provide a fundamental understanding of the rapidly emerging functional food/nutraceutical industry with an emphasis on the history, regulation, chemical basis and quality control of healthy ingredients/products and their effects on human health.

**Course Contents & Topics**

Concept, history and global regulation of functional foods and nutraceuticals; classification of functional foods and nutraceuticals based on their chemical structures; unsaturated fatty acids, proteins, food pigments and dietary fibers as healthy food ingredients; health benefits of dietary phenolics, terpenes, phytosterols and sulphur-containing compounds; probiotics and prebiotics; small berries, spices, teas and herbs for health; quality control and assurance of functional foods and nutraceuticals.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1: understand the definition and global regulation of functional foods and nutraceuticals
- CLO 2: have substantial chemical knowledge of functional food and nutraceutical products
- CLO 3: be able to describe examples of functional foods and interpret critically their claimed health benefits
- CLO 4: demonstrate understanding of the current functional food and nutraceutical industry
- CLO 5: understand major techniques and technologies for quality control and manufacturing of healthy products

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BIOL3201 or BIOL3202

**Offer in 2016 - 2017** 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 knowledge to draw appropriate and insightful conclusions to real-world problems. Demonstrate highly effective team-based organizational and presentational skills.
- B: Demonstrate substantial grasp of the subject matter covered. Show evidence of analytical and critical abilities and logical thinking with some evidence of competence in professional-level problem solving. Use knowledge to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.
- C: Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking with limited competence in professional-level problem solving. Use knowledge to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentational skills.
- D: Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, but lacking competence in professional-level problem solving. Use knowledge to draw sometimes appropriate but often erroneous conclusions to real-world problems. Demonstrate team-based organizational and presentational skills of limited effectiveness.
- 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 knowledge 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**

<table>
<thead>
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<tr>
<td>Examination</td>
<td>80</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>20</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**

This course will be offered subject to a minimum enrollment number and availability of teachers.

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**BIOL4210**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr M F Wang, Biological Sciences (mfwang@hku.hk)

**Teachers Involved** Dr M F Wang, Biological Sciences

**Course Objectives**

To introduce the key concepts and techniques used in food product development. To provide small group experience in the design, development and production of a new food product.

**Course Contents & Topics**

History and future of the food industry; industrial product development process; idea generation and prototype development for new food products; quality management and legal protection; marketing strategies; food labeling; food package design; new product development for different food industries.

On successful completion of this course, students should be able to:

- 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.
- 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.
- 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.
- 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 knowledge ineffectively, leading generally to inappropriate and usually erroneous conclusions to real-world problems. Demonstrate ineffectiveness team-based organizational and presentational skills.
Course Learning Outcomes

| 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 2016 - 2017

Offer in 2017 - 2018 : 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 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 occasionally 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>

Course Type

Laboratory and workshop course

Course Learning & Teaching 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></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>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.

BIOL4301 Fish and fisheries (6 credits)

Offering Department Biological Sciences

Biological Sciences

Quota 40

Course Co-ordinator Prof Y J Sadovy, Biological Sciences (yjsadovy@hku.hk)

Teachers Involved Prof Y J Sadovy, Biological Sciences

Course Objectives

- to acquaint students with the principles governing interrelationships among fishes as well as with biotic and abiotic aspects of their environment for an understanding of population dynamics and multispecies interactions.
- to provide an understanding of how species diversity and selected aspects of their life history are relevant to fishery management challenges, sustainable supply of seafood, and the conservation of threatened species.
- to cover the theoretical and practical aspects of marine fisheries management, fish farming and fish conservation using local, regional and global examples.

Course Contents & Topics

Introduction to course: phylogenetic, biological and ecological concepts and adaptation. Multispecies interactions in marine and freshwater fish assemblages. Fishery theory; how do fisheries work? Status of the world’s capture fisheries; fish stock assessment and fishery management practices using local, regional and global examples. The roles of mariculture and capture fisheries for seafood supply and relationship to capture fisheries. Fishery management and fish conservation. Conclusion: fish biodiversity and fishery production; ethics of fish research and exploitation; climate change and the future of fish and fisheries.

Course Learning Outcomes

On successful completion of this course, students should be able to:

| CLO 1 | understand the basis of fish species diversity in relation to phylogenetic, ecological and biological factors |
| CLO 2 | appreciate the direct and indirect impacts and consequences of human activities on fish species and species assemblages and implications for seafood security |
| CLO 3 | understand the functioning of fisheries and standards of fisheries assessment, development and management |
| CLO 4 | appreciate the mutual dependency of humans with fished populations in relation to their long-term sustainability |
| CLO 5 | enhance the ability for critical and synthetic thinking |

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in BIOL3301 or BIOL3303

Offer in 2016 - 2017

Y 2nd sem

Offer in 2017 - 2018 : Y

Examination May

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 course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, ability to integrate</td>
</tr>
</tbody>
</table>
BIOL4302  Environmental impact assessment (6 credits)  Academic Year 2016

Offering Department Biological Sciences  Quota 30
Course Co-ordinator Dr B D Russell, Biological Sciences (brussell@hku.hk)  Prof K M Y Leung, Biological Sciences  Dr C H Hau, Biological Sciences
Teachers Involved Dr B D Russell, Biological Sciences  Prof K M Y Leung, Biological Sciences

Course Objectives
To introduce the general principles, processes, techniques, current practices and problems of environmental impact assessment (EIA).

Course Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1  understand the operation of EIA systems in Hong Kong and overseas
- CLO 2  apply a variety of techniques in assessing environmental impact
- CLO 3  evaluate different options and determine acceptability in environmental impact assessment
- CLO 4  prepare EIA reports for small scale projects

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in (BIOL2103 or BIOL2306); and (ENVS3004 or any BIOL3XXX course)

Offer in 2016 - 2017  Y

Grade Descriptors (A+ to F)
A  Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, ability to integrate and synthesize information, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective presentational skills. Strong evidence of clear attention to thoughtful and reflective thinking.

B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, integration of materials and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate effective presentational skills. Evidence of clear attention to thoughtful and reflective thinking.

C  Demonstrate general but incomplete command of knowledge and skills required for attaining 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 presentational skills. Little evidence of clear attention to thoughtful and reflective thinking.

D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities and little attempt at integration. Show limited ability to apply knowledge to solve problems. Apply limited effectiveness in presentational skills. Lack of attention to thoughtful and reflective thinking.

Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods and Weighting
Methods
- Assignments
- Examination
- Test

Assessment Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
- 30  CLO 1,2,3,4,5
- 60  CLO 1,2,3,4,5
- 10  CLO 3

Compulsory Reading
- H. G. Helfman, B. Collette and D. Facey: The Diversity of Fishes (Blackwell Science, 1997)

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.
**BIOL4303 Animal behaviour (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr L Karczmarski, Biological Sciences (leszek@hku.hk)

**Teachers Involved** Dr L Karczmarski, Biological Sciences

**Offer in 2016 - 2017**

- Pass in BIOL3306; and
- Pass in one of the following courses: BIOL3301, BIOL3313, BIOL3319, BIOL3320 or BIOL3419

**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 development 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 BIOL3306; and
- Pass in one of the following courses: BIOL3301, BIOL3313, BIOL3319, BIOL3320 or BIOL3419

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Examination</td>
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<tr>
<td>B</td>
<td>Examination</td>
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<tr>
<td>C</td>
<td>Examination</td>
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<tr>
<td>D</td>
<td>Examination</td>
</tr>
<tr>
<td>Fail</td>
<td>Examination</td>
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</table>

**Course Type** Lecture with laboratory component course

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td></td>
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<tr>
<td>Project work</td>
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<tr>
<td>Reading / Self study</td>
<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>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>active participation/continuous assessment/presentation</td>
<td>55</td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Examination</td>
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<td>45</td>
<td>CLO 1,2,3,4,5</td>
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</table>

**School of Biological Sciences**

Ecosystem functioning and services (6 credits)

**Offering Department:** Biological Sciences  
**Quota:** 30

**Course Co-ordinator:** Dr B D Russell, Biological Sciences  
**Teachers Involved:** Dr B D Russell, Biological Sciences

**Course Objectives:**
This course will introduce the functioning of terrestrial, fresh water and marine ecosystems and the services which they provide human populations. The concept of ecosystem services will be further expanded into "value", including financial, cultural, social and, importantly, the intrinsic value that may be priceless. We will also explore how human activities degrade these ecosystem services and how protecting ecosystems and biodiversity can increase the ecosystem services supplied to humans.

**Course Contents & Topics:**
Natural ecosystems provide trillions of dollars' worth of ecosystem services to humans every year. Many of these services go unrecognized and undervalued. In fact, because humans rely on ecosystems many of these services may be priceless. This course will first cover the function of different ecosystems from terrestrial, fresh water and marine environments. Students will then be introduced to the concept of ecosystem services and what they provide to human populations. Finally, human activities which degrade ecosystems and reduce the extent that ecosystems can provide these services, and what that means for human populations, will be covered.

**Pre-requisites (and Co-requisites and Impermissible combinations):**
Pass in two of the following courses: BIOL3301, BIOL3303, BIOL3313 or BIOL3319

**Offer in 2016 - 2017:**
Y 1st sem  Offer in 2017 - 2018 : Y  
**Examination:** Dec

**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.

- **Fail:** No evidence of basic a minimum grasp of the subject and the minimum relevant research techniques. No evidence of background reading and no familiarity with any relevant examples and case studies. Inadequate evidence of coherent logical thought. Ineffective presentation skills with poor argumentation and no abilities to draw meaningful conclusions. Work fails to reach degree level.

**Course Type:** Lecture-based course

**Course Teaching & Learning Activities:**
- **Activities:** Details  
  - Lectures: 36  
  - Tutorials: 12  
  - Reading / Self study: 70

**Assessment Methods and Weighting:**
- **Methods:** Details  
  - Assignments: 40  
  - Examination: 40  
  - Presentation: 20  
  - Weighting in final course grade (%):  
  - Assessment Methods to CLO Mapping: CLO 1,2,3,4,5

**Required/recommended reading and online materials:**
Students will be directed to relevant scientific literature and websites

**Additional Course Information:**
This course will be offered subject to a minimum enrollment number and availability of teachers.
Course Contents & Topics

Basic parameters affecting antigen-antibody interactions
Application of antigen-antibody interaction in advanced research: CHIP assay, co-immunoprecipitation, immunohistochemistry and dual Immunofluorescence
Principles and application of flow cytometry
Techniques in cellular immunology and tumor immunology

Microbial pathogens and associated diseases, host immune response, antimicrobial agents and multidrug resistance, epidemiology and prevention of microbial infections
Clinical laboratory analyses in serology, haematology, blood banking, microbiology and chemical pathology

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 or BIOL3403

Offer in 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : 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 lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.  
B Demonstrate substantial command of a broad range of knowledge required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete command of knowledge required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited command of knowledge required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

Activity Details No. of Hours
Lectures 24
Laboratory 20
Tutorials 6
Reading / Self study

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
To be announced in class

Course Website
http://moodle.hku.hk/

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4402 Microbial biotechnology (6 credits) Academic Year 2016

Offering Department Biological Sciences Quota 30
Course Co-ordinator ---, Biological Sciences ()

Course Objectives
This course is intended for students who would like to understand the application of modern microbiology in biotechnology. The microbial systems being used include different types of viruses, bacteria, fungi and algae. At the end of the course the students are expected to know the parameters and conditions that affect the yield of production and the systems available for the expression of various types of biotechnology products.

Course Contents & Topics
Upstream and downstream processing will be briefly described to equip the students with the background for microbial biotechnology. The latest advances in microbial expression systems using viruses, bacteria, yeasts and algae will be reviewed. Specific examples on the use of these systems will be provided. These include but not limited to production of recombinant vaccines, secondary metabolites, food and food additives, industrial enzymes and biocatalysts as well as bioremediation and medical diagnostics.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 explain the fundamental biochemical concepts underlying the industrial production of selected microbial biotechnology products
CLO 2 understand the importance of the current recombinant technology for large-scale manufacturing of various protein products
CLO 3 describe the major expression systems, understand their purposes, advantages, and disadvantages
CLO 4 deliver a professional group presentation on a self-decided topic related to microbial biotechnology

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIOL3401
<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Offer in 2017 - 2018</th>
<th>Examination</th>
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<tbody>
<tr>
<td>N</td>
<td>N</td>
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</table>

**Grade Descriptors (A+ to F)**

- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Demonstrate deep understanding of the subject. Demonstrate integration of the full range of appropriate theories, principles, evidence and techniques. Illustrate insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly. 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. Demonstrate substantial grasp of the subject. Demonstrate general integration of theories, principles, evidence and techniques. Illustrate critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly. Apply effective organizational and presentational skills.
- **C** Demonstrate general but incomplete knowledge and skills required for attaining most of the course learning outcomes. Demonstrate partial integration of theories, principles, evidence and techniques. Illustrate use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly. Apply moderately effective organizational and presentational skills.
- **D** Demonstrate limited knowledge and skills required for attaining some of the course learning outcomes. Demonstrate partial but incomplete grasp, with retention of some relevant information, of the subject. Show limited integration of theories, principles, evidence and techniques. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Apply limited or barely effective organizational and presentational skills.
- **Fail** Demonstrate little or no 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. Show little or no inapt integration of theories, principles, evidence and techniques. Show limited use of secondary sources and no critical comparison of them. Organization and presentational skills are minimally effective or ineffective.

**Course Type**

Lecture-based course

**Offering Department**

Biological Sciences

**Course Co-ordinator**

Dr W B L Lim, Biological Sciences (bllim@hku.hk)

**Teachers Involved**

Dr W B L Lim, Biological Sciences

**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 virology, medicine and biotechnology.

**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: Parvoviruses
14. Mechanisms of Viral Oncogenesis
15. Anti-viral treatments
16. Viruses as Tools in Medicine and Biotechnology

**Practical Virology**

19. Specimen Collection, Transportation and Processing, Quality Assurance & Laboratory Safety
20. Virus isolation, propagation and titration
21, 22. Virus Identification: Immunocytological assays, ELISA, Complement Fixation Assay, Hemagglutination and HI assays
23, 24. Neutralization assay and Antiviral assay

**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

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Offer in 2017 - 2018</th>
<th>Examination</th>
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</thead>
<tbody>
<tr>
<td>Y</td>
<td>Y</td>
<td>Dec</td>
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</tbody>
</table>

**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.
School of Biological Sciences

BIOL4411 Plant and food biotechnology (6 credits) Academic Year 2016

Offering Department: Biological Sciences
Quota: 80

Course Co-ordinator: Dr J S H Tsang, Biological Sciences (jshtsang@hku.hk)

Course Objectives:
This course covers the principles and key concepts of plant and food biotechnology and its applications in increasing global food supply. The significances of biotechnology in agriculture and food production, and the emerging importance of plant biotechnology in molecular farming for the production of biopharmaceuticals and other high-value proteins will be discussed. The course will also provide an insight on the real-life applications of plant and food biotechnology.

Course Contents & Topics:
- Genetic improvements in agriculture.
- Transgenic crops in global food production.
- Tools in plant genetic engineering: promoters and marker genes.
- Techniques in plant gene transfer: Agrobacterium-mediated transformation, biolistics and microinjection.
- Nuclear and plastid transformation.
- Gene silencing in plants. Genetic manipulation of commercially useful biosynthetic pathways in crops.
- Biotechnology in plant pest and disease management:
  - Producing crops resistant to phytopathogens and pests.
  - Herbicide-resistant RNAs in gene silencing to defend against plant viruses.
  - Developing crops with resistance to pests and diseases.
- Biotechnology in biopharmaceuticals:
  - Producing proteins for human and animal health.
  - Genetically-engineered biofortified foods: provitamin A-enriched rice, omega-3-enriched soy and high-anthocyanin tomatoes.
- Gene silencing in plants. Genetic manipulation of commercially useful biosynthetic pathways in crops.
- Nuclear and plastid transformation.
- Techniques in plant gene transfer: Agrobacterium-mediated transformation, biolistics and microinjection.
- Tools in plant genetic engineering: promoters and marker genes.
- Transgenic crops in global food production.
- Improvements in agriculture.

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 2016 - 2017:
Y 1st sem

Grade Descriptors (A+ to F):
A Demonstrate thorough and complete mastery of extensive knowledge and skills required for attaining the learning outcomes in Plant and Food Biotechnology. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations in plant biotechnology. Apply highly effective organizational and presentational skills.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes in plant biotechnology. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show some evidence of 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.
F Fail to demonstrate command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. No evidence in ability to apply knowledge in plant biotechnology. Ineffective organizational and presentational skills.

Course Type: Lecture with laboratory component course

Activities Details No. of Hours
Lectures 24
Laboratory 24
Tutorials 6
Reading / Self study 100

Assessment Methods and Weighting:
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 80 CLO 1,2,3
Laboratory reports 20 CLO 1,2,3

Additional Course Information:
This course will be offered subject to a minimum enrollment number and availability of teachers.

http://moodle.hku.hk/
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>tutorials/assignments/computer sessions</td>
<td>6</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>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1.2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>10</td>
<td>CLO 1.2,3</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>20</td>
<td>CLO 1.2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
- E-reserves (HKU Library)
- Lecture notes on Moodle
- Core in Molecular Biology & Biotechnology Major
- An advanced elective course in FNS Major
- An advanced elective course in Plant Science Minor

Course Website
http://moodle.hku.hk/

Additional Course Information
- Suggested readings for each topic will be provided.
- Human Molecular Genetics (Strachan and Read, Garland Science, 2010)
- 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.
- Moodle

BIOL4415 Healthcare biotechnology (6 credits)

Offering Department
Biological Sciences

Quota
70

Course Co-ordinator
Prof A S T Wong, Biological Sciences

Teachers Involved
Prof A S T Wong, Biological Sciences
Dr K W Y Yuen, 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:

1. CLO 1: describe key concepts in genetic biotechnology and human health
2. CLO 2: acquire and apply advanced laboratory techniques essential to biotechnology
3. CLO 3: develop scientific inquiry and critical thinking skills to understand, analyze, and evaluate problems in order to develop solutions
4. CLO 4: gain insight into real-world applications in healthcare biotechnology

Pre-requisites
Pass in BIOL3401

Offer in 2016 - 2017
Y 2nd sem
Offer in 2017 - 2018: 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 organizational skills. Writings 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 organizational skills. Writings mostly 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 analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational skills. Writings mostly indicate informed, intellectual engagement with concepts or theories but not always with sufficient depth, breadth or understanding.</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. Writings indicate some intellectual engagement with concepts or theories but mostly at a superficial level.</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. Writings reveal an absence of intellectual engagement with concepts or theories. Writings are irrelevant or superficial.</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>Assignment/Discussion</td>
<td>10</td>
<td>CLO 1.3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1.3,4</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>10</td>
<td>CLO 1.3</td>
</tr>
</tbody>
</table>

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/
### BIOL4416

**Offering Department**
Biological Sciences

**Course Co-ordinator**
Dr K W Y Yuen, Biological Sciences (kwyyuen@hku.hk)

**Teachers Involved**
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:

1. **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

2. **Aging and longevity:**
   - model systems used for aging and life-span studies
   - cellular and molecular biology of aging
   - telomeres and cellular senescence
   - genomic stability, DNA mutations and repair
   - mitochondrial defects and oxidative stress
   - genetic aging diseases
   - genetic, biochemical and metabolic pathways involved in longevity

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- **CLO 1:** appreciate the complex regulations of cell potency, cell age and organism longevity
- **CLO 2:** describe the characteristics of stem cells and the different types of stem cells
- **CLO 3:** describe applications of stem cell research, and understand ethical concerns involved
- **CLO 4:** describe the cellular mechanisms of aging, and the pathways involved in longevity

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in BIOC3601 or BIOC3604 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408

**Offer in 2016 - 2017**
Y 2nd sem

**Grade Descriptors (A+ to F)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Demonstrate thorough and complete mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td><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. 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><strong>C</strong></td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to some familiar situations. Apply moderately effective organizational and presentational skills.</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. 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><strong>F</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 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>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/discussion</td>
<td>10 CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60 CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>20 CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>10 CLO 1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>

**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**
This course will be offered subject to a minimum enrollment number and availability of teachers.

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### BIOL4417

**Offering Department**
Biological Sciences

**Course Co-ordinator**
Dr J W Zhang, Biological Sciences (jzhang1@hku.hk)

**Course Objectives**
Recent progress in high-throughput omics technology has revolutionized the biological research. Genome-wide profiling of various biomolecules simultaneously by omics technology generates huge amounts of data, providing the potential to obtain a global and holistic view of the system. This course aims to introduce the technologies of Omics and Systems Biology, and overview of various applications of omics technology in agricultural, biomedical,
Course Contents & Topics

The course covers various OMICS techniques with special focus on sequence alignment, next generation sequencing, computational modeling, and statistical programming. This course will also provide students hands-on experience in large scale data analysis, and high-throughput methodologies involved in:

- Genomics - the study of all genes or DNA sequences in a genome
- Transcriptomics - the study of all mRNA transcripts
- Proteomics - the study of all proteins
- Interactomes - the study of all genetic or physical interactions among genes or proteins
- Systems biology and functional genomics - the study of the interactome/network between components of a biological system, and modeling to discover the integrated function and emergent properties of that system
- Metagenomics - all genetic materials found in an environment
- Metabolomics - metabolites & intermediates involved in a biological reaction.

Course Learning Outcomes

On successful completion of this course, students should be able to:

**CLO 1** explain the conceptual differences between 'Omics'/Systems Biology studies and traditional one-gene approach, and discuss the pros and cons of both approaches

**CLO 2** describe common methodologies used in major 'Omics' studies

**CLO 3** describe basic analytical methods, and access database resources generated in major 'Omics' studies

**CLO 4** describe how 'Omics' data are used in Systems Biology to understand the integrated functions of the system

**CLO 5** identify questions that can be addressed by 'Omics' and System Biology studies, appreciate and describe applications in 'Omics' studies

Pre-requisites (and Co-requisites and Weighting)

Pass in BIOC3601 or BIOC3604 or BIOL3211 or BIOL3401 or BIOL3402 or BIOL3403 or BIOL3404 or BIOL3408

Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>Offer 2017 - 2018</th>
<th>Examination</th>
<th>May</th>
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<tbody>
<tr>
<td>Y</td>
<td>2nd sem</td>
<td>Offer in 2017 - 2018</td>
<td>Y</td>
<td></td>
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</table>

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, 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 some 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.

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>
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Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>40</td>
<td>CLO 2,3,4,5</td>
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<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
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</tbody>
</table>

Required/recommended reading and online materials

TBA

Course Website

http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4451

Cetacean behaviour, ecology and conservation: field research experience (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr. L. Karczmarski, Biological Sciences (<a href="mailto:leszek@hku.hk">leszek@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr. L. Karczmarski, Biological Sciences</td>
</tr>
</tbody>
</table>

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 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, BIOL3201, 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 2016 - 2017 Grade Descriptors (A+ to F)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
<th>No of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail</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 comparative perspective to draw insightful and logical conclusions. Show outstanding abilities of independent work, effective presentation skills with excellent analytical argumentation. Excellent or outstanding work relative to what is required at degree level.</td>
<td>12</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>
</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 adequate 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 sufficiently for what is required for degree level.</td>
<td>100</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>12</td>
</tr>
<tr>
<td>A</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></td>
</tr>
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</table>

**Course Type**

Field camps

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>lectures and tutorials</td>
<td>12</td>
</tr>
<tr>
<td>Field work</td>
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<td>80</td>
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<tr>
<td>Presentation</td>
<td>interactive debates</td>
<td>10</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Assessment</td>
<td>group projects</td>
<td>12</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>35</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Report</td>
<td>project report (35%), group investigation &amp; presentation (30%)</td>
<td>65</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
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**Required/recommended reading and online materials**


**Course Website**

http://www.biosch.hku.hk/ecology/lsc/

**Additional Course Information**

**Enrollment Procedure:**

The course is open to enrollment only during the add/drop period of the 2nd semester. Students are required to submit a brief (maximum 1-page) application letter (PDF file) via e-mail to the Course Coordinator (leszek@hku.hk) not later than 10th January. The application shall include the following:

1. Personal and academic details
2. ID photograph
3. Brief description of academic interests
4. GPA
5. Pre-requisite courses taken and grades received (if pre-requisites are not met, a reasoned request for waiver)

All applications will be reviewed prior to the commencement of the 2nd semester and results will be announced within the 1st week of the add/drop period of the 2nd semester.

**BIOL4501 Molecular phylogeny and evolution (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
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<tbody>
<tr>
<td>Quota</td>
<td>25</td>
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</table>

**Course Co-ordinator**

TBC, Biological Sciences

**Teachers Involved**

TBC, Biological Sciences

**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**

School of Biological Sciences

Course Learning Outcomes

On successful completion of this course, students should be able to:
- CLO 1 understand the fundamental principles of molecular phylogenetics
- CLO 2 understand the purposes each method is used for and be able to choose the most appropriate method(s) for the analysis of given data
- CLO 3 understand the advantages and disadvantages of the methods
- CLO 4 acquire practical skills for the analysis of molecular data

Pre-requisites

Pass in BIOL3401 or BIOL3408

Offer in 2016 - 2017

Grade Descriptors (A+ to F)

Grade Descriptors

N Offer in 2017 - 2018 : N
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. Basic 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 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 poor understanding of the subject. Show some ability to combine and to apply theories, principles and methods taught in the course. Basic skills in possession and application of the methods and software for molecular evolutionary analysis of real data. Show general ability to collect, systematize, analyze and evaluate data from various sources and to quote them appropriately. Basic presentational skills.

D Demonstrate incomplete knowledge and weak skills sufficient for accomplishing only some of the goals and expected learning outcomes of the course. Demonstrate poor understanding of the subject. Show poor ability to combine and to apply theories, principles, and methods taught in the course. Limited skills in possession and application of the methods and software for molecular evolutionary analysis of real data. Show poor ability to collect data from various sources, to systematize, analyze and evaluate them appropriately. Poor presentational skills.

Fail Demonstrate poor or no knowledge and skills required for accomplishing the goals and expected learning outcomes of the course. Demonstrate very poor or no understanding of the subject. Show no ability to combine and/or to apply theories, principles, and methods taught in the course. Poor or no skills in possession and application of the methods and software for molecular evolutionary analysis of real data. Show very poor or no ability to collect data from other sources and to systematize, analyze and evaluate them appropriately. Very poor or no presentational skills.

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
- Assignments 40 CLO 2,3,4
- Examination 60 CLO 1,2,3

Required/recommended reading and online materials


Course Website

http://moodle.hku.hk/

Additional Course Information

This course will be offered subject to a minimum enrollment number and availability of teachers.

BIOL4861 Ecology & biodiversity internship (6 credits)

Academic Year 2016

Quota ---

Offering Department Biological Sciences

Course Co-ordinator Dr T Vengatesen, Biological Sciences (rajan@hku.hk)

Teachers Involved All academic staff in Ecology & Biodiversity Major, 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.

Course Learning Outcomes

On successful completion of this course, students should be able to:
- CLO 1 gain first hand work experience in a job placement related to their Ecology & Biodiversity Major
- CLO 2 apply the knowledge in their Ecology & Biodiversity Major in solving practical problems in the work place
- CLO 3 acquire an understanding and appreciation of the real work environment
- CLO 4 extend their network in their field of study

Pre-requisites (and Co-requisites and Impermissible combinations)

This course is for Ecology & Biodiversity Major students only.

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

Offer in 2016 - 2017

Grade Descriptors (Pass/Fail)

Pass Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc.

Fail Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.

Course Type Internship

Course Teaching & Learning Activities

Activities Details No. of Hours
- Internship work at least 160 hours 160

Methods Details

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Introduction

This course will be offered subject to a minimum enrollment number and availability of teachers. It will be a project-based course, allowing students 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 students.

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

Methods

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Written report, supervisor's feedback and oral presentation 100 CLO 1,2,3,4

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

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 including BIOL3303. 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.

Offer in 2016 - 2017

Y 2nd sem Offer in 2017 - 2018 : 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 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 moderate effective presentational skills and understanding of the practical challenges of effective conservation initiatives. Little 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, 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 consideration of the wider issues of biodiversity conservation for Society.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, ability to apply knowledge to most familiar situations and of relevance of biodiversity conservation for Society. Apply moderately effective presentational skills and understanding of the practical challenges of effective conservation initiatives. Little evidence of clear attention to thoughtful and reflective thinking.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities and little attempt at integration. Have basic understanding of importance of biodiversity conservation for Society. Apply limited ability to apply knowledge to solve problems or consider the practical challenges of biodiversity conservation. Apply limited effectiveness in presentational skills. Lack of attention to thoughtful and reflective thinking.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking or attention to detail. Show very little or no ability to apply knowledge or practical thinking to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type

Project-based course

Course Teaching & Learning Activities

Activities Details No. of Hours

Reading / Self study supervised practical work of at least 80 hours followed by written & oral reports. Tutorials provided by course coordinator 120

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Oral presentation project report 40 CLO 1,2,3,4

Written report project report 60 CLO 1,2,3,4,5
BIOL4921

**Outing Department**
Biological Sciences

**Course Co-ordinator**
Dr L Karczmarzki, Biological Sciences (leszek@hku.hk)

**Teachers Involved**
Dr L Karczmarzki, Biological Sciences

**Course Title**
Animal behaviour and behavioural ecology: field course (6 credits)

**Course Learning Outcomes**
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 researching and conceptual basis of studying animal behaviour and ecological analysis. This course is offered 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 research techniques, and (iii) hands-on experience in application of research techniques and methods. 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 of the scientific basis for the subject matter covered. Students will show evidence of competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates appropriate and insightful conclusions to real-world problems. Demonstrate moderately effective team-based organizational and presentational skills.

**Grade Descriptors**

- **A**
  - Demonstrate highly effective team-based organizational and presentational skills.
  - Undergraduate students demonstrate superior completion of the coursework assessments, achieving high marks in all aspects of the course.
  - Students show evidence of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates moderate effective team-based organizational and presentational skills.

- **B**
  - Demonstrate effective team-based organizational and presentational skills.
  - Undergraduate students demonstrate effective completion of the coursework assessments, achieving high marks in all aspects of the course.
  - Students show evidence of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates moderate effective team-based organizational and presentational skills.

- **C**
  - Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates moderate effective team-based organizational and presentational skills.

- **D**
  - Demonstrate ineffectiveness team-based organizational and presentational skills.
  - Undergraduate students demonstrate ineffective completion of the coursework assessments, achieving low marks in all aspects of the course.
  - Students show evidence of coherent and logical thinking, and minimal competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates moderate 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 lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates moderate effective team-based organizational and presentational skills.

**Course Requirements**

- **Prerequisites**
  - Pass in BIOL3XXX or BIOL4XXX
  - Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX)

- **Quota**
  - 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 2016 - 2017**
  - Summer
  - Offer in 2017 - 2018: Y
  - Examination: No Exam

**Course Website**
http://moodie.hku.hk/

**Additional Course Information**
This course will be offered subject to a minimum enrollment number and availability of teachers.

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**BIOL4921**

**Outing Department**
Biological Sciences

**Course Co-ordinator**
Prof N P Shah, Biological Sciences (npshah@hku.hk)

**Teachers Involved**
Prof N P Shah, Biological Sciences

**Course Title**
Sensory evaluation of food (6 credits)

**Course Learning Outcomes**
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.

**Grade Descriptors**

- **A**
  - Understand the psychophysiological basis for 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.
  - 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**
  - Understand the major techniques used in sensory testing. 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.
  - Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates moderate effective team-based organizational and presentational skills.

- **C**
  - Understand the major techniques used in sensory testing. 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.
  - Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates moderate effective team-based organizational and presentational skills.

- **D**
  - Interpret sensory evaluation reports, and to design and conduct sensory evaluation projects using appropriately chosen methods.
  - Understand the major techniques used in sensory testing. 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.
  - Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates moderate effective team-based organizational and presentational skills.

- **Fail**
  - Interpret sensory evaluation reports, and to design and conduct sensory evaluation projects using appropriately chosen methods.
  - Understand the major techniques used in sensory testing. 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.
  - Use lab skills and techniques and analysis of data and results to draw moderately appropriate but sometimes erroneous conclusions to real-world problems. Demonstrates moderate effective team-based organizational and presentational skills.

**Course Requirements**

- **Prerequisites**
  - Pass in BIOL3201; and
  - Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX)

- **Quota**
  - 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 2016 - 2017**
  - Summer
  - Offer in 2017 - 2018: Y
  - Examination: No Exam

**Course Website**
http://moodie.hku.hk/

**Additional Course Information**
This course will be offered subject to a minimum enrollment number and availability of teachers.
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 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 BIOL3101; and
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Ecology & Biodiversity Major.
This capstone course is for Ecology & Biodiversity Major Students only.

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

Offer in 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : N Examination No Exam

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.

Fail No evidence of basic a minimum grasp of the subject and the minimum relevant research techniques. No evidence of background reading and no familiarity with any relevant examples and case studies. Inadequate evidence of coherent logical thought; ineffective presentation skills with poor argumentation and no abilities to draw meaningful conclusions. Work fails to reach degree level.

Course Type
Field camps

Course Teaching & Learning Activities

Activities | Details | No. of Hours
--- | --- | ---
Lectures | lectures and tutorials | 10
Field work | 72
Presentation | interactive debates | 100
Reading / Self study | group project | 15

Assessment Methods and Weighting

Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Assignments | | 35 | CLO 1,2,3,4
Report | project report (35%), group investigation & presentation (30%) | 65 | CLO 1,2,3,4

Required/recommended reading and online materials
Required/recommended reading and online materials (at most 400 characters)

Course Website
http://www.biosch.hku.hk/ecology/lsc/

Additional Course Information

Enrollment Procedure:
The course is open to enrollment only during the add/drop period of the 2nd semester. Students are required to submit a brief (maximum 1-page) application letter (PDF file) via e-mail to the Course Coordinator (leszek@hku.hk) not later than 10th January. The application shall include the following:
1. Personal and academic details
2. ID photograph
3. Brief description of academic interests
4. GPA
5. Pre-requisite courses taken and grades received (if pre-requisites are not met, a reasoned request for waiver).
All applications will be reviewed prior to the commencement of the 2nd semester and results will be announced within the 1st week of the add/drop period of the 2nd semester.

BIOL4922 Food product development and evaluation (6 credits)

Academic Year | 2016
Offering Department | Biological Sciences
Course Co-ordinator | Dr M F Wang, Biological Sciences (mfwang@hku.hk)
Teachers Involved | Dr M F Wang, Biological Sciences

Course Objectives
To introduce the key concepts and techniques used in food product development. To provide small group experience in the design, development and production of a new food product.

Course Contents & Topics
History and future of the food industry; industrial product development process; idea generation and prototype development for new food products; quality management and legal protection; marketing strategies; food labeling; food package design; new product development for different food industries.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand the food product development cycle

School of Biological Sciences
School of Biological Sciences

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; 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.
Not for students who have passed in BIOL4210 Food product development.

Offer in 2016 - 2017
Y 1st sem Offer in 2017 - 2018 : Y Examination Dec

Course Type Laboratory and workshop course
Course Teaching & Learning Activities
Activities Details No. of Hours
Laboratory 48
Group work 80-100 hours group project work
Tutorials 100 6 lectures + 6 tutorials
Reading / Self study 12

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Assessments assessment of group product development project including food product presentation 100 CLO 1,2,3,4,5

Required/recommended reading and online materials

Course Website http://moodle.hku.hk/

Additional Course Information
This course will be offered subject to a minimum enrolment number and availability of teachers.

BIOL4962 Food & nutritional science internship (6 credits)

Offering Department Biological Sciences
Academic Year 2016
Quota ---

Course Co-ordinator Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)

Teachers Involved All academic staff in Food & Nutritional Science Major, Biological Sciences

Course Objectives To provide a stimulating experience for all Food & Nutritional Science Major undergraduates to integrate and apply their knowledge and skills obtained from the Food & Nutritional Science Major through gaining work experience in the field of Food & Nutritional Science that are related to the major of study.

Course Contents & 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 2016 - 2017
Y 1st sem 2nd sem Summer Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors
A 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 among and with peers, clients, and others. 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"
B Demonstrate general but incomplete grasp of the subject matter covered. Show some evidence of analytical and critical abilities and logical thinking, with some evidence of coherence and logical thinking, but lacking competence in professional-level problem solving. Use lab skills and techniques and analysis of data and results to draw generally appropriate conclusions to real-world problems. Demonstrate effective team-based organizational and presentational skills.
C Demonstrate partial but limited grasp, with retention of some relevant information, of the subject matter covered. Show some evidence of coherence 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.
D 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 coherence and logical thinking, and minimal or no 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.

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments assessment of group project delivery including food product presentation 100 CLO 1,2,3,4,5

Examination

Examination

Dec
School of Biological Sciences

### BIOL4964 Biological sciences internship (6 credits)

**Offering Department**
Biological Sciences

**Course Co-ordinator**
Prof W W M Lee, Biological Sciences (hrszwlwm@hku.hk)

**Teachers Involved**
All academic staff in Biological Sciences Major, 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 workplace
- CLO 3 acquire an understanding and appreciation of the real work environment
- CLO 4 extend their network in their field of study

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Molecular Biology & Biotechnology Major.

**Offer in 2016 - 2017**
Y 1st sem 2nd sem Summer Offer in 2017 - 2018 : Y

**Grade Descriptors (Pass/Fail)**
Pass
- Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job 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**
Internship work at least 160 hours (lunch hour excluded) in at least 20 working days

**Assessment Methods and Weighting**
- Written report written report, supervisor's feedback and oral presentation 100 CLO 1,2,3,4

**Course Website**
http://moodle.hku.hk

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### BIOL4963 Molecular biology & biotechnology internship (6 credits)

**Offering Department**
Biological Sciences

**Course Co-ordinator**
Dr W K Yip, Biological Sciences (wkyip@hku.hk)

**Teachers Involved**
All academic staff in Molecular Biology & Biotechnology Major, Biological Sciences

**Course Objectives**
To provide a stimulating experience for all Molecular Biology & Biotechnology Major undergraduates to integrate and apply their knowledge and skills obtained from the Molecular Biology & Biotechnology Major through gaining work experience in the field of Molecular Biology & Biotechnology that are related to the major of study.

**Course Contents & Topics**
Students taking this course will work as an intern for at least 160 hours in at least 20 working days within the University or outside the University in a company, government department or NGO. The internship may be arranged by the School or obtained by students themselves. In the latter case, the internship must be in a relevant field to the Molecular Biology & Biotechnology Major that the students are taking and prior approval by the course coordinator is required.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1 gain first hand work experience in a job placement related to their Molecular Biology & Biotechnology Major
- CLO 2 apply the knowledge in their Molecular Biology & Biotechnology Major in solving practical problems in the workplace
- CLO 3 acquire an understanding and appreciation of the real work environment
- CLO 4 extend their network in their field of study

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Molecular Biology & Biotechnology Major.

**Offer in 2016 - 2017**
Y 1st sem 2nd sem Summer Offer in 2017 - 2018 : Y

**Grade Descriptors (Pass/Fail)**
Pass
- Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of "Distinction".

Fail
- Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.

**Course Type**
Internship

**Course Teaching & Learning Activities**
Internship work at least 160 hours (lunch hour excluded) in at least 20 working days

**Assessment Methods and Weighting**
- Written report written report, employer's feedback and oral presentation 100 CLO 1,2,3,4

**Course Website**
http://moodle.hku.hk

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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.

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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.

---

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.
field to the Biological Sciences major that the students are taking and prior approval by the course coordinator is required.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1 gain first hand work experience in a job placement related to their Biological Sciences Major
- CLO 2 apply the knowledge in their Biological Sciences Major in solving practical problems in the workplace
- CLO 3 acquire an understanding and appreciation of the real work environment
- CLO 4 extend their network in their field of study

**Pre-requisites**
Pass 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.

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (Pass/Fail)</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>No Exam</td>
<td></td>
</tr>
</tbody>
</table>

**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>at least 160 hours (lunch hour excluded) in at least 20 working days</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>Written report</td>
<td>written report, employer's feedback and oral presentation</td>
<td>100</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

**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)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>All academic staff in Ecology &amp; Biodiversity Major, Biological Sciences</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>To provide a stimulating capstone experience for Ecology &amp; Biodiversity Major undergraduates to integrate and apply their knowledge and skills obtained from the Ecology &amp; Biodiversity Major 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 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.</td>
</tr>
</tbody>
</table>

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1 critique and review appropriate scientific literature
- CLO 2 use this information to generate a scientifically relevant research question
- CLO 3 develop and formulate scientific hypotheses to test this question
- CLO 4 design and undertake practical research work to formally test the hypotheses proposed
- CLO 5 analyse and evaluate the data collected to test the hypotheses, present data in a professional manner to illustrate the outcomes
- CLO 6 draw an objective series of conclusions based on the experimental work
- CLO 7 highlight and discuss their research findings and place them into a holistic scientific context
- CLO 8 submit their context following a specified journal format, present their work as a scientific conference talk

**Pre-requisites**
Pass at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Ecology & Biodiversity Major; and Cumulative GPA of 3.0 or above.

Students are not permitted to take both BIOL3991 and BIOL4991. 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.

**Offer in 2016 - 2017**

<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>Examination</td>
<td>No Exam</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BIOL4992 Food & nutritional science project (12 credits) Academic Year 2016

Offering Department Biological Sciences

Course Co-ordinator Dr J C Y Lee, Biological Sciences (jettylee@hku.hk)

Offer in 2016 - 2017 Y Year long Offer in 2017 - 2018 : Y Examination No Exam

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; and Cumulative GPA of 3.0 or above. This capstone course is for Food & Nutritional Science Major students only. The earliest a student is allowed to take this capstone course is their year 3 study.

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 this information to generate a scientifically relevant research question
- CLO 3 develop and formulate scientific hypotheses to test this question
- CLO 4 design and undertake practical research work to formally test the hypotheses proposed
- CLO 5 analyse and evaluate the data collected to test the hypotheses, present data in a professional manner to illustrate the outcomes
- CLO 6 draw an objective series of conclusions based on the experimental work
- CLO 7 highlight and discuss their research findings and place them into a holistic scientific context
- CLO 8 submit their work following a specified journal format, present their work as a scientific conference talk

Course Type Project-based course

Assessment Methods & Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Course grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissertation</td>
<td>research seminar</td>
<td>80</td>
<td>CLO (1, 2, 3, 4, 5, 6, 7, 8)</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>measurement seminar</td>
<td>20</td>
<td>CLO (1, 2, 3, 4, 5, 6, 7)</td>
</tr>
</tbody>
</table>

Additional Course Information

A dissertation of maximum 12,000 words (80% weighting) and a research seminar (20% weighting). As BIOL4992 "FNS project"is a whole year course, students should enrol this course during the course selection period or the add/drop period in the 1st Semester only.
BIOL4993

Molecular biology & biotechnology project (12 credits)

Course Co-ordinator
Dr W K Yip, Biological Sciences (wkyip@hku.hk)

Teachers Involved
All academic staff in Molecular Biology & Biotechnology Major, Biological Sciences

Course Objectives
To provide a stimulating capstone experience for all Molecular Biology & Biotechnology Major undergraduates to integrate and apply their knowledge and skills obtained from the Molecular Biology & Biotechnology 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 this information to generate a scientifically relevant research question
CLO 3: design and undertake practical research work to formally test the hypotheses proposed
CLO 4: analyse and evaluate the data collected to test the hypotheses
CLO 5: present data in a professional manner to illustrate the outcomes
CLO 6: highlight and discuss their research findings and place them into a holistic scientific context

Pre-requisites
Pass in at least 24 credits of advanced level disciplinary core/elective biological sciences courses (BIOL3XXX or BIOL4XXX) in the Molecular Biology & Biotechnology Major; and Cumulative GPA of 3.0 or above.

Offer in 2016 - 2017
No Exam

Grade Descriptors (A+ to F)
A: Evidence of complete or near-complete understanding and a thorough grasp of the subject matter as demonstrated by attainment of all learning outcomes. Excellent critique and knowledge of relevant literature and identification of research hypothesis. Well-designed experimental approach to test research hypothesis. Show excellent organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate comprehensive, critical, assessment of results and professional presentation of research work.
B: Evidence of near-complete understanding and a good grasp of the subject matter as demonstrated by attainment of the majority of learning outcomes. Good critique and knowledge of relevant literature and identification of research hypothesis. Appropriately designed experimental approach to test research hypothesis. 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.
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 confused and poorly organized assessment of results and limited presentation of research work.
Fail: Evidence of poor or inadequate understanding and grasp of the subject matter such that most of the learning outcomes are not attained. Poor critique and knowledge of relevant literature and identification of research hypothesis. Badly designed experimental approach to test research hypothesis. Show little evidence of appropriate organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate incorrect interpretation and assessment of results and poor presentation of research work.

Course Type
Project-based course

Assessment Methods and Weighting

<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>
<tr>
<td>Dissertation</td>
<td>research seminar</td>
<td>20</td>
</tr>
</tbody>
</table>

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).

BIOL4994

Biological sciences project (12 credits)

Course Co-ordinator
Prof W W M Lee, Biological Sciences (hrszlw@hku.hk)

Teachers Involved
All academic staff in Biological Sciences Major, Biological Sciences

Course Objectives
To provide a stimulating capstone experience for all Biological Sciences Major undergraduates to integrate and apply their knowledge and skills obtained from the Biological Science Major through planning and carrying out a research project under the supervision of a member of staff.

Course Contents & Topics
Students should seek approval from a prospective supervisor prior to selecting this course. After admission to the course is approved by the course coordinator, students will complete their project work under the guidance of their supervisor.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1: critique and review appropriate scientific literature
CLO 2: use this information to generate a scientifically relevant research question
CLO 3: develop and formulate scientific hypotheses to test this question
CLO 4: design and undertake practical research work to formally test the hypotheses proposed
CLO 5: analyse and evaluate the data collected to test the hypotheses
CLO 6: present data in a professional manner to illustrate the outcomes
CLO 7: draw an objective series of conclusions based on the experimental work
CLO 8: highlight and discuss their research findings and place them into a holistic scientific context

Pre-requisites
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.
and Impermissible combinations) 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.

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y Year long</td>
<td>Offer in 2017 - 2018 : Y Examination No Exam</td>
</tr>
<tr>
<td>A</td>
<td>Evidence of complete or near-complete understanding and a thorough grasp of the subject matter as demonstrated by attainment of all learning outcomes. Excellent critique and knowledge of relevant literature and identification of research hypothesis. Well designed experimental approach to test research hypothesis. Show excellent organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate comprehensive, critical, assessment of results and professional presentation of research work.</td>
</tr>
<tr>
<td>B</td>
<td>Evidence of near-complete understanding and a good grasp of the subject matter as demonstrated by attainment of the majority of learning outcomes. Good critique and knowledge of relevant literature and identification of research hypothesis. Appropriately designed experimental approach to test research hypothesis. Show good organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate effective, critical, assessment of results and good presentation of research work.</td>
</tr>
<tr>
<td>C</td>
<td>Evidence of adequate understanding and grasp of the subject matter as demonstrated by general but incomplete attainment of most of the learning outcomes. Acceptable critique and knowledge of relevant literature and identification of research hypothesis. Adequately designed experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate adequate but not necessarily critical, assessment of results and presentation of research work.</td>
</tr>
<tr>
<td>D</td>
<td>Evidence of limited understanding and grasp of the subject matter as demonstrated by incomplete attainment of many of the learning outcomes. Limited critique and knowledge of relevant literature and identification of research hypothesis. Poorly designed experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate confused and poorly organized assessment of results and limited presentation of research work.</td>
</tr>
<tr>
<td>Fail</td>
<td>Evidence of poor or inadequate understanding and grasp of the subject matter such that most of the learning outcomes are not attained. Poor critique and knowledge of relevant literature and identification of research hypothesis. Badly designed experimental approach to test research hypothesis. Show little evidence of appropriate organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate incorrect interpretation and assessment of results and poor presentation of research work.</td>
</tr>
</tbody>
</table>

Course Type Project-based course

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Assessment Methods and Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities</td>
<td>Methods</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Dissertation</td>
</tr>
<tr>
<td>formal lectures, seminars &amp; practical work</td>
<td>Oral presentation</td>
</tr>
<tr>
<td>No. of Hours</td>
<td>Weighting in final course grade (%)</td>
</tr>
<tr>
<td>144</td>
<td>80</td>
</tr>
<tr>
<td>Assessment Methods to CLO Mapping</td>
<td>1,2,3,4,5,6,7,8</td>
</tr>
<tr>
<td>Course Website <a href="http://moodle.hku.hk/">http://moodle.hku.hk/</a></td>
<td>20</td>
</tr>
<tr>
<td>Additional Course Information</td>
<td>1,2,3,4,5,6,7,8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ENVS1301</th>
<th>Environmental life science (6 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Biological Sciences</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>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr T Vengatesen, Biological Sciences</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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.</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 understand life, environment and their interactions</td>
<td>Adequately designed experimental approach to test research hypothesis. Show fair organizational and/or analytical skills and laboratory/fieldwork techniques.</td>
</tr>
<tr>
<td>CLO 2 appreciate species and ecosystem responses to human-induced environmental change</td>
<td>Poor critique and knowledge of relevant literature and identification of research hypothesis. 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.</td>
</tr>
<tr>
<td>CLO 3 attain ability to critically think and discuss about current environ-life science issues</td>
<td>Show general but incomplete knowledge and original thought during the analysis of environmental life science issues.</td>
</tr>
<tr>
<td>CLO 4 be motivated and equipped: to tackle biological environmental science questions and to choose advanced environmental science courses</td>
<td>Poorly designed experimental approach to test research hypothesis. Show little evidence of appropriate organizational and/or analytical skills and laboratory/fieldwork techniques. Demonstrate confused and poorly organized assessment of results and limited presentation of research work.</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>NIL</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td>A</td>
</tr>
<tr>
<td>B</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>
</tr>
<tr>
<td>C</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>
</tr>
<tr>
<td>D</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>
</tr>
<tr>
<td>Fail</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</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture with laboratory component course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
</tr>
<tr>
<td></td>
<td>Lectures</td>
</tr>
<tr>
<td></td>
<td>Field work</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>
</tr>
<tr>
<td></td>
<td>Presentation</td>
</tr>
<tr>
<td></td>
<td>Test</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>Appropriate reading materials/handouts will be provided during the course.</td>
</tr>
<tr>
<td>Course Website</td>
<td><a href="http://www.biosch.hku.hk/ecology/lsc/">http://www.biosch.hku.hk/ecology/lsc/</a></td>
</tr>
<tr>
<td>Additional Course Information</td>
<td>This course will be offered subject to a minimum enrollment number and availability of teachers.</td>
</tr>
</tbody>
</table>

**ENVS2001 Environmental field and lab course (6 credits)**

**Offering Department** Biological Sciences

**Course Co-ordinator** Dr D M Baker, Biological Sciences (dmbaker@hku.hk)

**Teachers Involved** Dr D M Baker, Biological Sciences

**Course Objectives** To introduce students to a broad spectrum of field and laboratory methods for data collection in environmental science. Through exposure to environmental data collection, experimental design, data analysis, interpretation and reporting, students will gain a deeper appreciation of the process that underlies environmental science research and its relevancy to critical thinking and future careers in the sciences.

**Course Contents & Topics** This course will involve environmental data collection in both field and laboratory settings. In-class lectures will cover basic principles of specific methodologies and relevant applications in preparation for laboratory and field-based experiential learning. Having an interdisciplinary focus, the course will cover topics relevant to the study of the biosphere, encompassing terrestrial, aquatic, and atmospheric systems. Students will gain hands-on experience with the operation of standard and advanced sampling and analytical equipment, quality control, basic data analysis and reporting.

**Course Learning Outcomes** On successful completion of this course, students should be able to:
- CLO 1 understand how scientific data is used to address environmental problems
- CLO 2 have a basic understanding of the techniques and methodologies necessary for collecting environmental data
- CLO 3 understand some of the problems inherent in data collection, and how this impacts data interpretation
- CLO 4 understand how data collected in the lab and field can be used to critically evaluate ideas

**Pre-requisites** Pass in BIOL1309 or EASC1401 or ENVS1301 or ENVS1401

**Offer in 2016 - 2017** Y

**Grade Descriptors (A+ to F)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>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.</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 lab / fieldwork skills and techniques. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational 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 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.</td>
</tr>
<tr>
<td><strong>D</strong></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. 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.</td>
</tr>
<tr>
<td><strong>Fail</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>

**Course Type** Laboratory and workshop course

| Activities | Details | No. of Hours |
| Laboratory | 30 |
| Field work | 10 |
| Project work | 20 |
| Tutorials | 12 |
| Reading / Self study | 60 |

**Assessment Methods and Weighting**

| Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
| Assignments | 10 | CLO 1,2,3 |
| Laboratory reports | 20 | CLO 1,2,3,4 |
| Presentation | 20 | CLO 2,3 |
| Project reports | 50 | CLO 1,2,3,4 |

**Course Website** http://www.biosch.hku.hk/ecology/lsc/

**ENVS2002 Environmental data analysis (6 credits)**

**Academic Year** 2016

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403
School of Biological Sciences

### Course Content & Topics
The course will feature lectures on aspects of sampling, distributions, uncertainty, probability, and hypothesis testing in addition to lectures on advanced analysis topics. Special emphasis will be placed on qualities inherent to most environmental datasets such as large size, multivariate, and spatial. All material will be applied and practiced in environmental science contexts (e.g., chemistry, ecology, geology and oceanography) using a variety of datasets in a computer laboratory setting using the ‘R Project for Statistical Computing’ software (a graphical user interface will be implemented such that prior knowledge of coding or computer science is not required).

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in BIO1309 or EASC1401 or ENV51301 or ENV51401

### Offer in 2016 - 2017
2nd sem

### 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 a highly effective computational skills and techniques for basic statistical analyses. Be able to critically use data and statistical results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

- **B**
  - Demonstrate substantial grasp of the subject and skills required for attaining at least most of the course learning outcomes. Present evidence of analytical and critical abilities and logical thinking, Apply effective computational skills and techniques for basic statistical analyses. Be able to correctly use data and statistical results to draw appropriate conclusions. Apply effective organizational and presentational skills.

- **C**
  - Demonstrate general but incomplete grasp of the subject and skills required for attaining some of the course learning outcomes. Present evidence of some analytical and critical abilities and logical thinking. Apply moderately effective computational skills and techniques for basic statistical analyses. Demonstrate mostly correct but some erroneous use of data and statistical results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

- **D**
  - Demonstrate partial and limited grasp of the subject and skills required for attaining some of the course learning outcomes. Present evidence of some analytical and critical abilities and logical thinking but with limited analytical and critical abilities. Apply limited or barely effective computational skills and techniques for basic statistical analyses. Demonstrate limited ability to use data and statistical results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

- **Fail**
  - Demonstrate limited or no grasp of the subject and skills required for attaining any of the course learning outcomes. Present evidence of little or lack of analytical and critical abilities, logical or coherent thinking. Apply minimally effective or ineffective computational skills and techniques for basic statistical analyses. Demonstrate misuse of data and statistical results and/or unable to draw appropriate conclusions. Apply minimally effective or ineffective organizational and presentational skills.

### Course Type
Lecture with laboratory component course

### Assessment Methods and Weighting

- **Examination**
  - No. of Hours
  - Weighting in final course grade (%)
  - CLO Methods to CLO Mapping
  - CLO 1
  - CLO 2
  - CLO 3
  - CLO 4

### Assessment Methods

- **Methods**
  - Details
  - No. of Hours

- **Examination**
  - 25
  - CLO 1
  - CLO 2

- **Project report**
  - 25
  - CLO 3
  - CLO 4

- **Test**
  - 50
  - CLO 5

### Required/recommended reading and online materials
Textbooks:

References:

### Course Website
http://www.biosch.hku.hk/ecology/lsc/
ENVS4110 Environmental remediation (6 credits)  Academic Year 2016
Offering Department Biological Sciences  Quota 30
Course Co-ordinator Dr J D Gu, Biological Sciences (jdg@hku.hk)
Teachers Involved Dr J D Gu, Biological Sciences
Course Objectives 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 of critical skills for analysis of the recent technological development and the proposed applications.
Course Contents & Topics 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 phyto remediation; mechanisms of bioremediation transformation of polyaromatic hydrocarbon, polychlorinated biphenols, agrichemicals and phthalate esters as well as both metals and metalloids; biochemical pathways and the specific genes involved in detoxification; chemotaxis and engineering the degradation pathways in bacteria; transport of microorganisms and monitoring in subsurface environment; survival of introduced organisms; evolution of the degradative genes in bacteria; in situ and ex situ remediation techniques; green technologies.
Course Learning Outcomes 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.
Pre-requisites (and Co-requisites and Impermissible combinations) Pass in BIOL3036 or ENVS2001 or ENVS2002
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 high logical thinking, with evidence of original thought, ability to integrate and synthesize information, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective presentational skills. Strong evidence of clear attention to thoughtful and reflective thinking.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, integration of materials and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate effective presentational skills. Evidence of clear attention to thoughtful and reflective thinking.
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective presentational skills. Little evidence of clear attention to thoughtful and reflective thinking.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities and little attempt at integration. Show limited ability to apply knowledge to solve problems. Limited effectiveness in presentational skills. Lack of attention to thoughtful and reflective thinking.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
Course Type Lecture-based course
Course Teaching & Learning Activities Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100
Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination Mid-term exam (20%), Final exam (30%) 50 CLO 1,2,3,4
Presentation 20 CLO 1,2,3,4
Project reports 30 CLO 1,2,3,4
Required/recommended reading and online materials Textbooks:
References:
Course Website http://www.biosch.hku.hk/ecology/lsc/
Additional Course Information This course will be offered subject to a minimum enrollment number and availability of teachers. This course will be offered in alternative year.
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 strong 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.

### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Field work</td>
<td></td>
<td>6</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>
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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>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>25</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>Test</td>
<td></td>
<td>5</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. This course will be offered in alternative year.

### ENVS4955

**Environmental science in practice (6 credits)**

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Biological Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>M. Yasuhara, Biological Sciences (<a href="mailto:yasuhara@hku.hk">yasuhara@hku.hk</a>)</td>
</tr>
</tbody>
</table>

**Course Objectives**

To provide students experiential learning experience in the field of environmental science. The course is primarily based on an array of field studies covering essential areas of environmental science as well as thesis style report on environmental science topic. Invited guest lectures delivered by environmental practitioners may be held.

**Course Contents & Topics**

Students to attend a series of field studies in, and/or outside, Hong Kong throughout the final academic year. The field studies may include:

1. Residential field trip, for example, to Japan (that may include marine environmental survey, sediment core sampling, practical learning of ecological, paleoecology and environmental problems, environmental geology/paleontology field trip, and other tours and activities);
2. Natural resource management and conservation: visiting Agriculture, Fisheries and Conservation Department, Fish Marketing Organization, local fisheries organizations, agriculture/aquaculture/mariculture farms, Mai Po RAMSAR Site, Hong Kong Wetland Park, Hong Kong Organic Resource Centre, Country Park Visitor Centre, and Marine Parks and Reserves;
3. Environmental science and technologies: visiting water treatment plant, waste water treatment plant, strategic landfill sites, power plants, Environmental Management Division of Productivity Council (for research and development of green technology), Centre for Marine Environmental Research and Innovative Technology; and
4. Environmental Lab: visiting Environmental Science and other PI's laboratory, looking into research activities, interviewing PI, postdocs, post-graduate students, and writing a short article on the Lab.

In addition, the course includes thesis style report on an environmental science topic. The list of potential topics will be provided. Alternatively, students may propose their own topic.

**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 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 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Y Year long</th>
<th>Offer in 2017 - 2018</th>
<th>Y Examination</th>
<th>No Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
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<tr>
<td>B</td>
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<td>C</td>
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<tr>
<td>D</td>
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</tr>
<tr>
<td>Fail</td>
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</tbody>
</table>
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>Course Type</th>
<th>Laboratory and workshop course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td></td>
</tr>
<tr>
<td>Activities</td>
<td>Details</td>
</tr>
<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 66 hours</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>Laboratory reports</td>
<td>field reports</td>
<td>30</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>group presentations</td>
<td>30</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td>individual report</td>
<td>40</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

| Course Website | http://www.biosch.hku.hk/ ecology/lsc/ |
| Additional Course Information | Some trips will be organized in reading weeks, and others in weekends. Students will need to pay for their own travel cost for the residential field trip. (please contact us for details and financial difficulty). This course will be offered subject to a minimum enrollment number and availability of teachers. |
### Course 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. Students will also complete four online-learning modules through the Moodle platform on academic grammar, academic vocabulary, citation and referencing skills and understanding and avoiding plagiarism. 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

On successful completion of this course, students should be able to:

- **CLO 1** identify and distinguish between main ideas and supporting details in lectures and written texts and demonstrate an understanding of the arguments / facts expressed
- **CLO 2** form and express personal opinions through critical reading and listening
- **CLO 3** argue for and defend a position in a clear and structured way using academic sources, through writing and speaking
- **CLO 4** demonstrate control of grammatical accuracy and lexical appropriacy in academic communication

### Course Learning Outcomes

#### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
</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 generally comprehensible and fluent.</td>
</tr>
<tr>
<td>C</td>
<td>Satisfactory to reasonably good result. Spoken and written academic texts produced by students are sometimes not-well structured but there is some evidence of this ability. Students are sometimes unable to clearly and concisely explain academic concepts. While they can argue for a position, it is not very detailed and tend to be simplistic rather than critical. Students sometimes use sources which are nonacademic and/or not appropriate to support their ideas in writing and speaking. There are some systematic errors in citation and referencing but also evidence of correct systematic use. Students have some difficulty comprehending and critically interpreting texts. They can 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>
</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 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>
</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>
</tr>
</tbody>
</table>

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pre-requisites (and Co-requisites and Impermissible combinations)

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Y</th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Offer in 2017 - 2018</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Descriptors</td>
<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>
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<td></td>
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</tr>
<tr>
<td></td>
<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 generally comprehensible and fluent.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Satisfactory to reasonably good result. Spoken and written academic texts produced by students are sometimes not-well structured but there is some evidence of this ability. Students are sometimes unable to clearly and concisely explain academic concepts. While they can argue for a position, it is not very detailed and tend to be simplistic rather than critical. Students sometimes use sources which are nonacademic and/or not appropriate to support their ideas in writing and speaking. There are some systematic errors in citation and referencing but also evidence of correct systematic use. Students have some difficulty comprehending and critically interpreting texts. They can 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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<td></td>
</tr>
<tr>
<td></td>
<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 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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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<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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</tbody>
</table>
CAES9820  Academic English for science students (6 credits)  Academic Year  2016
Offering Department  English  Quota  ---
Course Co-ordinator  Ms E Law, English (ellielaw@hku.hk)  
Teachers Involved  Ms E Law, Centre for Applied English Studies

Course Objectives
This six credit English-in-the-Discipline course will be offered to second year students studying in the Science Faculty. This course will help students develop the necessary skills to use both written and spoken English within their studies. Students will learn to better communicate and spontaneously discuss general and scientific concepts within their division, with other scientists as well as to a larger audience. Particular emphasis will be placed on enabling students to identify their own language needs and develop appropriate self-learning strategies to improve their proficiency.

Course Contents & Topics
Topics covered in the course will be:
- Finding, evaluating and using appropriate academic source materials;
- Compiling an academic bibliography;
- Contrasting academic and popular genres of Science;
- Writing for a specific audience, including stance, shared knowledge, levels of formality; and
- Organizing and articulating ideas in an academically suitable format including appropriate vocabulary and grammar; and
- Critically examine their own language proficiency and analyze how that relates to their ability to perform successfully within their discipline. Developing self-directed learning strategies.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 identify and summarize disciplinary sources related to a specified topic
CLO 2 produce texts (written and spoken) appropriate for a cross-disciplinary audience based on their disciplinary knowledge
CLO 3 identify their own language learning needs and implement a plan to meet those needs

Pre-requisites
NIL

Offer in 2016 - 2017
Y 1st sem  2nd sem  Offer in 2017 - 2018 : Y  Examination  No Exam

Grade Descriptors
(A+ to F)

A  Excellent result. Consistently demonstrates ability to summarize salient points accurately from appropriate and reliable sources using original language. Text uses sources appropriately and demonstrates accurate and appropriate grammatical, lexical and organizational characteristics. Language learning needs are clearly identified and aligned with evidence of planning, self-study and reflection.

B  Good to very good result. Usually demonstrates ability to summarize salient points accurately using mostly original language. Text mostly uses sources appropriately and demonstrates mostly accurate and appropriate grammatical, lexical and organizational characteristics. Language learning needs are stated with some evidence of planning and reflection although there is some misalignment between goals and self-study completed.

C  Satisfactory to reasonably good result. Demonstrates some ability to summarize salient points using mostly original language although some inaccuracies are present. Text uses some sources appropriately and demonstrates appropriate but simple grammatical and lexical characteristics with some organizational flaws. Language learning needs are stated with some limited evidence of planning and reflection but goals and self-study are misaligned.

D  Barely satisfactory result. Demonstrates a limited ability to summarize salient points using mostly original language although some inaccuracies are present. Text uses sources appropriately and demonstrates appropriate but simple grammatical and lexical characteristics with some organizational flaws. Language learning needs are stated with limited evidence of planning and reflection but goals and self-study are misaligned.

Fail  Unsatisfactory result. Does not demonstrate ability to summarize salient points identify, interpret or appropriately paraphrase reliable sources. Text uses no sources and demonstrates serious grammatical, lexical and/or organizational errors. Does not demonstrate any meaningful attempt to identify language learning needs or implement a plan.

Course Type  Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorials</td>
<td>seminars</td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>independent learning work</td>
<td>120</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>independent learning work</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Essay</td>
<td>other genres of writing</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

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 is a compulsory course for all students studying undergraduate degrees in the Faculty of Science.
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: Chemistry: Matter and Measurement (2 hours)**
- Elements, compounds, and mixtures; physical properties of matter; chemical changes and chemical properties; measuring mass, length, volume and temperature; atomic structure and subatomic particles; the mole concept and stoichiometry; solutions and concentrations; uncertainty in measurement and significant figures.

**Topic 2: 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 3: 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 4: 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; advanced materials e.g. electronic materials, liquid crystals, ceramic materials and polymeric materials.

**Topic 5: Chemical Equilibrium (4 hours)**
- The equilibrium state and the equilibrium constant; the equilibrium law: calculation of equilibrium constants and reaction quotients; Le Chélier's Principle.

**Topic 6: Introductory Organic Chemistry (9 hours)**
- Homologous series and nomenclature; isomerism; typical reactions of selected functional groups.

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 nomenclature, isomerism, and typical reactions of various functional groups of 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

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. 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.</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 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.</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 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.</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 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.</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. 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.</td>
</tr>
</tbody>
</table>

Pre-requisites and Co-requisites:

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.

Offer in 2016 - 2017:

<table>
<thead>
<tr>
<th>Year</th>
<th>Offer in 2017 - 2018</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Offer in 2017 - 2018: Y</td>
<td>Dec</td>
</tr>
</tbody>
</table>

Course Type: Lecture-based course

Assessment Methods and Weighting:

<table>
<thead>
<tr>
<th>Assessment</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>20</td>
<td>CLO 1.2,3,4,5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>65</td>
<td>CLO 1.2,3,4,5,6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1.2,3,4,5,6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:

1) Petrucci; Herring; Madura; Bissonnette: General Chemistry: Principles and Modern Applications, latest edition, Pearson
3) Zumdahl; Zumdahl: Chemistry, latest edition, Brookes/Cole

Additional Course Information:

Suggested follow-up course: CHEM1042 General Chemistry I
## Course Contents & Topics

1. Chemistry: its nature and method
   - Physical properties; chemical changes and chemical properties; elements and compounds; measuring mass, length, volume and temperature; atomic structure and subatomic particles; the mole concept and stoichiometry; solutions and concentrations; uncertainty in measurement and significant figures.

2. Atoms: the quantum world
   - Electromagnetic radiation and matter; Planck's quantum theory; the Bohr model of the hydrogen atom; the quantum mechanical model of the atom; quantum numbers, energy levels, and atomic orbitals; shapes of atomic orbitals; electron configurations; periodic trends: atomic radii, ionic radii, ionization energies, and electron affinities.

3. Chemical bonding and structures

4. Energetics and kinetics of reactions
   - Heat and work; the first law of thermodynamics; heat of reactions; spontaneity of changes. Reaction rate; factors that influence reaction rate; rate laws: differential and integrated rate laws; temperature and reaction rate; reaction mechanisms.

5. Acid-Base equilibria
   - Acid-base concepts; equilibria in solutions of weak acids and in weak bases; ionization constants; molecular properties and acid strength; acid-base properties of salt solutions; buffer solutions; acid-base titrations.

## Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 demonstrate a basic knowledge and understanding of the microscopic nature of atomic structure and concepts of chemical bonding and their relationships with the bulk properties of matter
- CLO 2 demonstrate knowledge and understanding in relation to thermodynamics and kinetics of reactions as well as aqueous equilibria including acid-base equilibria
- CLO 3 apply the theories and concepts introduced in the course to 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

## 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 thorough grasp of the subject. Demonstrate strong analytical and critical abilities and logical thinking, with ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Show highly effective lab skills and techniques. Apply highly effective organizational and presentational skills.</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 substantial grasp of the subject. Demonstrate evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Show effective lab skills and techniques. Apply effective organizational and presentational skills.</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 general but incomplete grasp of the subject. Demonstrate evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Show moderately effective lab skills and techniques. Apply moderately effective organizational and presentational skills.</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 partial but limited grasp, with retention of some relevant information, of the subject. Demonstrate evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Demonstrate partially effective lab skills and techniques. 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. Show evidence of little or no grasp of the knowledge and understanding of the subject. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Demonstrate minimally effective or ineffective lab skills and techniques. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

## Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>60</td>
<td>CLO 1,2,3,4,5,6</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>25</td>
<td>CLO 1,2,3,4,5,6</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1,2,3,4,5,6</td>
<td></td>
</tr>
</tbody>
</table>

## Course Type

Lecture with laboratory component course

## Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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<td>24</td>
</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>

## Required/recommended reading and online materials

1. Petrucci; Herring; Madura; Bissonnette: General Chemistry: Principles and Modern Applications, latest edition, Pearson
**CHEM1043**

**Offering Department** Chemistry  
**Course Co-ordinator** Dr A P L Tong, Chemistry (apltong@hku.hk)  
**Teachers Involved** Dr A P L Tong, Chemistry  
Prof D L Phillips, Chemistry  
**Course Objectives**  
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 areas 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; \( E_{\text{cell}} \), \( \Delta G \), and \( K \); \( E_{\text{cell}} \) as a functions of concentrations; batteries; corrosion; electrolysis; industrial electrolysis processes.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 demonstrate a knowledge and understanding of the properties and behavior of gases and apply gas laws and kinetic-molecular theory to processes involving gases
- CLO 2 demonstrate a knowledge and understanding in relation to solutions and their properties, solubility and complex-ion equilibria, and also electrochemistry
- CLO 3 apply molecular orbital theory to explain the formation and properties of diatomic molecules of first and second period of elements and of some simple polyatomic molecules
- CLO 4 demonstrate a knowledge and understanding of the relationship between free energy and spontaneity of reaction
- CLO 5 apply the theories and concepts introduced in the course to solve problems, perform calculations, make predictions and rationalize trends
- CLO 6 organize and present chemical ideas in a clear, logical and coherent way
- CLO 7 demonstrate awareness of the relevant applications of chemistry in society and in everyday life

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in CHEM1042; and  
Not for students in 2014-15 cohort or before having taken CHEM2541.

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2017 - 2018</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Y</td>
<td>Dec May</td>
</tr>
<tr>
<td>B</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>Y</td>
<td></td>
</tr>
</tbody>
</table>

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>70%</td>
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<td></td>
</tr>
<tr>
<td>Test</td>
<td>Test and assignment</td>
<td>30%</td>
<td>CLO 1, 2, 3, 4, 5, 6, 7</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

1. Petrucci; Herring; Madura; Bissonnette: General Chemistry: Principles and Modern Applications, latest edition, Pearson

**CHEM2041**

**Principles of chemistry (6 credits)**  
**Academic Year** 2016
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; introduction to spectroscopy: UV/Visible absorption spectroscopy, Beer-Lambert Law; IR Spectroscopy, identification of functional groups; NMR Spectroscopy, Larmor frequency & chemical shift, peak integral, spin-spin coupling multiplicities; Mass Spectrometry, isotopic distribution, determination of molecular formulae.

Course Objectives
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
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 Chemistry major students.

Assessment Methods
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 25 CLO 1,2
Examination 75 CLO 1,2

Grade Descriptors (A+ to F)
A Demonstrate thorough knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemistry, instrumentations and applications of spectrometry and spectroscopy for chemical analysis. Show strong ability to apply and integrate knowledge and theory, and strong ability to analyze problems related to general chemistry and spectroscopy.
B Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemistry, instrumentations and applications of spectrometry and spectroscopy for chemical analysis. Show evidence to apply and integrate knowledge and theory, and ability to analyze problems related to general chemistry and spectroscopy.
C Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemistry, instrumentations and applications of spectrometry and spectroscopy for chemical analysis. Show evidence of some abilities to apply and integrate knowledge and theory, and to analyze problems to most familiar situations to general chemistry and spectroscopy.
D Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemistry, instrumentations, and applications of spectrometry and spectroscopy for chemical analysis. Show evidence of limited abilities to apply and integrate knowledge and theory, and limited ability to analyze problems to most familiar situations related to general chemistry and spectroscopy.
Fail Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles and theories relating to the modern chemistry, instrumentations and applications of spectrometry and spectroscopy for chemical analysis. 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 general chemistry and spectroscopy.

Chemical Equilibrium and chemical analysis: aqueous solution and chemical equilibrium; analysis by acid-base reactivity, complexation reactivity, precipitation reactivity
Quality assurance: validation of analytical procedures

Required/recommended online materials
Pre-requisites (and Co-requisites and Impermissible combinations) Pass in CHEM1042 (for students admitted in 2014-15 or before); Pass in CHEM1042, and Pass in CHEM1043, or already enrolled in this course (for students admitted in 2015-16 or thereafter)


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 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.

Course Type Lecture with laboratory component course

Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments 5 CLO 1
Examination 65 CLO 1,2
Laboratory reports 20 CLO 3
Test 10 CLO 1,2


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) Academic Year 2016

Offering Department Chemistry Quota 120

Course Co-ordinator Prof V W W Yam (1st sem); Dr H Y Au Yeung (2nd sem), Chemistry (wwyam@hku.hk; hoyuay@hku.hk)

Teachers Involved Prof V W W Yam / Dr H Y Au Yeung, Chemistry Dr A M Y Yuen, 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 understand the basic principles and concepts of inorganic chemistry and appreciate their relevance to selected examples of biological processes and materials science

CLO 2 demonstrate knowledge and understanding of the acid-base concept and definition

CLO 3 demonstrate knowledge and understanding of the structure and bonding of main group compounds and transition metal complexes and their relevance to the electronic absorption and magnetic properties of transition metal complexes

CLO 4 demonstrate knowledge and understanding of the thermodynamic stability of metal complex formation and the thermodynamic and kinetic aspects of substitution and redox reactions

CLO 5 demonstrate knowledge and understanding of the role of main group elements and transition metal complexes in bioinorganic chemistry

Pre-requisites (and Co-requisites and Impermissible combinations) Pass in CHEM1042; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before); Pass in CHEM1042; and Pass in CHEM1043, or already enrolled in this course; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)


Grade Descriptors (A+ to F) A Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of inorganic chemistry, especially those related to acid-base concept; structure and bonding of main group compounds and metal complexes; electronic absorption spectroscopy; magnetic properties as well as thermodynamic and kinetic aspects of metal complexes and their reactions; and their relevance to biological processes and materials science. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to the basic principles and knowledge of inorganic chemistry. Demonstrate highly effective basic laboratory skills and techniques, especially in the synthesis and characterization of inorganic compounds and metal complexes.

B Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of inorganic chemistry, especially those related to acid-base concept; structure and bonding of main group compounds and metal complexes; electronic absorption spectroscopy; magnetic properties as well as thermodynamic and kinetic aspects of metal complexes and their reactions; and their relevance to biological processes and materials science. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of inorganic chemistry. Demonstrate effective basic laboratory skills and techniques, especially in the synthesis and characterization of inorganic compounds and metal complexes.
# Course Details

## Course: CHEM2441 Organic Chemistry I (6 credits)

### Offering Department
Chemistry

### Teachers Involved
- Dr X Y Li (1st sem)
- Prof P Chiu (2nd sem)
- Chemistry (xiaoyuli@hku.hk; pchiu@hku.hk)

### Course Objectives
To provide students with the basic principles to understand the structure and reactivity of organic molecules, with examples illustrating the role of organic chemistry in daily life and industry. This course serves as the first part of the complete program on fundamental organic chemistry, to be followed up by CHEM2441 Organic Chemistry II.

### Course Contents & Topics
Structure and bonding of organic compounds, three dimensional structures of organic molecules, conformational stereochemistry, chirality, Chemistry of alkanes, cycloalkanes, alkenes, alkynes, haloalkanes, dienes, aromatic compounds, and materials science. Show little or no evidence of abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of inorganic chemistry. Show little or no ability to analyze problems to most familiar situations and errors in data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of inorganic chemistry.

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- **CLO 1** understand basic concepts and employ the vocabulary of organic chemistry
- **CLO 2** visualize and draw three-dimensional, stereochemically correct representations of organic molecules
- **CLO 3** recognize, discriminate and name chiral stereoisomers and diastereomers
- **CLO 4** understand the reactivity of the functional groups
- **CLO 5** understand reaction mechanisms and apply mechanistic knowledge to solve chemistry problems
- **CLO 6** apply reactions to the synthesis of target molecules
- **CLO 7** appreciate the relevance of organic chemistry in biological processes and daily life

### Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in CHEM1042, and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before);
- Pass in CHEM1042, and in CHEM1043, or already enrolled in this course; and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>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 analyze and solve novel organic chemistry problems. Demonstrate highly effective organization, understanding, and execution of lab skills and techniques in organic chemistry experiments.</td>
</tr>
<tr>
<td>B</td>
<td>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 analyze and solve novel organic chemistry problems. Demonstrate effective organization, understanding, and execution of lab skills and techniques in organic chemistry experiments.</td>
</tr>
<tr>
<td>C</td>
<td>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 limited 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.</td>
</tr>
<tr>
<td>D</td>
<td>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 evidence of limited ability to integrate knowledge and theory, and a limited ability to analyze novel problems. Show some correct but also erroneous use of knowledge to solve most familiar problems. Demonstrate a partially effective organization, understanding and application of lab skills and techniques in organic chemistry experiments.</td>
</tr>
</tbody>
</table>

### Assessment Methods
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>5</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
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<tr>
<td>Examination</td>
<td>65</td>
<td>CLO 1,2,3,4,5</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>10</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>

### Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

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# Course: CHEM3441 Organic Chemistry II (6 credits)

### Offering Department
Chemistry

### Teachers Involved
- Dr X Y Li (1st sem)
- Prof P Chiu (2nd sem)
- Chemistry (xiaoyuli@hku.hk; pchiu@hku.hk)

### Course Objectives
To understand the structure and reactivity of organic molecules, with examples illustrating the role of organic chemistry in daily life and industry. This course serves as the second part of the complete program on fundamental organic chemistry, to be followed up by CHEM3441 Organic Chemistry III.

### Course Contents & Topics
Structure and bonding of main group compounds and metal complexes; electronic absorption spectroscopy, magnetic properties as well as thermodynamic and kinetic aspects of metal complexes and their reactions; and their relevance to biological processes and materials science. Show little or no evidence of abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of inorganic chemistry. Show little or no ability to analyze problems to most familiar situations and errors in data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of inorganic chemistry.

### Course Learning Outcomes
On successful completion of this course, students should be able to:
- **CLO 1** understand basic concepts and employ the vocabulary of organic chemistry
- **CLO 2** visualize and draw three-dimensional, stereochemically correct representations of organic molecules
- **CLO 3** recognize, discriminate and name chiral stereoisomers and diastereomers
- **CLO 4** understand the reactivity of the functional groups
- **CLO 5** understand reaction mechanisms and apply mechanistic knowledge to solve chemistry problems
- **CLO 6** apply reactions to the synthesis of target molecules
- **CLO 7** appreciate the relevance of organic chemistry in biological processes and daily life

### Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in CHEM1042; and NOT for students who have passed in CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before);
- Pass in CHEM1042, and in CHEM1043, or already enrolled in this course; and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>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 analyze and solve novel organic chemistry problems. Demonstrate highly effective organization, understanding, and execution of lab skills and techniques in organic chemistry experiments.</td>
</tr>
<tr>
<td>B</td>
<td>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 analyze and solve novel organic chemistry problems. Demonstrate effective organization, understanding, and execution of lab skills and techniques in organic chemistry experiments.</td>
</tr>
<tr>
<td>C</td>
<td>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 limited 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.</td>
</tr>
<tr>
<td>D</td>
<td>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 evidence of limited ability to integrate knowledge and theory, and a limited ability to analyze novel problems. Show some correct but also erroneous use of knowledge to solve most familiar problems. Demonstrate a partially effective organization, understanding and application of lab skills and techniques in organic chemistry experiments.</td>
</tr>
</tbody>
</table>
## CHEM2442
### Fundamentals of organic chemistry (6 credits)

**Offering Department**: Chemistry  
**Quota**: 130

**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 2016 - 2017**: Y 1st sem  
**Grade Descriptors**: A+ to F

<table>
<thead>
<tr>
<th>Grade Descriptors</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>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 limited ability to apply knowledge and theory, and little or no ability to analyze novel problems.</strong></td>
<td></td>
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<tr>
<td><strong>Demonstrate limited understanding of basic principles of organic chemistry, and limited ability to apply knowledge and skills required for attaining most of the course learning outcomes.</strong></td>
<td></td>
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<tr>
<td><strong>Demonstrate partial understanding of basic principles of organic chemistry, and ability to apply knowledge to most familiar problems.</strong></td>
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<tr>
<td><strong>Demonstrate limited understanding of basic principles of organic chemistry, and ability to apply knowledge to most familiar problems.</strong></td>
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<tr>
<td><strong>Demonstrate lack of understanding of basic principles of organic chemistry, and ability to apply knowledge to some familiar problems.</strong></td>
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</tbody>
</table>

**Course Type**: Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td></td>
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<tr>
<td>Laboratory</td>
<td></td>
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</tr>
<tr>
<td>Tutorials</td>
<td></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></td>
<td>10 CLO 1,2,3,4,5,6,7</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>2 hrs written examination</td>
<td>75 CLO 1,2,3,4,5,6</td>
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</tr>
<tr>
<td>Test</td>
<td></td>
<td>15 CLO 1,2,3,4,5,6</td>
<td></td>
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</tbody>
</table>

**Required/recommended reading and online materials**


**Additional Course Information**: Nil

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## CHEM2443
### Fundamentals of organic chemistry for pharmacy students (6 credits)

**Offering Department**: Chemistry  
**Quota**: 60

**Course Co-ordinator**: Dr P H Toy, Chemistry (phtoy@hku.hk)

**Course Objectives**: Students who are planning to CHEM3441 should take CHEM2441. Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

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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)
Passed in CHEM1042; Not for students who have passed CHEM2442, or already enrolled in this course.

Offer in 2016 - 2017 Year 1st sem Offer in 2017 - 2018 Y Examination Dec

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive organic chemistry knowledge, and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar problems.

B Demonstrate substantial command of organic chemistry with a broad range of knowledge, and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar problems.

C Demonstrate 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.

Course Type Lecture with laboratory component course
Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 24
Laboratory 20
Tutorials 5
Reading / Self study 100

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Examination 60 CLO 1, 2, 3
Test 40 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.

CHEM2541 Introductory physical chemistry (6 credits)

Offering Department Chemistry Quota 200
Course Co-ordinator Dr A M Y Yuen (1st sem); Dr J Y Tang (2nd sem), Chemistry (maiyan@hku.hk; jinyao@hku.hk)

Teachers Involved Dr A M Y Yuen (1st sem), Chemistry Dr J Y Tang (2nd sem), Chemistry

Course Objectives The course aims to provide a rigorous understanding of equilibrium thermodynamics and chemical kinetics. Students are required to apply mathematical skills (derivations and integrations) and basic physics to understand chemical reactions and related processes. Topics include the three laws of thermodynamics, thermodynamic properties of mixtures, solutions, chemical equilibrium, electrochemistry, rates of chemical reactions and reaction dynamics. Students will gain a good foundation of knowledge and skills for further study in Physical Chemistry.

Course Contents & Topics
Properties of Gases
States of gases and the gas laws with applications.

The First Law of Thermodynamics
Basic concepts of work, heat, energy, expansion work, heat transactions, enthalpy and adiabatic changes and examples in relation to biochemistry and materials science.

The Second and Third Laws of Thermodynamics
Direction of spontaneous change, entropy and the Third Law of Thermodynamics.

Simple Mixtures
Thermodynamic description of mixtures, partial molar quantities, and chemical potentials of liquids. Activities of solvent, solute, regular solutions and ions in solution.

Chemical Equilibrium
Spontaneous chemical reactions, the Gibbs energy minimum and equilibrium. Response of equilibria to pressure, temperature.

Electrochemistry
Electrochemical cell, relationship of electrochemical potential to thermodynamic functions. Applications of electrochemistry in energy, material science, sensing.

Molecules in Motion
Molecular motion in gases and liquids, kinetic model, collisions with surfaces, the rate of effusion and transport properties, conductivities of electrolyte solutions.
## Department of Chemistry

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: demonstrate knowledge and understanding of the properties of gases, molecules in motion and the rates of chemical reactions
- CLO 2: understand and demonstrate knowledge of the three laws of thermodynamics
- CLO 3: understand and apply the concepts of chemical equilibrium and the response of chemical equilibria to temperature and pressure
- CLO 4: understand and demonstrate knowledge of electrochemistry and its relationship to thermodynamics, can build electrochemical cell and calculate thermodynamic functions from electrochemical reactions
- CLO 5: demonstrate knowledge and understanding of basic reaction dynamics including reaction mechanism and how mechanism determines reaction rate law

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM1042 and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2014-15 or before);

Pass in CHEM1042 and CHEM1043 and NOT for students who have passed CHEM2041, or already enrolled in this course (for students admitted in 2015-16 or thereafter)

### Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 1st sem 2nd sem</td>
<td>Offer in 2017 - 2018: Y</td>
</tr>
<tr>
<td>Examination Dec May</td>
<td></td>
</tr>
</tbody>
</table>

### Grade Descriptors

| A | Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show thorough grasp of the subject. Demonstrate strong analytical and critical abilities and logical thinking, with ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. |
| B | Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show substantial grasp of the subject. Demonstrate evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. |
| C | Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show general but incomplete grasp of the subject. Demonstrate evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. |
| D | Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show partial but limited grasp, with retention of some relevant information, of the subject. Demonstrate evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. |
| Fail | Demonstrate little or no 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. |

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</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>
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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 including tests</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Course Contents & Topics
- Atmosphere chemistry: atmospheric composition and behavior, ozone in the stratosphere, chemistry of the troposphere, air pollution
- Water Chemistry: property of water, water resources and cycle, chemical quality of natural water, acid-base chemistry, oxidation-reduction chemistry, water purification
- Organic pollutants: persistent organic pollutants, pesticides, toxicology
- Energy: energy resources, fossil fuels, solar energy, nuclear energy, energy conversion (heat engine, fuel cells)
- Waste treatment: domestic and hazardous waste treatment (landfill, incineration, air stripping, adsorption, oxidation)

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: demonstrate knowledge on chemical principles of the various environmental phenomena and processes
- CLO 2: describe the practical processes of chemistry in 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 CHEM2041 or CHEM2341 or CHEM2441 or CHEM2442 or CHEM2541

### Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 2nd sem</td>
<td>Offer in 2017 - 2018: Y</td>
</tr>
<tr>
<td>Examination May</td>
<td></td>
</tr>
</tbody>
</table>

### Grade Descriptors

| 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 general but incomplete grasp of the subject. - Demonstrate some partial integration of theories, principles, and evidence. - Show evidence of some analytical abilities and logical thinking, little evidence of independent thinking, and ability to apply knowledge to most familiar situations. - Demonstrate moderately effective organization and presentation skills. |
| 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 integration of theories, principles, and evidence. |

### Teachers Involved

Dr W T Chan, Chemistry (wtchan@hku.hk)

### Course Co-ordinator

Dr W T Chan, Chemistry

### Teachers Involved

Prof A S C Cheung, 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

- Atmospheric science: atmospheric composition and behavior, ozone in the stratosphere, chemistry of the troposphere, air pollution
- Water chemistry: property of water, water resources and cycle, chemical quality of natural water, acid-base chemistry, oxidation-reduction chemistry, water purification
- Organic pollutants: persistent organic pollutants, pesticides, toxicology
- Energy: energy resources, fossil fuels, solar energy, nuclear energy, energy conversion (heat engine, fuel cells)
- Waste treatment: domestic and hazardous waste treatment (landfill, incineration, air stripping, adsorption, oxidation)
### CHEM3142
**Introduction to materials chemistry (6 credits)**

**Offering Department:** Chemistry  
**Quota:** 60  
**Academic Year:** 2016

**Pre-requisites:** Pass in CHEM2041 or CHEM2341 or CHEM2441 or CHEM2541

<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Teachers Involved</th>
<th>Course Objectives</th>
</tr>
</thead>
</table>
| Prof G K Y Chan | Dr V C Y Li, Chemistry  
| Chemistry  
| Dr Y H So, Chemistry  
| Visiting Professor, Chemistry | 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. |

**Content & 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.

**Learning Outcomes:**  
On successful completion of this course, students should be able to:  
- CLO 1: solve basic problems of energy and mass balances in chemical and environmental processes  
- CLO 2: be familiarized with a few common chemical industries and chemical processes  
- CLO 3: understand some general principles of industrial practice through plant visits

**Assessment Methods and Weighting:**

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Methods</th>
<th>Details</th>
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<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>continuous assessment</td>
<td>30</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Course Information:**  
Laboratory courses are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

**Additional Course Information:**  
Laboratory courses are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

**Reading and online materials:**  

**Additional Reading:**  
Fielder and Rousseau: Elementary Principles of Chemical Processes

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### CHEM3143
**Introduction to materials chemistry (6 credits)**

**Offering Department:** Chemistry  
**Quota:** 100  
**Academic Year:** 2016

**Pre-requisites:**  
- Demonstrate limited or barely effective organization and presentation skills.  
- Demonstrate incoherent organization and poor presentation skills.

<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Teachers Involved</th>
<th>Course Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof W K Chan</td>
<td>Prof W K Chan, Chemistry</td>
<td>This course provides an introduction to materials chemistry. Some basic material characterization techniques will also be introduced. This course is essential for students who wish to take advanced materials course.</td>
</tr>
</tbody>
</table>

**Content & Topics:**  
This course provides an introduction to materials chemistry. Some basic material characterization techniques will also be introduced. This course is essential for students who wish to take advanced materials course.
Classification of materials; introduction to organic polymers: molecular weight, polymerization reaction, polymer synthesis and characterization; ceramics; semiconducting materials; applications of different materials; materials characterizations.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 describe different materials classification and to explain the concept of structure/property relationship

CLO 2 understand the concept of molecular weight distribution in polymers, and explain how it is affected by the kinetics of polymerization reactions

CLO 3 identify examples of some important polymers, and explain how the molecular structure of these polymers affect their physical properties

CLO 4 demonstrate knowledge in materials characterizations

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM2041 or CHEM2341 or CHEM2441 or CHEM2442 or CHEM2541

Offer in 2016 - 2017

Y 1st sem Offer in 2017 - 2018 : Y Examination Dec

Grade Descriptors (A+ to F)

A Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the classification of materials, materials properties, synthesis and characterization of polymers, properties and applications of common polymers. Show strong ability to apply and integrate knowledge and theory relating to the synthesis and applications of materials. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to materials synthesis and characterization.

B Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the classification of materials, materials properties, synthesis and characterization of polymers, properties and applications of common polymers. Show evidence to apply and integrate knowledge and theory relating to the synthesis and applications of materials. Show evidence to analyze novel problems and correct use of data and experimental results to draw appropriate conclusions relating to materials synthesis and characterization.

C Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the classification of materials, materials properties, synthesis and characterization of polymers, properties and applications of common polymers. Show evidence of some abilities to apply and integrate knowledge and theory relating to the synthesis and applications of materials. 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 materials synthesis and characterization.

D Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the classification of materials, materials properties, synthesis and characterization of polymers, properties and applications of common polymers. Show evidence of limited abilities to apply and integrate knowledge and theory relating 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 and experimental results to draw appropriate conclusions relating to materials synthesis and characterization.

Fail Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the classification of materials, materials properties, synthesis and characterization of polymers, properties and applications of common polymers. Show little or no evidence of abilities to apply and integrate knowledge and theory relating to the synthesis and applications of materials. Show little or no ability to analyze problems to most familiar situations and erroneous use of data and experimental results to draw appropriate conclusions relating to materials synthesis and characterization.

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Examination 70 CLO 1,2,3,4

Test (continuous assessment) 30 CLO 1,2,3,4

Required/recommended reading and online materials

F. W. Billmeyer: Textbook of Polymer Science (John Wiley and Sons, 1984)
M. P. Stevens: Polymer Chemistry: An Introduction (Oxford University Press, 1999)

CLO 1 describe different materials classification and to explain the concept of structure/property relationship

CLO 2 understand the concept of molecular weight distribution in polymers, and explain how it is affected by the kinetics of polymerization reactions

CLO 3 identify examples of some important polymers, and explain how the molecular structure of these polymers affect their physical properties

CLO 4 demonstrate knowledge in materials characterizations

Offer in 2016 - 2017

N Offer in 2017 - 2018 : N Examination ---
CHEM3241

Course Type: Lecture-based course

Course Teaching & Learning Activities:
- Activities: Details
  - Lectures: 36
  - Tutorials: 12
  - Reading / Self study: 100

Assessment Methods and Weighting:
- Methods: Details
  - Assignments: 15
  - Examination: 70
  - Test: 15

Grade Descriptors:
- A: Demonstrate a 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 high proficiency lab skills and techniques and critical use of data and results to draw appropriate and insightful conclusions.
- 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.
- C: Demonstrate general but incomplete grasp of the subject. Show evidence of some analytical abilities and logical thinking, limited 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.
- 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 partial effective lab skills and techniques and limited ability to use data and results to draw appropriate conclusions.
- E: 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 minimal effective or ineffective lab skills and techniques and misuse of data and results and/or unable to draw appropriate conclusions.

Required/recommended reading and online materials:

Additional Course Information:
- Suggested follow-up course: CHEM3241
- Quota: 80

CHEM3242

Course Type: Food and water analysis (6 credits)

Course Teaching & Learning Activities:
- Activities: Details
  - Reading / Self study: 100

Assessment Methods and Weighting:
- Methods: Details
  - Examination: 65
  - Laboratory reports: including an oral presentation
  - Test: 25

Grade Descriptors:
- 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 high proficiency lab skills and techniques and critical use of data and results to draw appropriate and insightful conclusions.
- 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.
- C: Demonstrate general but incomplete grasp of the subject. Show evidence of some analytical abilities and logical thinking, limited 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.
- 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 partial effective lab skills and techniques and limited ability to use data and results to draw appropriate conclusions.
- E: 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 minimal effective or ineffective lab skills and techniques and misuse of data and results and/or unable to draw appropriate conclusions.

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.
Course Co-ordinator: Dr K M Ng, Chemistry (kwanmng@hku.hk)

Course Objectives:
To cover areas in the application and new methodology development in analytical chemistry with focus on food and water analysis.

Course Contents & Topics:
Chemical Analysis in Practicing Laboratories: Use of standard methods, guidelines and standards for food and water analysis; good laboratory practice; reliability and quality issues in chemical analysis.

Food Analysis: Requirement of nutritional labeling; determination of food nutritional value (e.g. total protein content, sodium content); detection of food adulteration and contamination (e.g. presence of banned additives, toxins, undeclared components); recent issues and case studies in food analysis.

Water Analysis: Water quality standards; sampling, pretreatment, storage of water samples; theory and technologies for field, laboratory and automated analysis of selected types of water (e.g. drinking water, recreational water, waste water).

Analytical Method Development: Selection, application and combination of analytical (e.g. sample digestion, solid phase extraction) and instrumental (e.g. GC, LC, MS) techniques for food and water analysis; method validation (e.g. recovery analysis, analysis of certified reference materials)

Course Learning Outcomes:
On successful completion of this course, students should be able to:

CLO 1: identify and determine errors and uncertainty of analytical results
CLO 2: apply measures taken to control quality and ensure reliability of analytical results
CLO 3: demonstrate a general knowledge in food and water analysis
CLO 4: understand issues in public health protection related to chemical analysis
CLO 5: carry out analytical techniques used in practicing food and water laboratories

Pre-requisites (and Co-requisites and Impermissible combinations):
Pass in CHEM2041 or CHEM2241 or CHEM2341 or CHEM2441 or CHEM2541

Offer in 2016 - 2017: Y

Grade Descriptors (A+ to F):
A: Demonstrates 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: Demonstrates 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 highly effective organization and presentation skills as shown in class work.

C: Demonstrates 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 the analysis of food and water. Apply effective organization and presentation skills as shown in class work.

D: Demonstrates 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 the analysis of food and water. Apply limited or barely effective organization and presentation skill 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.

Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:
- Lectures: 24 hours
- Laboratory: 24 hours
- Tutorials: 8 hours
- Reading / Self study: 100 hours

Assessment Methods and Weighting:
- Assignments: 5% (CLO 1, 2, 3, 4)
- Examination: 70% (CLO 1, 2, 3, 4)
- Laboratory reports: coursework assessment including laboratory work: 15% (CLO 2, 5)
- Test: 10% (CLO 1, 2, 3, 4)

Required/recommended reading and online materials:

Additional Course Information:
References to specialist texts and other published material will be made throughout the course. Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

CHEM3243:
Introductory instrumental chemical analysis (6 credits)

Offering Department: Chemistry

Course Co-ordinator: Dr X Li, Chemistry (xiangli@hku.hk)

Teachers Involved: Dr X Li, Chemistry, Dr K C J Wong, Pharmacology and Pharmacy

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.

Academic Year: 2016
Quota: 85

422
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 2016 - 2017**

Y 2nd sem Offer in 2017 - 2018 : Y Examination May

**Grade Descriptors (A+ to F)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Course Performance</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 minimally effective or ineffective lab skills and techniques and misuse of data and results and/or unable to draw appropriate conclusions. - Demonstrate insufficient organization and poor presentation skills.</td>
</tr>
</tbody>
</table>

**Course Type**

Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td></td>
<td>28</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</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>15</td>
<td>CLO 1,2</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>15</td>
<td>CLO 1,2</td>
<td></td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**Additional Course Information**

Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

**CHEM3244**

Analytical techniques for pharmacy students (6 credits) Academic Year 2016

**Offering Department**

Chemistry

**Quota**

35

**Course Co-ordinator**

Dr X Li, Chemistry (xiangli@hku.hk)

**Teachers Involved**

Dr X Li, Chemistry Dr K C J Wong, Pharmacology and Pharmacy

**Course Objectives**

This course is designed for Bachelor of Pharmacy students to provide an overview of different analytical and measurement techniques that are important to pharmacology and pharmaceutical sciences.

**Course Contents & Topics**

Principles and Applications of different analytical and measurement techniques in pharmaceutical sciences such as drug analysis and pharmacokinetics studies

Analysis and quality assurance: statistical analysis of data, control chart.

Analysis by Optical methods: Beer's Law; instrumentation, grating spectrometer, detectors; absorption spectrometry: UV-visible, infrared, and atomic; emission spectrometry;

Sample Separation and Purification: partition; chromatography theories; high performance liquid chromatography (HPLC) and gas chromatography (GC); instrumentation of HPLC and GC.

Molecular Mass Measurements: mass spectrometry-fundamental concepts; various ionization techniques including electrospray ionization (ESI) and matrix-assisted laser desorption ionization (MALDI); time-of-flight (TOF) and quadrupole (Q) mass analyzers; use of mass spectrometry in drug analysis

Nuclear magnetic resonance: basic principles; instruments; applications in structure determination of molecules of biological and pharmaceutical importance

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge and understanding of the principles of different optical methods, separation methods, mass spectrometry, NMR spectroscopy and their applications in pharmaceutical sciences
- 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, matrix effects correction (standard additions)

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in BPHM42136 (This course is for BPharm students only)

**Offer in 2016 - 2017**

Y 2nd sem Offer in 2017 - 2018 : Y Examination May
CHEM3341 Inorganic chemistry II (6 credits)

Offering Department Chemistry
Course Co-ordinator Prof V W W Yam, Chemistry (wwyam@hku.hk)
Teachers Involved Prof V W W Yam, Chemistry Dr A M Y Yuen, Chemistry

Course Objectives This course is a continuation from CHEM2341 Inorganic Chemistry I, with a more detailed treatment of general inorganic chemistry, with examples relevance to biological processes and material science, suited to the needs of those intending to extend their studies in chemistry.

Course Contents & Topics Chemistry of selected classes of inorganic, coordination and organometallic compounds including mechanisms of their reaction where appropriate.

Structure, bonding, magnetism and spectral properties of inorganic systems including examples in bioinorganic systems.

Course Learning Outcomes On successful completion of this course, students should be able to:
CLO 1 demonstrate knowledge of chemistry of selected classes of inorganic, coordination and organometallic compounds
CLO 2 understand structure, bonding, magnetism and spectral properties of inorganic systems
CLO 3 understand mechanisms of selected chemical reactions that are essential to coordination and organometallic compounds
CLO 4 gain appropriate knowledge of coordination compounds in biological systems

Pre-requisites (and Co-requisites and Impermissible combinations) Pass in CHEM2341

Offer in 2016 - 2017 Y 1st sem Offer in 2017 - 2018: Y Examination Dec

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.

Course Type Lecture with laboratory component course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
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<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>70</td>
<td></td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>15</td>
<td></td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td>15</td>
<td></td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

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.
On successful completion of this course, students should be able to:

- CLO 1 understand the principles and concepts of inorganic/organic chemistry in biological system
- CLO 2 understand structure, bonding, and spectral properties of selected metals in proteins and nucleic acids
- CLO 3 understand chemical mechanisms of selected metal homeostasis (i.e. uptake, transport and storage)
- CLO 4 understand the role of metal complexes medicine

Required/recommended reading and online materials

Catherine, Housecroft & Sharpe, Inorganic Chemistry (3rd Ed.), Prentice Hall, 2008

Additional Course Information

Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

CHEM3342 Bioinorganic chemistry (6 credits)

Offering Department Chemistry
Quota 50

Course Co-ordinator Prof H Z Sun, Chemistry (hsun@hku.hk)

Teachers Involved Dr H Y Au Yeung, Chemistry      Prof H Z Sun, Chemistry

Course Objectives
This course is a continuation from Basic Inorganic Chemistry and Basic Organic Chemistry, giving further and more details of inorganic chemistry in biological system, with examples relevance to biological processes and medical science, suited to the needs of those intending to extend their studies in (bio)chemistry and biomedical science.

Course Contents & Topics
Bioinorganic Chemistry of selected topics of interest. Examples include the inorganic chemistry (and biochemistry) behind the requirement of biological cells for metals such as zinc, iron and copper; and metals in medicine such as mechanisms by which organisms obtain required metal ions from their environment, and use of metal-containing compounds in treating diseases such as cancer.

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Details</th>
<th>No. of Hours</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>including lab report &amp; test</td>
<td>30</td>
<td></td>
<td>CLO 1, 2, 3, 4</td>
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<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td></td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM2341

Offer in 2016 - 2017

Y 2nd sem Offer in 2017 - 2018 : Y

Grade Descriptors (A+ to F)

A Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show strong ability to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate highly effective technical, especially in the characterization of inorganic active site and overall metallo-biomolecules.

B Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show evidence of some abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show evidence to analyze novel problems and correct use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.

C Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show evidence of some abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate moderate effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.

D Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show limited ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate partially effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.

F Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of bioinorganic chemistry, especially those related to hard-soft acid-base theory; chelation; structure and bonding of metals in biological systems; thermodynamic and kinetic aspects of metal ions in biological processes and their relevance to metal homeostasis; metal-based drugs. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show limited ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate minimal effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.
biological processes and their relevance to metal homeostasis; metal-based drugs. Show little or no evidence of abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of bioinorganic chemistry. Show little or no ability to analyze problems to most familiar situations and erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of bioinorganic chemistry. Demonstrate minimal effective basic techniques, especially in the characterization of inorganic active site and overall metallo-biomolecules.

<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>
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<tr>
<td>Lectures</td>
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</tr>
<tr>
<td>Tutorials</td>
<td></td>
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<tr>
<td>Reading / Self study</td>
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<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>(continuous assessment of assignments and presentation)</td>
<td>25</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td></td>
<td>75</td>
<td>CLO 1,2,3,4</td>
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</table>

<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
<th>Information</th>
</tr>
</thead>
</table>

**CHEM3441**  Organic chemistry II (6 credits)  
**Academic Year**: 2016

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr X Y Li (1st sem); Prof D Yang (2nd sem), Chemistry</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr X Y Li (1st sem); Prof D Yang (2nd sem), Chemistry</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Chemistry together with CHEM2441. This course aims to provide a solid foundation of organic chemistry and reactivity of organic molecules, with examples illustrating the role of organic chemistry in daily life and industry.</td>
</tr>
</tbody>
</table>

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

CLO 1: Draw correct structural representations of organic molecules
CLO 2: Understand the basic principles of structure and reactivity of organic molecules
CLO 3: Determine structures of organic compounds based on spectroscopic data
CLO 4: Write reasonable mechanisms for transformations of common functional groups (alcohols, ethers, carbonyl compounds, aldehydes, ketones, carboxylic acids, acyl halides, anhydrides, esters, amides, nitriles, and amines)
CLO 5: Appreciate the importance of organic chemistry in daily life
CLO 6: Devise synthetic pathways to organic compounds using functional group chemistry

**Pre-requisites and Impermissible combinations**

Pass in CHEM2441

(Remarks: CHEM3441 will be changed to lecture-based course from semester 2, 2015-16. For Chemistry students who admitted in 2014-15 or before, they must enroll also CHEM3443 for enrolling CHEM3441 (new version without lab component) to meet the Chemistry Major requirements.)

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 1st sem 2nd sem Offer in 2017 - 2018: Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>Fail</td>
</tr>
</tbody>
</table>

**CHEM3442**  Organic chemistry of biomolecules (6 credits)  
**Academic Year**: 2016

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr P H Toy, Chemistry</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr P H Toy, Chemistry</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

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.

On successful completion of this course, students should be able to:

CLO 1 have a basic understanding of biologically important organic molecules
CLO 2 have a basic understanding of enzyme catalysis
CLO 3 appreciate how organic chemistry plays an important role in biology and biochemistry

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM2442 or CHEM2443 or CHEM3441

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 | | 60 | CLO 1,2,3
Presentation | | 30 | CLO 1,2,3
Test | 2-mid term tests | 30 | CLO 1,2,3

Required/recommended reading and online materials


CHEM3443

Organic chemistry laboratory (6 credits)

Offering Department | Chemistry
Course Co-ordinator | Dr A M Y Yuen, Chemistry (mayian@hku.hk)
Teachers Involved | Dr A M Y Yuen, 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; or pass in CHEM3441, or already enrolled in this course:
NOT for students who have passed CHEM3441A in semester 1, 2015-16, or CHEM3441 in 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 2016 - 2017

Y 1st sem 2nd sem | Offer in 2017 - 2018: Y | Examination | Dec

Grade Descriptors (A+ to F)

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:

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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; or pass in CHEM3441, or already enrolled in this course:
NOT for students who have passed CHEM3441A in semester 1, 2015-16, or CHEM3441 in 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 2016 - 2017

Y 1st sem 2nd sem | Offer in 2017 - 2018: Y | Examination | Dec

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 presentional skills.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Show substantial grasp and mastery 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 organizational and presentional skills.
C Demonstrate partial but limited command of biomolecule organic chemistry knowledge, and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentional skills.
D Demonstrate little or no evidence of command of biomolecule organic chemistry knowledge, and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentional skills are minimally effective or ineffective.
F
Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory</td>
<td>12 x 4-hr lab sessions</td>
<td>48</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>2 hrs written examination (20%); practical and oral examination (25%)</td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>Lab report (20%); lab performance (20%)</td>
<td>40</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

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

Course Co-ordinator: Prof A S C Cheung, Chemistry (hraccsc@hku.hk)

Teachers Involved: Prof A S C Cheung, Chemistry

Course Objectives

The course presents fundamental principles and topics on quantum chemistry in order to provide a solid foundation for students intending to further their studies in chemistry.

Course Contents & Topics


Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand and use the terminology and nomenclature in quantum chemistry and topics discussed in the course.
- CLO 2 demonstrate knowledge and understanding of basic concepts in quantum mechanics, atomic and molecular structure.
- CLO 3 understand elementary numerical procedures and the basic relationships of quantum mechanics and molecular systems.
- CLO 4 hands-on experience of the application of the Hartree-Fock method to molecules.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM2541

Offer in 2016 - 2017 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 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 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 substantial grasp of the subject, ability to apply knowledge to familiar and some unfamiliar situations. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.</td>
</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 general but incomplete grasp of the subject, ability to apply knowledge to most familiar situations. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.</td>
</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 partial but limited grasp of the subject, retention of some relevant information of the subject, ability to apply knowledge to solve problems. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.</td>
</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 little or no grasp of the knowledge and understanding of the subject, very little or no ability to apply knowledge to solve problems. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.</td>
</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</td>
</tr>
<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></td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>
### CHEM3542

**Physical chemistry: statistical thermodynamics and kinetics theory (6 credits)**

**Offering Department:** Chemistry  
**Course Co-ordinator:** Dr J Yang (jinyu@hku.hk)

**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. On successful completion of this course, students should be able to:

- Understand and use the terminology and nomenclature associated with the small scale chemical project they are working on in the course.
- Understand the relationships of their particular chemical project to the wider area of chemistry.

**Course Contents & Topics:**
- Principles of Statistical Thermodynamics:
  - Thermodynamic laws
  - Ensembles and partition functions: microcanonical, canonical and grand-canonical
  - Systems of independent molecules: ideal gas
  - Molecular degrees of freedom: translation, rotation, vibration, and electronic
  - Ideal gas mixture: chemical equilibrium, binding, and titration
  - Lattice statistics: Ising model and phase transition
  - Quantum statistics

**Course Learning Outcomes:**
- CLO 1: understand and use the terminology and nomenclature in statistical thermodynamics and topics discussed in the course.
- CLO 2: demonstrate knowledge and understanding of basic concepts in statistical thermodynamics.
- CLO 3: understand correlation between macroscopic observables and microscopic statistical model systems.

**Pre-requisites (and Co-requisites and Impermissible combinations):**
- Pass in CHEM2541

**Offer in 2016 - 2017:** 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 knowledge.
- C: General but incomplete command of knowledge of statistical thermodynamics and reaction dynamics. Demonstrate limited 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 of on class quizzes & assignments (40%)
- Examination: 60%

**Required/recommended reading and online materials:**
- T. L. Hill, An introduction to Statistical Thermodynamics
- P. Atkins, Physical Chemistry

**Course Website:** Nil

<table>
<thead>
<tr>
<th>Course Type</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>24</td>
<td></td>
</tr>
<tr>
<td>Laboratory</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Course Grade (%):**
- CLO 1, 2, 3: 40%
- CLO 1, 2, 3: 60%

**Additional Course Information:** Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course. Students are strongly recommended to take CHEM3541 Physical Chemistry: Introduction to Quantum Chemistry before taking this course.

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### CHEM3999

**Directed studies in chemistry (6 credits)**

**Offering Department:** Chemistry  
**Course Co-ordinator:** Prof D L Phillips, Chemistry (philips@hku.hk)

**Course Objectives:** This course is designed for third year students who would like to take an early experience on research. It offers students an opportunity to carry out small scale chemical projects by themselves. Students interested in taking this course should contact their prospective supervisors in May to determine the contents and the nature of their project in the coming academic year. Prior approval from both the prospective supervisor and the course coordinator is required.

**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 project in the coming academic year.

**Course Learning Outcomes:**
- CLO 1: understand the terminology and nomenclature associated with the small scale chemical project they worked on in the course.
- CLO 2: demonstrate knowledge and understanding of basic concepts involved in their chemical project.
- CLO 3: understand the relationships of their particular chemical project to the wider area of chemistry.
Pre-requisites (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 a pass in CHEM2341 or CHEM2441 or CHEM2442 or CHEM2541 or CHEM3146.

This capstone course is for Chemistry Major 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.

Offer in 2016 - 2017 Grade Descriptors (A+ to F)

Offer in 2016 - 2017: Y
1st sem 2nd sem Offer in 2017 - 2018: Y Examination No Exam

A Show an extensive comprehension of the subject. Demonstrate very 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 presentional skills. [Work of A+ should demonstrate substantial additional work beyond that is required in wider areas relevant to the topic.]

B Show a substantial comprehension of the subject. Demonstrate an analytical and critical thinking with use of relevant information from sources. Demonstrate ability to compare meaningful differences among 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 presentional 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 compare 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 presentional 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 presentional 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 presentional skills are of very limited use or ineffective.

Course Type Project-based course

Course Teaching & Learning Activities

Methods
Details
Weighting in final course grade (%)
No. of Hours
Assessment Methods to CLO Mapping

Activities
Details
Weighting in final course grade (%)
No. of Hours
Assessment Methods to CLO Mapping

Methods
Details
Weighting in final course grade (%)
No. of Hours
Assessment Methods to CLO Mapping

Assessment Methods and Weighting

Methods
Details
Weighting in final course grade (%)
No. of Hours
Assessment Methods to CLO Mapping

Courses Involved

Prof V W W Yam, Chemistry

Prof C M Che, Chemistry

Offering Department Chemistry

Course Objectives

To introduce the concepts of symmetry and group theory and to apply them in solving chemical problems. This course also provides an introductory treatment of bonding theories, inorganic electronic and vibrational spectroscopy. This course is essential for students who wish to take advanced courses in inorganic chemistry and all types of spectroscopy.

Course Contents & Topics

Symmetry elements and symmetry operations; symmetry point groups; reducible and irreducible representations; character tables; direct products; symmetry-adapted linear combinations; projection operators; hybrid orbitals; molecular orbital theory for organic, inorganic and organometallic systems; selected applications in electronic and vibrational spectroscopy.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand the basic principles and concepts of symmetry and group theory and to apply them in solving chemical problems

CLO 2 demonstrate knowledge and understanding in the use of character tables and projection operator techniques

CLO 3 demonstrate knowledge and understanding of bonding theories involving hybrid orbitals and molecular orbitals for organic, inorganic and organometallic systems

CLO 4 demonstrate knowledge and understanding in the application of symmetry and group theory in electronic and vibrational spectroscopy

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM3341

Grade Descriptors (A+ to F)

Offer in 2016 - 2017 Grade Descriptors (A+ to F)

Offer in 2016 - 2017: Y
1st sem 2nd sem Offer in 2017 - 2018: Y Examination Dec

A 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. Show strong ability to apply and integrate knowledge and theory relating to the basic principles and concepts of symmetry and group theory in the applications in bonding, and electronic and vibrational spectroscopy. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to the principles and applications of symmetry and group theory. Demonstrate 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 presentional skills. [Work of A+ should demonstrate substantial additional work beyond that is required in wider areas relevant to the topic.]

B 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. Show evidence to apply and integrate knowledge and theory relating to the basic principles and concepts of symmetry and group theory in the applications in bonding, and electronic and vibrational spectroscopy. Show evidence to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to the principles and applications of symmetry and group theory.

CLO 1,2,3

Exceptional academic strength of the students is required for taking this course.

The course may involve Laboratory component as Course Teaching & Learning Activities.

CHEM4142 Symmetry, group theory and applications (6 credits)

Academic Year

Offering Department Chemistry

Course Co-ordinator Prof V W W Yam, Chemistry (wwyam@hku.hk)

Teachers Involved

Prof V W W Yam, Chemistry

Prof C M Che, Chemistry

Course Objectives

To introduce the concepts of symmetry and group theory and to apply them in solving chemical problems. This course also provides an introductory treatment of bonding theories, inorganic electronic and vibrational spectroscopy. This course is essential for students who wish to take advanced courses in inorganic chemistry and all types of spectroscopy.

Course Contents & Topics

Symmetry elements and symmetry operations; symmetry point groups; reducible and irreducible representations; character tables; direct products; symmetry-adapted linear combinations; projection operators; hybrid orbitals; molecular orbital theory for organic, inorganic and organometallic systems; selected applications in electronic and vibrational spectroscopy.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand the basic principles and concepts of symmetry and group theory and to apply them in solving chemical problems

CLO 2 demonstrate knowledge and understanding in the use of character tables and projection operator techniques

CLO 3 demonstrate knowledge and understanding of bonding theories involving hybrid orbitals and molecular orbitals for organic, inorganic and organometallic systems

CLO 4 demonstrate knowledge and understanding in the application of symmetry and group theory in electronic and vibrational spectroscopy

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in CHEM3341

Grade Descriptors (A+ to F)

Offer in 2016 - 2017 Grade Descriptors (A+ to F)

Offer in 2016 - 2017: Y
1st sem 2nd sem Offer in 2017 - 2018: Y Examination Dec

A 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. Show strong ability to apply and integrate knowledge and theory relating to the basic principles and concepts of symmetry and group theory in the applications in bonding, and electronic and vibrational spectroscopy. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to the principles and applications of symmetry and group theory. Demonstrate 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 presentional skills. [Work of A+ should demonstrate substantial additional work beyond that is required in wider areas relevant to the topic.]

B 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. Show evidence to apply and integrate knowledge and theory relating to the basic principles and concepts of symmetry and group theory in the applications in bonding, and electronic and vibrational spectroscopy. Show evidence to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to the principles and applications of symmetry and group theory.
### Course Type

**Lecture-based course**

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>(continuous assessment)</td>
<td>25</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>75</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials


### CHEM4143

Interfacial science and technology (6 credits)

**Offering Department** Chemistry

**Course Co-ordinator** Prof G K Y Chan, Chemistry (hrsccky@hku.hk)

**Teachers Involved** Prof G K Y Chan, Chemistry Guest lecturer, 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 CHEM3541

**Offer in 2016 - 2017** N

**Offer in 2017 - 2018** 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 thorough knowledge of interfacial science and technology, and mastery of skills required for attaining all of the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to solve problems in a wide range of complex, familiar and unfamiliar situations. Critical use of data and sourcing of references. Apply highly effective organizational and presentialational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial knowledge of interfacial science and technology and command of skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to solve problems in familiar and some unfamiliar situations. Correct use of data and sourcing of references. Apply effective organizational and presentialational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete knowledge of interfacial science and technology and command of skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge solve problems to most familiar situations. Mostly correct but some erroneous use of data and references. Apply moderately effective organizational and presentialational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited knowledge of interfacial science and technology and command of skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited ability to use data and source references. Apply limited or barely effective organizational and presentialational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of knowledge of interfacial science and technology, and command of skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Misuse of data and references. Organization and presentialational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

### Course Type

**Lecture-based course**

### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>(continuous assessment)</td>
<td>5</td>
<td>CLO 1, 2, 3</td>
</tr>
</tbody>
</table>

### Teachers Involved

Prof G K Y Chan, Chemistry

**Course Co-ordinator** Chemistry

**Quota**

N 50

**Offer in 2017 - 2018** N

**Examination** ---

**Grade Descriptors (A+ to F)**

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<td>B</td>
<td>Demonstrate substantial knowledge of interfacial science and technology and command of skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to solve problems in familiar and some unfamiliar situations. Correct use of data and sourcing of references. Apply effective organizational and presentialational skills.</td>
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<td>Demonstrate general but incomplete knowledge of interfacial science and technology and command of skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge solve problems to most familiar situations. Mostly correct but some erroneous use of data and references. Apply moderately effective organizational and presentialational skills.</td>
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<td>D</td>
<td>Demonstrate partial but limited knowledge of interfacial science and technology and command of skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Limited ability to use data and source references. Apply limited or barely effective organizational and presentialational skills.</td>
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<td>Fail</td>
<td>Demonstrate little or no evidence of knowledge of interfacial science and technology, and command of skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Misuse of data and references. Organization and presentialational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>
CHEM4144 Advanced materials (6 credits)
Offering Department Chemistry
Course Co-ordinator Prof W K Chan, 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
Advanced polymerization methods: copolymerization and applications of copolymers, coordination polymerization, and living polymerizations
Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3143
Grade Descriptors (A+ to F)
A Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to frontier approach in polymer synthesis, properties, application, and characterization of materials for advanced technology. Show strong ability to apply and integrate knowledge and theory relating to the synthesis and applications of advanced materials. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to advanced materials synthesis and their properties.
B Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to frontier approach in polymer synthesis, properties, application, and characterization of materials for advanced technology. Show evidence of ability to apply and integrate knowledge and theory relating to the synthesis and applications of advanced materials. Show evidence to analyze novel problems and correct use of data and experimental results to draw appropriate conclusions relating to advanced materials synthesis and their properties.
C Demonstrate general but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to frontier approach in polymer synthesis, properties, application, and characterization of materials for advanced technology. Show evidence of some abilities to apply and integrate knowledge and theory relating to the synthesis and applications of advanced materials. 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 advanced materials synthesis and their properties.
D Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to frontier approach in polymer synthesis, properties, application, and characterization of materials for advanced technology. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the synthesis and applications of advanced materials. 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 advanced materials synthesis and their properties.
Fail Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to frontier approach in polymer synthesis, properties, application, and characterization of materials for advanced technology. Show little or no evidence of abilities to apply and integrate knowledge and theory relating to the synthesis and applications of advanced materials. Show little or no ability to analyze problems to most familiar situations and erroneous use of data and experimental results to draw appropriate conclusions relating to advanced materials synthesis and their properties.
Course Type Lecture-based course
Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures or discussion 36
Tutorials 12
Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments (continuous assessment) 20 CLO 1,2,3,4
Examination 80 CLO 1,2,3,4
Required/recommended reading and online materials
Other specialist references will be given throughout the course.

CHEM4145 Medicinal chemistry (6 credits)
Offering Department Chemistry
Course Co-ordinator Prof H Z Sun, 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
Outcomes

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

Offer in 2016 - 2017

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
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<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of medicinal chemistry, especially those related to drug discovery, design, and development; drug targets; drug lead optimization; structure activity relationship; pharmacokinetics; drug delivery and its relevance to toxicity. Show strong ability to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal chemistry. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to the basic principles and knowledge of medicinal chemistry. Demonstrate highly effective basic techniques for medicinal chemistry, especially in drug discovery and metabolism.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of medicinal chemistry; especially those related to drug discovery; design and development; drug targets; drug lead optimization; structure activity relationship; pharmacokinetics; drug delivery and its relevance to toxicity. Show evidence to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal chemistry. Show evidence to analyze novel problems and correct use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of medicinal chemistry. Demonstrate effective basic techniques for medicinal chemistry, especially in drug discovery and metabolism.</td>
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<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of medicinal chemistry; especially those related to drug discovery; design and development; drug targets; drug lead optimization; structure activity relationship; pharmacokinetics; drug delivery and its relevance to toxicity. Show evidence of some abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal chemistry. Show ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the basic principles and knowledge of medicinal chemistry. Demonstrate partially effective basic techniques for medicinal chemistry, especially in drug discovery and metabolism.</td>
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<td>D</td>
<td>Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the basic foundation knowledge of medicinal chemistry; especially those related to drug discovery; design and development; drug targets; drug lead optimization; structure activity relationship; pharmacokinetics; drug delivery and its relevance to toxicity. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the basic foundation knowledge of medicinal chemistry. 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.</td>
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<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 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 ability 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 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.</td>
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Course Type

Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td></td>
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<tr>
<td>Tutorials</td>
<td></td>
<td></td>
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<tr>
<td>Reading / Self study or discussion</td>
<td></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 (continuous assessment)</td>
<td>25</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>75</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

An Introduction to Medicinal Chemistry (3/a), G.L. Patrick, Oxford University Press, 2005


Additional Course Information

This course is also offered to R Pg students, and the course code for R Pg students is CHEM6113.

**CHEM4241**

Modern chemical instrumentation and applications (6 credits)

**Offering Department**

Chemistry

**Course Co-ordinator**

Dr I K Chu, Chemistry (iankanchu@hku.hk)

**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

Laser Spectroscopy: Principle of laser; three-level and four-level lasers; laser instrumentation (Q-switching and frequency conversion); laser-induced fluorescence; laser atomic spectrometry; laser remote sensing; signal-to-noise enhancement by boxcar integration and photon counting.

Atomic Plasma Spectrometry: Inductively couple plasma-atomic emission spectrometry (ICP-AES) and mass spectrometry (ICP-MS); signal-production processes in ICP spectrometry; Echelle grating spectrometer; array detectors; interferences in ICP-AES and ICP-MS.

Atomic X-ray Spectrometry: x-ray fluorescence; wavelength-dispersive (WDXRF) and energy-dispersive (EDXRF) X-ray fluorescence spectrometers

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

CLO 1 explain the principles of the modern mass spectrometric methods for proteins and metabolites identification and quantification

CLO 2 explain how proteins are identified and sequenced experimentally and how data is generated in proteomics experiments

CLO 3 use the database searching techniques and software tools to analyze high-throughput proteomics data
CLO 4: apply LC/MS/MS method for target quantitative analysis of small molecules
CLO 5: explain the principles of the laser spectroscopy, atomic plasma spectrometry, and atomic x-ray spectrometry
CLO 6: describe the basic experimental set up and the properties of the basic components of the instruments used in the laboratory classes

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in CHEM3241

Offer in 2016 - 2017
A
Grade Descriptors (A+ to F)

Course Teaching & Learning Activities

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Lectures
Laboratory
Tutorials
Reading / Self study
Examination
Laboratory reports (lab performance, reports, test, oral test)

Assessment Methods and Weighting

CLO 1,2,3,4,5,6

Course Type Lecture with laboratory component course

Information Reference to published material will be made throughout the course. Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.

CHEM4242

Analytical chemistry (6 credits)

Offering Department Chemistry
Quota 50

Course Co-ordinator Dr K M Ng, Chemistry (kwanno@hku.hk)

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

Analytical measurement concepts: Statistical treatment & evaluation of chemical measurement data; Figures of merits of analytical methods; Validation of analytical methods; Quality assurance in chemical analysis and testing laboratories

Theoretical background and practical techniques of sample preparation, separation and detection: Sample preparation and enrichment techniques for biomedical, pharmaceutical and forensic chemical analysis; Advanced separation technologies for complex mixture analysis (e.g. multidimensional LC); Derivatization methods for chromatographic analysis and spectroscopic detection; Analytes characterization and detection techniques based on mass spectrometry

Problem-based design of analytical strategy for chemical & biochemical analysis: Expert sharing of practical knowledge and experience related to selected fields of research; Case study and review of analytical chemistry 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 (and Co-requisites and Impermissible combinations)
Pass in CHEM3241 or CHEM3242

Offer in 2016 - 2017

Grade Descriptors (A+ to F)

A

Grade Descriptors (A+ to F)

B

Reference to published material will be made throughout the course. Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.
CHEM4341 Advanced inorganic chemistry (6 credits) Academic Year 2016

Offering Department Chemistry

Course Co-ordinator Prof C M Che, Chemistry (cmche@hku.hk)

Teachers Involved Prof C M Che, Chemistry  Prof V W W Yam, Chemistry  Prof H Z Sun, 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

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 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 moderately 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.

Assessment Methods and Weighting

- Examination 70 CLO 1,2,3
- Laboratory reports 10 CLO 1,2
- Presentation 10 CLO 1,2,3
- Test/Quiz 10 CLO 1,2,3

CLO to Learning Outcomes Mapping

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 No. of Hours
  - Assignments (continuous assessment) 20 CLO 1,2,3
  - Examination 80 CLO 1,2,3
CHEM4342 Organometallic chemistry (6 credits)  Academic Year: 2016

Offering Department: Chemistry  Quota: 40

Course Co-ordinator: Prof V V W Yam, Chemistry  (wwysam@hku.hk)

Teachers Involved: Prof V V W Yam, Chemistry  Dr H Y Au-Yeung, Chemistry

Course Objectives:
To give further, more detailed, treatment to organometallic chemistry mentioned in CHEM3341 Inorganic Chemistry II. The course also aims to introduce and familiarize students with advanced laboratory techniques, and to prepare students for graduate work in inorganic and organometallic chemistry.

Course Contents & Topics:

Course Learning Outcomes:
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 Contents:

Course Learning Outcomes:
- CLO 1: Understand the advanced principles and concepts in organometallic chemistry
- CLO 2: Demonstrate knowledge and understanding in the bonding, structure and reactivities of main group and transition metal organometallics, especially in transition metal clusters, metal alkyls, metal alkylidenes and metal alkylidyynes.
- CLO 3: Demonstrate knowledge and understanding in the application of organometallics in organic synthesis, polymerization and catalysis.
- CLO 4: Demonstrate ability in advanced laboratory techniques including the synthesis and manipulation of air- and moisture-sensitive compounds, and their characterization by various spectroscopic methods.

Pre-requisites (and Co-requisites and Impermissible combinations): Pass in CHEM3341


Grade Descriptors (A+ to F):
- A: Demonstrate thorough knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show strong ability to apply and integrate knowledge and theory relating to the advanced principles and concepts of organometallic chemistry. Show strong ability to analyze novel problems and critical use of data and experimental results to draw appropriate and insightful conclusions relating to the advanced principles and applications of organometallic chemistry. Demonstrate highly effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.
- B: Demonstrate substantial command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show evidence of some abilities to apply and integrate knowledge and theory relating to the advanced principles and concepts of organometallic chemistry. Show ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the advanced principles and applications of organometallic chemistry. Demonstrate effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.
- C: Demonstrate partial but limited command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show evidence of some abilities to apply and integrate knowledge and theory relating to the advanced principles and concepts of organometallic chemistry. Show ability to analyze problems to most familiar situations and mostly correct but erroneous use of data and experimental results to draw appropriate conclusions relating to the advanced principles and applications of organometallic chemistry. Demonstrate moderately effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.
- D: Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show evidence of limited abilities to apply and integrate knowledge and theory relating to the advanced principles and concepts of organometallic 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 advanced principles and applications of organometallic chemistry. Demonstrate partially effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.
- Fail: Demonstrate little or no evidence of command of knowledge and understanding of essential facts, concepts, principles, and theories relating to the more detailed and advanced treatment of organometallic chemistry, especially those related to structure, bonding and reactivities of main group and transition metal organometallics; transition metal cluster chemistry; and application of organometallics in organic synthesis and catalysis. Show little or no ability to apply and integrate knowledge and theory relating to the advanced principles and concepts of organometallic chemistry. Show little or no ability to analyze problems to most familiar situations and erroneous use of data and experimental results to draw appropriate conclusions relating to the advanced principles and applications of organometallic chemistry. Demonstrate minimally effective advanced laboratory skills and techniques, especially in the synthesis and manipulation of air- and moisture-sensitive compounds and their characterization by various spectroscopic methods.

Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:
- Lectures: 24
- Laboratory: 30
- Tutorials: 5
- Reading / Self study: 100
- Assignments (continuous assessment): 30
- Examination: 70

Assessment Methods and Weighting:
- Methods: Weighting in final course grade (%)  Assessment Methods to CLO Mapping
- Assignments: 30  CLO 1,2,3,4
- Examination: 70  CLO 1,2,3,4

436
CHEM4441  
**Advanced organic chemistry (6 credits)**

**Academic Year**: 2016

**Offering Department**: Chemistry

**Course Co-ordinator**: Prof D Yang, Chemistry (yangdan@hku.hk)

**Teachers Involved**: Prof D Yang, Chemistry  Dr X C Li, Chemistry

**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.
- 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
- CLO 5: suggest reasonable mechanistic pathways for some types of organic reactions
- CLO 6: apply the knowledge of reaction mechanisms in design of synthetic routes for organic compounds

**Course Learning Outcomes**

- To introduce aspects of modern organic reactions with relevance to and in the context of the synthesis of natural products, drugs and medicinal chemistry to provide an integrated approach to the subject, and to provide training in advanced organic laboratory skills, and further hands-on experience in synthesis and characterization, as preparation for graduate studies or research in organic chemistry.
- 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 enantioregulatory control elements will be emphasized. A laboratory section provides training in the practical skills of synthesis.
- On successful completion of this course, students should be able to:
  - CLO 1: understand the rationale, selectivities, and mechanisms of various reactions and reagents in organic chemistry
  - CLO 2: able to solve mechanistic and synthetic chemistry problems
  - CLO 3: perform organic synthesis experiments at an increased level of technical difficulty, using additional skills in experimental design and execution, spectroscopic analysis, and reporting of results
  - CLO 4: integrate lecture material and literature search, to learn chemistry independently

**Assessment Methods and Weighting**

- Examination 70%
- Test 30%

**Required/recommended reading and online materials**


**Additional Course Information**

- 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.

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**CHEM4443**  
**Integrated organic synthesis (6 credits)**

**Academic Year**: 2016

**Offering Department**: Chemistry

**Course Co-ordinator**: Prof P Chiu, Chemistry (pchiu@hku.hk)

**Teachers Involved**: Prof P Chiu, Chemistry

**Course Objectives**: To introduce aspects of modern organic reactions with relevance to and in the context of the synthesis of natural products, drugs and medicinal chemistry to provide an integrated approach to the subject, and to provide training in advanced organic laboratory skills, and further hands-on experience in synthesis and characterization, as preparation for graduate studies or research in organic chemistry.

**Course Contents & Topics**

- Building on the organic chemistry covered in the foundational courses CHEM1003 and CHEM2402, this course will present modern synthetic methods and synthetic planning. The course is organized into units based on target drug molecules. In each unit, the chemical biology of these compounds are briefly presented and the syntheses of these molecules are introduced, accompanied by in-depth discussions of the reactions involved with emphasis on their mechanisms, selectivity, stereochemistry, scope and limitations. Concept of synthetic design including retrosynthetic analysis, stereoselectivity and enantioregulatory control elements will be emphasized. A laboratory section provides training in the practical skills of synthesis.

**Course Learning Outcomes**

- On successful completion of this course, students should be able to:
  - CLO 1: understand the rationale, selectivities, and mechanisms of various reactions and reagents in organic chemistry
  - CLO 2: able to solve mechanistic and synthetic chemistry problems
  - CLO 3: perform organic synthesis experiments at an increased level of technical difficulty, using additional skills in experimental design and execution, spectroscopic analysis, and reporting of results
  - CLO 4: integrate lecture material and literature search, to learn chemistry independently
Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities
- Activities: Details
  - Lectures: Laboratory
  - Reading / Self study: 25

Assessment Methods and Weighting
- Methods: Details
  - Examination: 65
  - Laboratory reports: 25
  - Test: 10

Weighting in final course grade (%)
- Examination: CLO 1,2
- Laboratory reports: CLO 1,2
- Test: CLO 3,4

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 glycochemistry and tools and techniques in chemical biology.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 understand chemical biology approaches in studying biology
CLO 2 give examples of how to use chemical methods to produce natural biomolecules and new biomolecules with altered functions
CLO 3 compare chemical biology and traditional biology approaches in drug discovery

Pre-requisites and Co-requisites
Pass in CHEM3441; or Pass in CHEM3441 (without lab component) and CHEM3443

Offer in 2016 - 2017
- Grade Descriptors (A+ to F)
  - 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. Apply highly effective organizational and presentational skills. Insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly.
  - B: 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. 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 most familiar situations. Apply moderately effective organizational and presentational skills. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly.
  - D: 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. 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 understanding of concepts, principles, reactions and mechanisms related to synthetic organic chemistry. Show evidence of a limited ability to integrate knowledge and theory, and a limited ability to analyze familiar situations and problems. Show some correct but erroneous use of knowledge to apply to the solution of most familiar problems. Demonstrate partially effective organization and application of lab skills and techniques in synthetic experiments.

Additional Course Information
Laboratory classes are mandatory. Students must complete ALL experiments and laboratory reports to pass this course.
### CHEM4541
**Physical chemistry III: statistical thermodynamics and kinetics theory (6 credits)**

**Offering Department**: Chemistry  
**Course Co-ordinator**: --, Chemistry  
**Teachers Involved**: --, Chemistry

**Course Objectives**
The course presents fundamental principles and topics on statistical thermodynamics and kinetic theory in order to provide a solid foundation for students intending to further their studies in physical chemistry and related fields.

**Course Contents & Topics**
Principles of Statistical Thermodynamics  
- Thermodynamic laws  
- Ensembles and partition functions: microcanonical, canonical and grand-canonical  
- Systems of independent molecules: ideal gas  
- Molecular degrees of freedom: translation, rotation, vibration, and electronic  
- Ideal gas mixture: chemical equilibrium, binding, and titration  
- Lattice statistics: Ising model and phase transition  
- Quantum statistics  
- Chemical equilibrium and kinetics theory  
- Rate theory: collision theory, transition state theory

**Course Learning Outcomes**
On successful completion of 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 CHEM3541

**Offer in 2016 - 2017**: N  
**Examination**: ---

**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 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.

**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>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 on class quizzes &amp; assignments</td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**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.

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### CHEM4542
**Computational chemistry (6 credits)**

**Offering Department**: Chemistry  
**Course Co-ordinator**: Prof G H Chen, Chemistry  
**Teachers Involved**: Prof W Zhuang, Chemistry

**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.

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

Pass in CHEM4541 or PHYS3351

- Offer in 2016 - 2017
  - Grade Descriptors (A+ to F)
  - A: Mastery of advanced knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Evidence of analytical and critical abilities and logical thinking, with strong ability to apply knowledge to practical problems in physical chemistry.
  - B: Substantial command of a broad range of knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Evidence of analytical and critical abilities and logical thinking, with strong ability to apply knowledge to practical problems in physical chemistry.
  - C: Command of knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Evidence of some analytical and critical abilities and logical thinking, with ability to apply knowledge to familiar problems in physical chemistry. Strong analytical and critical abilities and logical thinking, with strong ability to apply knowledge to practical problems in physical chemistry.
  - D: Partial but limited command of knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Evidence of some analytical and critical abilities and logical thinking, with limited ability to apply knowledge to practical problems in physical chemistry.
  - Fail: Little or no evidence of command of knowledge on following topics: density-functional theory, Kohn-Sham equation, time-dependent density-functional theory, open system, molecular dynamics, force field, and quantum mechanics/molecular mechanics. Lack of analytical and critical abilities and logical thinking, with very little or no ability to apply knowledge to practical problems in physical chemistry.

Lecture with laboratory component course

- Activities Details No. of Hours
  - Lectures
  - Laboratory lab sessions 6x4 hours of computational laboratory
  - Tutorials
  - Reading / Self study

- 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 (continuous assessment)</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Attila Szabo & Neil S. Ostlund: Modern Quantum Chemistry (1st ed.)
J. M. Haile: Molecular Dynamics Simulation
Andrew R. Leach: Molecular Modelling - Principles and Applications

- Required/recommended reading and online materials

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.

- Additional Course Information

The 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 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 2016 - 2017
  - Grade Descriptors (A+ to F)
  - A: 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.
  - B: Substantial command of a broad range of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Evidence of analytical and critical abilities and logical thinking, with ability to apply knowledge to practical problems in physical chemistry.
  - C: 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 ability to apply knowledge to familiar problems in physical chemistry.
  - D: 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 coherent analytical and critical abilities and logical thinking, with limited ability to apply knowledge to practical problems in physical chemistry.
  - Fail: Little or no evidence of command of knowledge on following topics: variation method in quantum mechanics, Hartree-Fock method, perturbation theory, advanced statistical thermodynamics, reaction dynamics. Lack of analytical and critical abilities and logical thinking, with very little or no ability to apply knowledge to practical problems in physical chemistry.

- Course Type

Lecture-based course
### CHEM4910: Chemistry literacy and research (6 credits)

**Offering Department:** Chemistry  
**Quota:** ---  
**Course Co-ordinator:** Dr X Li, Chemistry (xiangli@hku.hk)  
**Teachers Involved:** Various teachers in the Department, Chemistry  
**Course Objectives:** 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.  
**Course Contents & Topics:** 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. Thelaboratory-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:** 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.  
**Offer in 2016 - 2017:** Y 2nd sem Offer in 2017 - 2018: Y  
**Examination:** No Exam  
**Methods to CLO Mapping**  
<table>
<thead>
<tr>
<th>CLO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CLO 1: demonstrate knowledge of academic databases and search engines of chemistry literature</td>
</tr>
<tr>
<td>2</td>
<td>CLO 2: understand the terminology and nomenclature associated with their own research project</td>
</tr>
<tr>
<td>3</td>
<td>CLO 3: demonstrate knowledge and understanding of the chemical techniques they used to do the research in their own research project</td>
</tr>
<tr>
<td>4</td>
<td>CLO 4: demonstrate knowledge and understanding of the results of their own research project and its context in the broader research area</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

Assessments Details Weighting in final course grade (%) Assessment Methods to CLO Mapping  
Assignments (continuous assessment) 20 CLO 1,2,3  
Examination 80 CLO 1,2,3  
**Required/recommended reading and online materials**  
- P. W. Atkins: Physical Chemistry  
- Ira N. Levine: Quantum Chemistry (Prentice Hall, 4th ed.)  
- R. C. Tolman: The Principles of Statistical Mechanics  
- R. D. Levine, R. B. Bernstein: Molecular Reaction Dynamics  
**Course Website:** Nil  
**Additional Course Information:** Nil

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### CHEM4911: Capstone experience for chemistry undergraduates: HKUtopia (6 credits)

**Offering Department:** Chemistry  
**Quota:** ---  
**Course Co-ordinator:** Dr A P L Tong, Chemistry (aptong@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.

**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>Lectures</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td>tutorials/discussion 12</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</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.
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:
- CLO 1 observe and evaluate the various issues we are facing with and determine ways in which chemistry can be used to solve the problems.
- CLO 2 integrate theory and practice, and to understand limitations of their current knowledge.
- CLO 3 work in a team and to collaborate with people with different background.
- CLO 4 express scientific ideas effectively in both written and oral forms.
- CLO 5 develop further logical, critical thinking and creativity.
- CLO 6 advocate to others the appreciation for chemistry as to its relevance to our daily life.

Pre-requisites (and Co-requisites and Impermissible combinations)
Students are expected to have satisfactorily completed all introductory chemistry disciplinary core courses and at least 24 credits of advanced level disciplinary core/elective chemistry courses in the Chemistry Major.

Students who are interested in taking the course should contact the course coordinator for application in April - May. Late application may not be considered.

This capstone course is for Chemistry Major students only.

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

No Exam

Course Type
Project-based course

Assessment Methods and Weighting
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral presentation</td>
<td>40% Presentation; 10%</td>
<td>60</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Research report</td>
<td>40% Participation; 10% Peer evaluation</td>
<td>40</td>
<td>CLO 1,2,4,5,6</td>
</tr>
</tbody>
</table>

Course Website
http://www.chemistry.hku.hk/hkutopia/

Additional Course Information
Enrolment of this course is not conducted via the online course selection system and should be made through the relevant Department/School office after approval has been obtained from the course coordinator.

CHEM4966
Chemistry internship (6 credits)

Academic Year
2016

Offering Department
Chemistry

Quota
---

Course Co-ordinator
Dr H Y Au-Yeung, Chemistry (hoyuay@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 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
- 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 students only.

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

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.

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CHEM4999 | Chemistry project (12 credits) | Academic Year | Quota
--- | --- | --- | ---
Offering Department | Chemistry | 2016 | ---
Course Co-ordinator | Dr J Y Tang, Chemistry (jinyao@hku.hk) | --- | ---
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 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 knowledge and understanding of the results of their own chemical 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. | --- | ---
Offer in 2016 - 2017 | Y | 1st sem | 2nd sem | Summer | Offer in 2017 - 2018 | Y | Examination | No Exam
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. Composite 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 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. | --- | --- |
| Failure | 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
Activities | Details | No. of Hours
--- | --- | ---
Reading / Self study | 8 hours per week for 24 weeks or longer discussions & meetings | 192

Assessment Methods and Weighting
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping
--- | --- | --- | ---
Dissertation | including a written report and an oral presentation | 100 | CLO 1,2,3

Required/recommended reading and online materials
Specialist texts dependant on the selected topic.

Additional Course Information
Third year students with exceptional academic achievement may also apply for this course
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Academic Year</th>
<th>Quota</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC9001</td>
<td>Practical Chinese for science students (6 credits)</td>
<td>2016</td>
<td></td>
</tr>
</tbody>
</table>

**Offering Department**
Chinese

**Course Co-ordinator**
Mr K W Wong, Chinese  
(kswongb@hkusua.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**
- Grammar & vocabulary of modern Chinese  
- The Chinese writing system  
- Techniques of writing short messages: good-news and goodwill messages, bad-news messages, and persuasive messages  
- Techniques of writing electronic documents: emails; presentations  
- Styles and rhetoric of reader-based reports, proposals and presentations

**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 2016 - 2017**
Y 1st sem 2nd sem  Offer in 2017 - 2018 : Y

**Grade Descriptors (A+ to F)**
A  The student acquired a superb ability to achieve the intended learning outcomes of the course at all levels of learning: describe, apply, evaluate, and synthesize the language techniques for effective communication in all situations.
B  The student acquired the ability to achieve the intended learning outcomes of the course at all levels of learning: describe, apply, evaluate, and synthesize the language techniques for effective communication in most situations.
C  The student acquired adequate ability to achieve the intended learning outcomes of the course at low levels of learning (i.e. describe and apply the language techniques for effective communication) but not at high levels of learning (i.e. evaluate and synthesize the language techniques for effective communication).
D  The student only has basic familiarity with the subject.
Fail  The student has very limited familiarity with the subject.

**Course Type**
Lecture-based course

**Course Teaching & Learning Activities**
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Tutorials</td>
<td>Small group tutorials</td>
<td>12</td>
</tr>
<tr>
<td>Group work</td>
<td>Workshops</td>
<td>24</td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Reading/self study (20 hours) and preparation (12 hours)</td>
<td>32</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Self-access &amp; online exercises (40%) and Tutorial discussion (10%)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
- 汪麗芳，1998年，《漢語修辭》，上海：上海大學出版社。  
- 李家樹，1994年，《漢語的特性和運用》，香港：香港大學出版社。  
- 吳耀聲，1996年，《中文應用寫作教程》，香港：三聯書店。  
- 2000年，《現代應用漢語大全》，香港：商業印書館。  
- 汪麗芳，1998年，《漢語寫作》，上海：上海大學出版社。  
- 2001年，《中文修辭：修辭學》，香港：商業印書館。  
- 習慣和應用，1998年，《中文應用寫作教程》，香港：三聯書店。  
- 2000年，《現代應用漢語大全》，香港：商業印書館。  
- 汪麗芳，1998年，《漢語寫作》，上海：上海大學出版社。  
- 2001年，《中文修辭：修辭學》，香港：商業印書館。  
- 習慣和應用，1998年，《中文應用寫作教程》，香港：三聯書店。
Department of Earth Sciences

**EASC1020**

**Introduction to climate science (6 credits)**

**Offering Department**  Earth Sciences  
**Academic Year**  2016  
**Quota**  ---  

**Course Co-ordinator**  Dr Z H Liu, Earth Sciences  
**Teachers Involved**  Dr S H Li, 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**

NIL

**Required/recommended reading and online materials**

Robert V. Rohli and Anthony J. Vega: Climatology (Jones and Bartlett Publishers, 2006)

**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 some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Demonstrate mostly correct but some erroneous use of data and results to draw appropriate conclusions. Show use of relevant information from sources and ability to make comparisons between different interpretations and to quote/reference aptly.

D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent 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**

<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>25</td>
<td>CLO 2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td>25</td>
<td>CLO 1,4</td>
<td></td>
</tr>
</tbody>
</table>

**Offer in 2016 - 2017**

Y  2nd sem  Offer in 2017 - 2018 : Y  
Examination  May  

Department of Earth Sciences
This course is an introduction to fundamental principles and concepts in geology. It covers a range of topics including:

- 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: describe the overall structure of the earth and the key external and internal processes
- CLO 2: explain the major geological phenomena in the context of plate tectonics theory
- CLO 3: name the major events in earth's history
- CLO 4: describe the methods in geological dating
- 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 2016 - 2017

Y 1st sem 2nd sem Offer in 2017 - 2018 : Y

Graduate 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 limited knowledge of the overall structure of the earth and the key external and internal processes

B

Demonstrate substantial command of knowledge / competencies/skills at an Earth Science introductory level required for attaining most of the course learning outcomes. Shows limited knowledge of the overall structure of the earth and the key external and internal processes

C

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 as well as organizational skills to present observations made mostly correct but with some erroneous use and results to draw appropriate conclusions.

D

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 limited observational and presentational skills. Ineffective presentation of observed details and facts and unable 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 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.

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</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>20</td>
<td>CLO 1,2,4</td>
</tr>
<tr>
<td>Project report</td>
<td>Field project report</td>
<td>30</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Quizzes</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Murphy, B and Damian N.: Earth Science Today (1999)

EASC1402 Principles of geology (6 credits)

Offering Department Earth Sciences

Quota --

Offering Year 2016

Course Co-ordinator Prof M Sun, Earth Sciences (minsun@hku.hk)

Teachers Involved Prof M Sun, Earth Sciences Dr J A King, Earth Sciences

Course Objectives

This course is an introduction to fundamental principles and concepts in geology.
**Course Type**
Lecture with laboratory component course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>12 sessions x 2 hours</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>laboratory practical on rocks and minerals, earthquakes, fossil identification</td>
<td>16</td>
</tr>
<tr>
<td>Field work</td>
<td>1 field trip</td>
<td>8</td>
</tr>
<tr>
<td>Group work</td>
<td>1 group project with presentation</td>
<td>4</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

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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>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>Practical reports</td>
<td>25</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Project report</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

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**EASC1403**
**Geological heritage of Hong Kong (6 credits)**

**Offering Department**
Earth Sciences

**Course Co-ordinator**
Prof M F Zhou, Earth Sciences (mfzhou@hku.hk)

**Teachers Involved**
Prof M F Zhou, Earth Sciences, Dr X R Zuo, Earth Sciences

**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**
NIL

**Grade Descriptors (A+ to F)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough understanding at an advanced level of extensive knowledge and skills with evidence for attaining all the course learning objectives. Show strong analytical and critical abilities and logical thinking. Evidence of original thoughts, excellent field observation and ability to solve problems. Highly effective organization and presentation skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial understanding at an advanced level of extensive knowledge and skills with evidence for attaining all the course learning outcomes. Show analytical and critical abilities and logical thinking. Evidence of original thoughts and abilities of field observation. Effective organization and presentation skills.</td>
</tr>
<tr>
<td>C</td>
<td>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.</td>
</tr>
<tr>
<td>D</td>
<td>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 presentation skills.</td>
</tr>
</tbody>
</table>

| Fail  | No or little knowledge about the subject. No evidence for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Very little or no ability for field observation and for solving problems. Poor organization and presentational skills. |

**Offer in 2016 - 2017**
Y 2nd sem Offer in 2017 - 2018: Y

**Examination**
May

**EASC1404**
**Early life on earth (6 credits)**

**Offering Department**
Earth Sciences

**Academic Year**
2016

**Quota**
50
**Course Co-ordinator:** TBC, Earth Sciences

**Teachers Involved:** Dr S H Li, Earth Sciences

### 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
NIL

### 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>
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<tr>
<th>Methods</th>
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<th>Weighting in final course grade (%)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>1 midterm, group presentations, short-paper</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written examination</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
Sections from: Mason, S.F.: Chemical Evolution (Oxford University Press, 1991)

**EASC1405**

**Title:** Peaceful use of nuclear technologies (6 credits)

**Offering Department:** Earth Sciences

**Course Co-ordinator:** Dr S H Li, Earth Sciences (shli@hku.hk)

**Teachers Involved:** Dr S H Li, Earth Sciences

### Course Objectives
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 2016 - 2017

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<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 the ability to apply his/her knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Y Offer in 2017 - 2018: Y</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, with evidence of original thought, and the ability to apply his/her knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>N Examination</td>
<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 his/her knowledge to a range of problems in the field of &quot;origins of life&quot;. Shows the ability to apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>N Offer in 2017 - 2018: N</td>
<td>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 &quot;origins of life&quot; field. Shows the ability to apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>A Examination--</td>
<td>E 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 &quot;origins of life&quot;. Shows the ability to apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>A Examination--</td>
<td>F 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.</td>
</tr>
</tbody>
</table>

**EASC1405:**

**Title:** Peaceful use of nuclear technologies (6 credits)

**Offering Department:** Earth Sciences

**Course Co-ordinator:** Dr S H Li, Earth Sciences (shli@hku.hk)

**Teachers Involved:** Dr S H Li, Earth Sciences

### Course Objectives
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 2016 - 2017

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<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 the ability to apply his/her knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Y Offer in 2017 - 2018: Y</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, with evidence of original thought, and the ability to apply his/her knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>N Examination</td>
<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 his/her knowledge to a range of problems in the field of &quot;origins of life&quot;. Shows the ability to apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>N Offer in 2017 - 2018: N</td>
<td>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 &quot;origins of life&quot; field. Shows the ability to apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>A Examination--</td>
<td>E 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 &quot;origins of life&quot;. Shows the ability to apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>A Examination--</td>
<td>F 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.</td>
</tr>
</tbody>
</table>

**EASC1405:**

**Title:** Peaceful use of nuclear technologies (6 credits)

**Offering Department:** Earth Sciences

**Course Co-ordinator:** Dr S H Li, Earth Sciences (shli@hku.hk)

**Teachers Involved:** Dr S H Li, Earth Sciences

### Course Objectives
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 2016 - 2017

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
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</tr>
</thead>
<tbody>
<tr>
<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 the ability to apply his/her knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Y Offer in 2017 - 2018: Y</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, with evidence of original thought, and the ability to apply his/her knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>N Examination</td>
<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 his/her knowledge to a range of problems in the field of &quot;origins of life&quot;. Shows the ability to apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>N Offer in 2017 - 2018: N</td>
<td>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 &quot;origins of life&quot; field. Shows the ability to apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>A Examination--</td>
<td>E 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 &quot;origins of life&quot;. Shows the ability to apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>A Examination--</td>
<td>F 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.</td>
</tr>
</tbody>
</table>
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

Fail

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.

D

Assessment Method and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Group activities and reports</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour</td>
<td>50</td>
<td>CLO 1,2,4</td>
</tr>
<tr>
<td>Project reports</td>
<td>Individual Report</td>
<td>20</td>
<td>CLO 1,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

To be announced

EASC2401 Fluid/solid interactions in earth processes (6 credits)  Academic Year 2016

Offering Department  Earth Sciences  Quota --

Course Co-ordinator  Dr K H Lemke, Earth Sciences (kono@hku.hk)

Course Objectives  This course provides an overview of the physical and chemical principles that govern Earth processes

Course Content & Topics  List topics with approximate number of weeks

- 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 thermodynamics as applied to the Earth Sciences
CLO 2 use phase diagrams to explain processes of fluid/solid interactions
CLO 3 describe how energy is exchanged throughout the Earth System
CLO 4 demonstrate an understanding of the kinetics of geochemical reactions
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 2016 - 2017  Grade Descriptors (A+ to F)

Y 2nd sem  Offer in 2017 - 2018 : Y  Examination  May

A  Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type  Lecture with laboratory component course

Course Teaching & Learning Activities  Activities Details No. of Hours

Lectures  12 sessions x 2 hour  24
Laboratory  paper exercises  24
Reading / Self study  100

Assessment Methods and Weighting  Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments  60 CLO 1,2,3,4,5
Examination  40 CLO 1,2,3,4,5

Required/recommended reading and online materials  Kinetics of Water-Rock Interaction (2007) - Brantley, Kubicki & White (Editors).
EASC2402 | Field methods (6 credits) | Academic Year 2016
---|---|---
Offering Department | Earth Sciences | Quota
Course Co-ordinator | Dr P Bach, Earth Sciences (pabach@hku.hk) | 35
Teachers Involved | Dr P Bach, Earth Sciences
Course Objectives | This course is hands-on field and class-based that introduces basic geological field and mapping techniques and the use of geological equipment and air photographs, an overview of the geology of Hong Kong.
Course Contents & Topics | - Maps and map reading, map reference system (1 week)
| - Interpretation of geological maps: topographic and geological cross sections, geological structures from outcrop patterns and structural contour lines (horizontal, inclined strata, folded, and faulted strata, unconformities) (3 weeks)
| - Interpretation and use of air photographs (1 week)
| - Geological field techniques and equipment, field observation and description of rocks and outcrops (7 field days)
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 | demonstrate techniques for basic field observations, measurements and identifications
| CLO 3 | create and interpret an internally consistent geological map from a set of collected field observations and data
| 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
Offer in 2016 - 2017 | Y | 1st sem
Grade Descriptors (A+ to F) | A | Y | Examination | Dec
| B | C | D | Fail
Methods Details | A | B | C | D
Field work | 5-day field camp & 2 day trips | 56
Lab Assignments | 10
Test | 20
Assignments | Lab Assignments | 10 | CLO 1,2
Report | Field Work Assessment | 70 | CLO 2,3,4,5
Test | | | CLO 1,2
Required/recommended reading and online materials | Comprehensive Course Notes provided.
EASC2404 | Introduction to atmosphere and hydrosphere (6 credits) | Academic Year 2016
---|---|---
Offering Department | Earth Sciences | Quota
Course Co-ordinator | Dr J R Ali, Earth Sciences (jrali@hku.hk) | 50
Teachers Involved | Dr J R Ali, Earth Sciences Prof P P C Wu, 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); Geophysical 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 processes that cause climate change and the effects of climate change, and be able to critically evaluate the role of human activities in climate change.
**Earth Sciences**

**Course:** EASC2406 Geochemistry (6 credits)

**Offering Department:** Earth Sciences

**Course Co-ordinator:** Dr S H Li, Earth Sciences (shli@hku.hk)

**Course Objectives:**
This course provides an understanding of the fundamentals and approaches for geochemical analysis. It introduces students to the basic chemical principles, modern techniques and quantitative analysis for studying the earth.

**Course Contents & Topics:**
- Physical and chemical state of the earth,
- Differentiation of and cosmic abundance of elements,
- Aqueous solutions and chemistry of natural water,
- Trace element,
- Chemistry of igneous rocks,
- Chemical controls on soil formation,
- Radiogenic isotope geochemistry,
- Stable isotope geochemistry,
- Oxidation and reduction,
- Chemical weathering

**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 EASC1401 or EASC1402

**Teachers Involved:**
Dr S H Li, Earth Sciences

**Course Type:** Lecture with laboratory component course

**Assessment Methods and Weighting:**
- **Assignments:** 20
- **Essay:** 25
- **Examination:** 50
- **Presentation:** 5

**Required/recommended reading and online materials:**
Tom S. Garrison: Oceanography: An Invitation to Marine Science
Frederick K. Lutgens and Edward J. Tarbuck: The Atmosphere: An Introduction to Meteorology
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking, and ability to apply minimally effective or ineffective lab skills and techniques to solve problems. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities

<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>
</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>Assignments</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</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)

| Academic Year | 2016 |

### Offering Department
Earth Sciences

<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Prof M Sun, Earth Sciences (<a href="mailto:minsun@hku.hk">minsun@hku.hk</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>Prof M Sun, Earth Sciences Dr Y Li, Earth Sciences</td>
</tr>
</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 crystalization, mineral chemistry
- Mineral symmetry, Miller indices
- Physical properties of minerals
- Mineral composition, structure and classification
- Identification of rock forming minerals-hand specimens
- Use of petrographic microscope
- Optical properties under plane polarized light
- Optical properties under orthoscopic illumination
- Optical properties under conoscopic illumination
- Identification of rock forming minerals-thin sections
- Precious minerals
- Chemical variations of minerals
- Trace elements
- Instrument analysis for 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 and chemical properties used in identification of rock-forming mineralogy and mineral structure
- CLO 3 describe the principle of optical mineralogy
- CLO 4 identify the common rock-forming minerals in hand specimens and thin sections
- CLO 5 understand some principles of mineral chemistry

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in EASC1402

### Offer in 2016 - 2017
Y 1st sem  Offer in 2017 - 2018 : Y

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Demonstrate extensive knowledge and skills at an advanced level required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply highly effective lab skills and techniques to solve problems. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply effective lab skills and techniques to solve problems. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply moderately effective lab skills and techniques to solve problems. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities, and limited ability to apply partially effective lab skills and techniques to solve problems. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking, and ability to apply minimally effective or ineffective lab skills and techniques to solve problems. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

### Fall
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking, and ability to apply minimally effective or ineffective lab skills and techniques to solve problems. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective. 

### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>12 sessions x 2 hours</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>12 sessions x 2 hours</td>
<td>24</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>
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<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
EASC2408  
**Planetary geology** (6 credits)  
**Academic Year**: 2016  
**Offering Department**: Earth Sciences  
**Course Co-ordinator**: Dr M H Lee, Earth Sciences (mhlee@hku.hk)  
**Teachers Involved**: Dr J R Ali, 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 (and Co-requisites and Impermissible combinations)**:  
Pass in EASC1401 or EASC1402 or PHYS1650  
**Offer in 2016 - 2017**: Y  
**Grade Descriptors (A+ to F)**:  
A: Demonstrate thorough mastery of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.  
B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.  
C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.  
D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.  
Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.  
**Course Type**: Lecture with laboratory component course  
**Course Teaching & Learning Activities**:  
<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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</tr>
<tr>
<td>Laboratory</td>
<td>12 sessions x 2 hours</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>
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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></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**:  

EASC2409  
**Regional field studies** (6 credits)  
**Academic Year**: 2016  
**Offering Department**: Earth Sciences  
**Course Co-ordinator**: Dr J R Ali, Earth Sciences (jrali@hku.hk)  
**Teachers Involved**: Dr J R Ali, Earth Sciences  
**Course Objectives**:  
This course is field-based and introduces geology of China, Taiwan and/or regions in the vicinity of Hong Kong through hands on studies and field excursions. The course is compulsory for majors in Geology (accredited pathway)  
**Course Contents & Topics**:  
The course will introduce the following topics:  
- Geological studies in Southern China and/or Taiwan  
- Geological history of S. China & 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  
- 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 and 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  
**Pass in EASC1401 or EASC1402; and consent of course coordinator**
<table>
<thead>
<tr>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Offer in 2016 - 2017</th>
<th>Grade Descriptors (A+ to F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Y 1st sem</td>
<td>Offer in 2017 - 2018 : Y</td>
</tr>
<tr>
<td>Course Type</td>
<td>Field camps</td>
<td></td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Activities</td>
<td>Details</td>
</tr>
<tr>
<td></td>
<td>Field work</td>
<td>15 days</td>
</tr>
<tr>
<td></td>
<td>Reading / Self study</td>
<td></td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
</tr>
<tr>
<td></td>
<td>Report</td>
<td></td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>Comprehensive course notes provided</td>
<td></td>
</tr>
<tr>
<td>Additional Course Information</td>
<td>Due to planning issues, priority is given to students doing the Geology majors. The Taiwan trip will be in early January of each year, the Wuhan trip will start in early June of each year.</td>
<td></td>
</tr>
</tbody>
</table>

**EASC3020**

Global change: anthropogenic impacts (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Earth Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr Z H Liu, Earth Sciences (<a href="mailto:zhliu@hku.hk">zhliu@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr Z H Liu, Earth Sciences</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course will explore the role of humans in global changes and the environmental responses to such changes. Causes and impacts of climate change will be discussed.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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</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 recognise the complexity of global climate systems</td>
</tr>
<tr>
<td></td>
<td>CLO 2 recognise the controversy of anthropogenic global warming</td>
</tr>
<tr>
<td></td>
<td>CLO 3 identify modern environmental issues</td>
</tr>
<tr>
<td></td>
<td>CLO 4 assess the credibility of various scientific arguments</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in EASC2404 or ENVS2001</td>
</tr>
<tr>
<td>Offer in 2016 - 2017</td>
<td>Y 1st sem</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</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. 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>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>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.</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. 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>

**Course Type**

Lecture-based course

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lectures</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project work</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tutorials</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discussion</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reading / Self study</td>
<td>48</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></td>
<td>Essay</td>
<td>Coursework Assessment</td>
<td>25</td>
<td>CLO 1.2,4</td>
</tr>
<tr>
<td></td>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>50</td>
<td>CLO 1,2,4</td>
</tr>
<tr>
<td></td>
<td>Project report</td>
<td>25</td>
<td>CLO 2.3,4</td>
<td></td>
</tr>
</tbody>
</table>
### EASC3402: Petrology (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Earth Sciences</th>
<th>Academic Year</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof G Zhao, Earth Sciences (<a href="mailto:gzhao@hku.hk">gzhao@hku.hk</a>)</td>
<td>Quota</td>
<td>---</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof G Zhao, Earth Sciences</td>
<td>Prof M Sun, Earth Sciences</td>
<td>Dr M Pittman, Earth Sciences</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Course Contents & Topics | - Magma and magmatism; textures and structures of igneous rocks, classification of igneous rocks, including volcanism and plutonism.  
- Basic igneous rocks  
- Intermediate igneous rocks  
- Acid igneous rocks  
- Sedimentary diagenesis, classification of sedimentary rocks; textures and structures of sedimentary rocks.  
- Clastic sedimentary rocks: conglomerate and sandstone, siltstone and mudstone  
- Biochemical sedimentary rocks: limestone and dolostone  
- Metamorphism; controlling factors of metamorphism; textures and structures of metamorphic rocks; classification of metamorphic rocks  
- Meta-pelitic rocks  
- Meta-basic rocks  
- Meta-carbonate rocks and meta-felsic rocks |
| Course Learning Outcomes | On successful completion of this course, students should be able to:  
CLO 1 identify major igneous rocks and their textures and structures in both hand specimens and under microscope  
CLO 2 identify major sedimentary rocks and their textures and structures in both hand specimens and under microscope  
CLO 3 identify major metamorphic rocks and their textures and structures in both hand specimens and under microscope  
CLO 4 make full description and write report on the above rock types |
| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in EASC2407 |
| Grade Descriptors (A+ to F) | A | Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations.  
B | Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations.  
C | Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations.  
D | Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. |
| 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. |
| Course Type | Lecture with laboratory component course |
| Course Teaching & Learning Activities | | | |
| Lectures | 12 sessions x 2 hours | No. of Hours | 24 |
| Laboratory | specimen descriptions & thin-section observations under microscope | | 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 | Harvey Blatt and Robert J. Tracy, Petrology (Second Edition; W.H. Freman and Company, New York) |

### EASC3403: Sedimentary environments (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Earth Sciences</th>
<th>Academic Year</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Dr J A King, Earth Sciences (<a href="mailto:jessking@hku.hk">jessking@hku.hk</a>)</td>
<td>Quota</td>
<td>---</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr J A King, Earth Sciences</td>
<td>Dr N R McKenzie, Earth Sciences</td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course discusses the origin, diagenesis, classification and economic importance of sedimentary rocks. Students will learn features and processes of sedimentary geology, paleontology and depositional processes.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Course Contents & Topics | - Overview of sedimentary geology  
- Physics of erosion, transportation and sedimentation  
- Sedimentary structures  
- Depositional environments (non-marine)  
- Depositional environments (marine)  
- Sequence stratigraphy  
- Basin analysis  
- Sedimentary environment around Hong Kong  
- Sedimentary environment on Mars |
| Course Learning Outcomes | On successful completion of this course, students should be able to:  
CLO 1 describe the nature and significance of sedimentary features and structures  
CLO 2 identify carbonate and siliciclastic rocks in hand sample  
CLO 3 describe the facies in a depositional environment |
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>6 sessions x 2 hours</td>
<td>12</td>
</tr>
<tr>
<td>Field work</td>
<td>1 day trip with field project</td>
<td>8</td>
</tr>
<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>
</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>40</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Mid-term examination</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Sedimentology and Stratigraphy (Second Edition), Gary Nichols

EASCC3404
Structural geology (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Dr J R Ali, Earth Sciences (jrali@hku.hk)

Teachers Involved
Dr J R Ali, Earth Sciences
Dr A A G Webb, Earth Sciences

Course Objectives
The course covers the mechanical properties of rocks and how and why rocks deform, geological maps and their use in interpreting structure.

Course Contents & Topics
- Stress, strain, stress-strain relation, Mohr circle techniques;
- Strain types;
- Stereons;
- Faults: strike-slip faults, dip-slip faults and thrusts;
- Joints;
- Extensional structures, listric faults;
- Folds; Satellite folds;
- Shear Zones;
- Fabrics (foliations, lineations);
- Pressure solution cleavages;
- Microscopic deformation, Dislocations;
- Structurally focused map interpretation;
- Key Structures in HK.

Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 understand a moderate level rock deformation
- CLO 2 interpret structural data from a geology map
- CLO 3 plot and interpret structural data on a stereonet
- CLO 4 appreciate 3D rock and 4D rock-time relationships

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in EASC2402 or EASC3402

Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Thorough grasp of the subject; evidence of strong critical abilities and logical thinking; apply knowledge to a wide range of complex, familiar and unfamiliar situations; highly effective fieldwork skills and techniques; critical use of data and results to draw appropriate and insightful conclusions; integration of the full range of appropriate theories, principles, evidence and techniques.</td>
</tr>
<tr>
<td>B</td>
<td>Substantial grasp of the subject; evidence of critical abilities and logical thinking; apply knowledge to familiar and some unfamiliar situations; effective fieldwork skills and techniques; correct use of data and results to draw appropriate conclusions; general integration of theories, principles, evidence and techniques.</td>
</tr>
<tr>
<td>C</td>
<td>General but incomplete grasp of the subject; evidence of some critical abilities and logical thinking; apply knowledge to most familiar situations; moderately effective fieldwork skills and techniques; mostly correct but some erroneous use of data and results to draw appropriate conclusions; some partial integration of theories, principles, evidence and techniques.</td>
</tr>
<tr>
<td>D</td>
<td>Limited grasp of the subject, retention of some relevant information of the subject; evidence of limited critical abilities; limited ability to apply knowledge to solve problems; partially effective fieldwork skills and techniques; limited ability to use data and results to draw appropriate conclusions; limited integration of theories, principles, evidence and techniques.</td>
</tr>
<tr>
<td>Fail</td>
<td>Little or no grasp of the knowledge and understanding of the subject; little or no evidence of critical abilities and coherent thinking; very little or no ability to apply knowledge to solve problems; minimally effective fieldwork skills and techniques; misuse of data and results and/or unable to draw appropriate conclusions; little or no inapt integration of 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>eleven 2-hour sessions</td>
<td>22</td>
</tr>
<tr>
<td>Laboratory</td>
<td>stereonets, map interpretation with a structural focus</td>
<td>22</td>
</tr>
</tbody>
</table>
Course Objectives
This course provides an introduction to the methods and applications of remote sensing for measuring, from a distance with instruments carried by satellites or aircraft, the spectral features of the earth's surface and atmosphere for inferring the nature and characteristics of the land, vegetation, seasurface and atmosphere and for solving environmental problems.

Course Contents & Topics
1. Basic principles of remotesensing
2. Key remote sensing platforms, sensors and their purposes
3. Image processing, analysis, evaluation and interpretation
4. Integration with environmental geographic information systems
5. Applications of remote sensing for environmental management

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 BIOL2306 or EASC2404 or ENVS2001 or ENVS2002

Offer in 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : Y

Grade Descriptors (A+ to F)

A
Demonstrate thorough mastery of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

B
Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Correct use of data and results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C
Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities, and limited ability to apply knowledge to solve problems. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fail
Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show little or no ability to apply knowledge to solve problems. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture with laboratory component course

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
768 pages
January 2015

EASC3405
Environmental remote sensing (6 credits)

EASC3406
Reconstruction of past climate (6 credits)
This course provides students with an understanding of how dynamic earth is and how it has changed over the last 2.6 million years. This course introduces the theory and methods of climate reconstructions.

**Course Contents & Topics**

The Quaternary period (1),
Climate changes in the last 2.6 million years (1),
Driven forces of climate change (1),
Quantitative reconstruction methods (1),
Pollen analysis and biological proxies (2),
Climate change in arid regions (1),
Quaternary geochronology (1),
Climate changes in East Asia (1),
Climate change impacts on human evolution and society (1),
Global warming and future climate change (1),
Climate change in Asia and Europe

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 understand the earth climate change during last 2.6 million years
- CLO 2 understand the driving forces of climate changes in different scales
- CLO 3 learn the methods for paleo-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 2016 - 2017**

N Offer in 2017 - 2018 : 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.
- F Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**

Lecture 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>
<td>90</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></td>
<td>50</td>
<td>CLO 1,2,3,5</td>
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<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**

Prof P P C Wu, Earth Sciences (ppwu@hku.hk)

**Teachers Involved**

EASC3408

**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 and paleomagnetism, as well as exploration geophysical methods for studying the earth's interior and near subsurface structure.

**Course Contents & Topics**

- Earth’s Dimension and Motion in Space
- Gravity and gravity anomalies
- Isostasy and Geodesy
- Geomagnetism
- Paleomagnetism and rock magnetism
- Thermal Properties of the Earth
- Seismic waves and free oscillations
- Applied Geophysical Methods: seismic method
- Applied Geophysical Methods: Electrical methods
- Application of geophysics in HK

**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

458
Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:

- Lectures: 12 sessions x 2 hours
- Laboratory: 8 paper exercises, 2 field exercises on exploration geophysical methods
- 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></td>
<td>22</td>
<td>CLO 1,2</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>18</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Offering Department: Earth Sciences

Course Co-ordinator: Prof M Sun, Earth Sciences (minsun@hku.hk)

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, A'KF, AFM, etc)
- Metamorphic processes and reactions
- Metamorphic petrogenesis and evolution of pelitic rocks
- Metamorphic petrogenesis and evolution of mafic rocks
- Metamorphism in different tectonic settings; metamorphic pressure-temperature-time (P-T-t) paths and their tectonic implications.

Course Learning Outcomes:

On successful completion of this course, students should be able to:

CLO 1 use rock associations, textures, structures and geochemical characteristics to infer the petrogenesis of major igneous rocks

CLO 2 use magmatic rocks to study the mantle and crustal characteristics

CLO 3 apply mineral assemblages, microtextures, mineral reaction relationships and metamorphic P-T paths to infer the tectonothermal evolution of metamorphic rocks

CLO 4 demonstrate knowledge and understanding of magmatic and metamorphic processes and their cause-and-effect relationships with tectonic settings and crustal evolution

Pre-requisites: Pass in EASC3402

Grade Descriptors (A+ to F):

A  Demonstrate extensive knowledge and skills at an advanced level required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, and ability to apply highly effective lab skills and techniques to solve problems. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply effective lab skills and techniques to solve problems. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply partially 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. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. 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.

Examination: May
course grade (%)

<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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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Additional Course Information

John D Winter: An Introduction to Igneous and Metamorphic Petrology (Prentice Hall, 2001)

EASC3410 Hydrogeology (6 credits) Academic Year 2016

Offering Department Earth Sciences
Course Co-ordinator Prof J J Jiao, Earth Sciences (jiao@hku.hk)
Teachers Involved Prof J J Jiao, Earth Sciences
Course Objectives

This course aims to introduce some basic concepts and theories of groundwater flow with special reference to case studies in HK. It consists of three components: 1) fundamentals of groundwater physics; 2) well hydraulics and evaluation of groundwater as a resource; and 3) influence of groundwater on geotechnical and environmental engineering.

Course Contents & 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
CLO 5 use basic field aquifer tests to estimate some important aquifer parameters

Pre-requisites (and Co-requisites and impermissible combinations)

Pass in EASC2402

Offer in 2016 - 2017

Y 1st sem Offer in 2017 - 2018 : 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 practical problems. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to most practical problems. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to some practical problems. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve practical problems. Apply limited or barely effective organizational and presentational skills.

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 practical problems. Organization and presentational skills are minimally effective or ineffective.

Course Type Lecture with laboratory component course

Course Teaching & Learning Activities Activities Details No. of Hours

Lectures 12 sessions x 2 hours 24
Laboratory 10 x 2 hours 20
Field work Half day field trip 5
Reading / Self study 100

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments 30 CLO 1,2,3,4
Examination 70 CLO 1,2,3,4,5

Required/recommended reading and online materials


EASC3412 Earth resources (6 credits) Academic Year 2016

Offering Department Earth Sciences
Course Co-ordinator Prof M F Zhou, Earth Sciences (mfzhou@hku.hk)
Teachers Involved Prof M F Zhou, Earth Sciences Prof G Zhao, Earth Sciences
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

460
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**

Pass in EASC2402 or EASC3402

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
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<tbody>
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<td>Demonstrate thorough understanding at an advanced level of extensive knowledge and skills with evidence for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking. Evidence of original thoughts, excellent field observation and ability to solve problems. Highly effective organization and presentation skills.</td>
<td>Demonstrate substantial understanding at an advanced level of extensive knowledge and skills with evidence for attaining all the course learning outcomes. Show analytical and critical abilities and logical thinking. Evidence of original thoughts and abilities of field observation. Effective organization and presentation skills.</td>
<td>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.</td>
<td>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 presentation skills.</td>
<td>No or little knowledge about the subject. No evidence for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Very little or no ability for field observation and for solving problems. Poor organization and presentational skills.</td>
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<td>Dec</td>
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<td>Course Type</td>
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<td>Details</td>
<td>Weighting in final course grade (%)</td>
<td>Assessment Methods to CLO Mapping</td>
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<td>CLO 1,2,3,4</td>
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</table>

**EASC3413** Engineering geology (6 credits)

**Offering Department**

Earth Sciences

**Quota**

35

**Course Co-ordinator**

Dr L N Y Wong, Earth Sciences (lnywong@hku.hk)

**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**

On successful completion of this course, students should be able to:

- **CLO 1** appreciate how civil engineering design is carried out and understand the work of the geologist on engineering projects, particularly the economic- and safety-critical duties
- **CLO 2** make simple engineering-geological models and understand how desk study, site reconnaissance survey and ground investigation design should be carried out
- **CLO 3** carry out simple air photo interpretation tasks and elementary soil and rock description and classification for engineering purposes
- **CLO 4** understand major types of slope failures and basic methods to control and mitigate landslides
- **CLO 5** carry out stability analyses using methods such as the limit equilibrium and stereographic projection method

**Pre-requisites**

Pass in EASC3410 and EASC3414, or already enrolled in these courses

This course is only for final year students.

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
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<td>Details</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 and skills to solve a wide range of complex, familiar and unfamiliar practical problems. 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 and skills to solve familiar and some unfamiliar practical problems. 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 and skills to solve most familiar, but not unfamiliar, practical problems. Apply moderately effective organizational and presentational skills.</td>
<td>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 apply knowledge and skills to solve familiar practical problems. Apply limited or barely effective organizational and presentation skills.</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge and skills to practical problems. Organization and presentational skills are minimally effective or ineffective.</td>
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<td></td>
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<td>Laboratory reports</td>
<td>20</td>
<td>CLO 1,2</td>
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</table>
**EASC3414**  
**Soil and rock mechanics (6 credits)**  
**Offering Department:** Earth Sciences  
**Course Co-ordinator:** Prof J J Jiao, Earth Sciences (jjiao@hku.hk)  
**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.  
**Pre-requisites (and Co-requisites and Impermissible combinations):**  
- Pass in EASC3410, or already enrolled in this course  
**Offer in 2016 - 2017:** 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. Apply highly effective organizational and presentational skills.  
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking. Apply effective organizational and presentational skills.  
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking. Apply moderately effective organizational and presentational skills.  
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Apply limited or barely effective organizational and presentational skills.  
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Organization and presentational skills are minimally effective or ineffective.  
**Course Type:** Lecture with laboratory component course  
**Course Teaching & Learning Activities:**  
- **Activities**  
  - Lectures: 24  
  - Laboratory: 20  
  - Reading / Self study: 5  
- **Assessment Methods and Weighting:**  
  - Assignments: 30 (CLO 2,3,4,5)  
  - Examination: 70 (CLO 1,2,3,4,5)  
  - **Method Details:**  
    - Assignments: including field report  
    - Examination:  
- **Required/recommended reading and online materials:**  
  - R. F. Craig: Soil Mechanics (Chapman & Hall, 6th ed.)  

**EASC3415**  
**Meteorology (6 credits)**  
**Offering Department:** Earth Sciences  
**Course Co-ordinator:** Dr Z H Liu, Earth Sciences (zhlui@hku.hk)  
**Teachers Involved:** Dr Z H Liu, Earth Sciences  
**Course Objectives:**  
This course provides students with a modern understanding of weather by examining at an advanced level the processes that govern atmospheric structure and behavior, weather elements, and weather systems.  
**Course Contents & Topics:**  
- Energy budget, radiative forcing, and greenhouse effect; stability, convection, and lapse rates; equation of state and pressure; thermodynamic diagrams; weather charts; Forces, winds, and general circulation; Monsoons, air masses, and fronts; thunderstorms, mid-latitude cyclones, and tropical cyclones; basic equations of the atmosphere; weather forecasting.  
**Pre-requisites (and Co-requisites and Impermissible combinations):**  
- Pass in EASC2404  
**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.)  
**CLO to CLO Mapping:**  
- Assignments: 30 (CLO 1,2,3,4,5)  
- Examination: 70 (CLO 1,2,3,4,5)  
**Course Teaching & Learning Activities:**  
- **Activities**  
  - Lectures: 24  
  - Laboratory: 20  
  - Reading / Self study: 100  
- **Assessment Methods and Weighting:**  
  - Assignments: 30 (CLO 1,2,3,4,5)  
  - Examination: 70 (CLO 1,2,3,4,5)  
  - **Method Details:**  
    - Assignments: including field report  
    - Examination:  

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Offer in 2016 - 2017 | Y | 1st sem | Offer in 2017 - 2018 : 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. Demonstrate critical use of data and results to draw appropriate and insightful conclusions. Show insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly.

B | Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Demonstrate correct use of data and results to draw appropriate conclusions. Show critical use of relevant information from sources and ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly.

C | Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to 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.

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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<tr>
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<tr>
<td>Project work</td>
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<td>Tutorials</td>
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<td>Reading / Self study</td>
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Assessment Methods and Weighting

<table>
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<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Assignments</td>
<td>25</td>
<td>CLO 1, 2, 3</td>
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</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
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<td>CLO 1, 2, 4</td>
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<tr>
<td>Project report</td>
<td>25</td>
<td>CLO 1, 4, 5</td>
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Required/recommended reading and online materials

Roland B. Stull, Meteorology for Scientists and Engineers (Brooks/Cole, 2000).

EASC3416
Advanced geochemistry and geochronology (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Prof M F Zhou, Earth Sciences (mfzhou@hku.hk)
Prof M Sun, Earth Sciences

Course Objectives
To present key concepts of modern geochemistry and their application to environmental and Earth science problems.

Course Contents & Topics
1. Principles of radiogenic isotopic dating and modern instruments
2. Zircon U-Pb isotopic dating and its application
3. Principles and techniques for dating mineral deposits
4. Introduction to Quaternary geochronology
5. Principle, development and applications of Luminescence dating

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 demonstrate knowledge of concepts and ideas of modern geochemistry
CLO 2 explain principles of radiogenic isotopic dating
CLO 3 understand how modern analytical techniques are applied to dating earth materials
CLO 4 understand how geochemical methods are applied to gain insight into process in environmental and Earth sciences

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in EASC2401 or EASC2406 or EASC2407

Offer in 2016 - 2017
N | Offer in 2017 - 2018 : N | Examination | ---

Grade Descriptors (A+ to F)

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 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.

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 geochemistry, and at the same time 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.

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 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.

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 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.

Fail | Student shows the ability to apply limited or barely effective organizational and presentational skills.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
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<th>No. of Hours</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
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</table>
### EASC3417 Earth through time (6 credits)

**Offering Department:** Earth Sciences  
**Quota:** ---  
**Pre-requisites:** Pass in EASC3403

#### 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
- 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

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60 CLO 1,2,3,4</td>
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<td>Presentation</td>
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<td>Project report</td>
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#### Offer in 2016 - 2017

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<tr>
<td>D</td>
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<td>Fail</td>
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**Required/recommended reading and online materials**

Geochemistry by William M. White (Wuley, Apr 1, 2013)

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### EASC3999 Directed studies in earth sciences (6 credits)

**Offering Department:** Earth Sciences  
**Quota:** ---  
**Pre-requisites:** To enhance the student's knowledge of a particular topic and the student's self-directed learning and critical thinking skills.

#### Course Objectives
- 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.

#### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
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<th>Weighting in final course grade (%)</th>
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<td>Presentation</td>
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<td>Project report</td>
<td>20 CLO 1,2,3,4</td>
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**Required/recommended reading and online materials**

Stanley, S. M.: Earth System History (W F Freeman, 2005)
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.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in the Geology or Earth System Science Majors; and Cumulative GPA of 2.5 or above. This course is not a capstone course and students cannot use this course to fulfill the capstone requirement of the Earth System Science and Geology Majors.

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

Offer in 2016 - 2017

<table>
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<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>A</th>
<th>B</th>
<th>C</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 activities and logical thinking.</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 interpretations and to quote/reference aptly. Correct use of data of results to draw appropriate conclusions and solve problems. Apply effective organizational and presentational skills.</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 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>
<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. Apply limited or barely effective organizational and presentational skills.</td>
<td>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.</td>
</tr>
<tr>
<td>No. of Hours</td>
<td>120</td>
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<tr>
<td>Assessment Methods and Weighting Details</td>
<td>Research report Report and presentation 100</td>
<td>Weighting in final course grade (%)</td>
<td>CLO Mapping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methods</td>
<td>Reading / Self study</td>
<td>The student is expected to spend at least 120 hours on the project</td>
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</tbody>
</table>

Course Type

Project-based course

Course Teaching & Learning Activities

- Activities: Details
- Reading / Self study: The student is expected to spend at least 120 hours on the project.

Assessment Methods and Weighting

- Methods: Details
- Weighting in final course grade (%): Research report 100%
- Assessment Methods to CLO Mapping: CLO 1, 2

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 EASC4303 or EASC3416 or ENVS3313

Offer in 2016 - 2017

<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>Course Teaching &amp; Learning Activities Details</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 activities and logical thinking.</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcome. Show evidence of analytical and critical abilities and logical thinking.</td>
<td>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.</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. She limited ability to apply knowledge to solve problems. Show some interest in the taught topics.</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Does not show positive attitude in learning; not able to answer most of questions.</td>
</tr>
<tr>
<td>No. of Hours</td>
<td>28</td>
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<td></td>
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<tr>
<td>Examination</td>
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</table>
Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
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<tbody>
<tr>
<td>Lectures</td>
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<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td>student seminars and exercises</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>essay, presentation plus additional reading</td>
<td>100</td>
</tr>
</tbody>
</table>

### Reading / Self study

Essay: including essays and seminars
Examination: 50%

### Required/recommended reading and online materials


### Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Essay</td>
<td>60%</td>
<td>CLO 1, 2, 3, 4</td>
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<tr>
<td>Examination</td>
<td>40%</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

### Course Objectives

To review the concepts and processes that shape the configuration of the Earth, from core to crust.

This course is intended to provide students with an understanding of the driving forces of Earth processes and the global outcome of these processes through an examination of direct and indirect observations, the evolution of hypotheses, and critical thinking.

### Course Contents & Topics

- Earth as a heat engine; Earth's interior; major features of the continents and oceans;
- Plate tectonics; orogenesis; crustal growth;
- Mantle convection; hot spots and plumes;
- Energy and driving forces of Earth processes;
- Methods of investigation of large scale structures and processes;
- Structure and physical properties of the planet;
- Isostasy; continental drift;
- 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.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 have an appreciation of the Earth as a dynamic planet
- 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

### Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade</th>
<th>CLO 1</th>
<th>CLO 2</th>
<th>CLO 3</th>
<th>CLO 4</th>
<th>CLO 5</th>
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<tbody>
<tr>
<td>Fail</td>
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<tr>
<td>D</td>
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<tr>
<td>A</td>
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</tbody>
</table>

### Grade Descriptors

- **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. Mentions reviews and other sources to undertake a high level of critical analysis and draw appropriate conclusions. Be able to integrate the full range of appropriate theories, principles, and evidence.

- **B**
  - The student should show a substantial knowledge of a significant range of the skills necessary for attaining most, if not all, of the course outcomes, and have a substantial grasp of the subject. Show evidence of the ability to think critically and to have effective organizational and presentational skills and make critical use of relevant information from different sources, showing the ability to make comparisons between consequent interpretations. Be capable of the general integration of theories, principles and evidence.

- **C**
  - The student should have a general command of the knowledge, competencies and skills required for attaining the majority of the course outcomes, and a general grasp of the subject. Show some evidence of critical ability and logical thinking and moderately effective organizational and presentational skills. The student should be moderately effective in the use of data to draw appropriate conclusions, should be able to use relevant information from sources and able to make comparisons between different interpretations, through partial integration of theories, principles and evidence.

- **D**
  - The student should have a partial but limited command of the knowledge, competencies and skills necessary for attaining a number of the course learning outcomes, and a limited grasp of the subject. Show evidence of some analytical competence and critical thinking and at least marginally effective organizational and presentational 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 thorough 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 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.
EASC4407 | Regional geology (6 credits) | Academic Year 2016
---|---|---
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 geological questions. | 
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 the various “tools” that are commonly used by geo-scientists to test and develop models for the evolution of tectonically complicated regions |
| | CLO 3 carry out an in-depth scientific literature review on a key regional geological issue and to present the findings via visual and written communication in an engaging, comprehensive online format |
Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in EASC3402; and (EASC3403 or EASC3404) |
Offer in 2016 - 2017 | Y 1st sem Offer in 2017 - 2018 : Y | Examination Dec |
Grade Descriptors (A+ to F) | 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. |
| | 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 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. |
| | 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. |
| | 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. |
Course Type | Lecture with laboratory component course |
Course Teaching & Learning Activities | Activities | Details | No. of Hours |
| | Lectures | 28 |
| | Laboratory guided literature surveys & wikipedia training | 20 |
| | Reading / Self study | 80 |
Assessment Methods and Weighting | Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
| | Assignments | assignments | 65 | CLO 1,2,3 |
| | Examination | 25 | CLO 1,2 |
| | Test | mid-term test | 10 | CLO 1,2 |

EASC4408 | Special topics in earth sciences (6 credits) | Academic Year 2016
---|---|---
Offering Department | Earth Sciences | 
Course Co-ordinator | Dr M H Lee, Earth Sciences (mhlee@hku.hk) | 
Teachers Involved | Dr Q H S Chan, Earth Sciences | Dr M H Lee, Earth Sciences | Dr Y Li, Earth Sciences |
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


Grade Descriptors (A+ to F) A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes, and evidence of productive reading supplementing lectures. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to synthesize and apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate critical use of data, literature reviews, and other sources to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to synthesize and apply knowledge to familiar and some unfamiliar situations, but falling short on excellence in some of these aspects. Demonstrate correct use of data, literature reviews, and other sources to draw appropriate conclusions. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to synthesize and apply knowledge to most familiar situations. Demonstrate mostly correct but some erroneous use of data, literature reviews, and other sources to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to synthesize and apply knowledge to solve problems. Demonstrate limited ability 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.

Course Type Lecture with laboratory component course

Course Teaching & Learning Activities Activities Details No. of Hours

Lectures 12 sessions x 2 hours 24

Laboratory 6 sessions x 2 hours 12

Group work preparation + presentation 15

Tutorials 6 sessions x 2 hours 12

Reading / Self study --- 60

Assessment --- 15

Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments --- 30 CLO 1,2,3,4,5,6

Presentation group presentation 20 CLO 1,2,3,4,6

Individual essay 50 CLO 1,2,3,4,6


In Quest of the Universe, Koupelis, 2012. ISBN: 9781449647940

Enrichment: There are enormous opportunities to read further on the subjects presented - just ask for details.

EASC4911 Earth system: contemporary issues (6 credits) Academic Year 2016

Offering Department Earth Sciences Quota ---

Course Co-ordinator Dr Y Li, Earth Sciences (yiliang@hku.hk)

Teachers Involved Dr Y Li, Earth Sciences Dr S C Chang, Earth Sciences

Course Objectives This is a capstone course that provides students with an opportunity to synthesize and correlate the knowledge gained in previous courses in Earth System Science for them to gain a more in-depth appreciation and awareness of the Earth System, the interplay between its component parts, and some of the global issues. Students will also get some basic concepts on how to do strategic analysis on global trends of natural resources.

Course Contents & Topics The Earth as an integrated system. The interactions between Earth's component parts.

The evolution of Earth's global climates in deep time. The Earth as a fine-tuning system. Natural resource and managements. Natural hazards and managements.

Bio-resources and Bioethics. Global trend in oil and natural gas. Global trend in mineral resources (non-metals, ferrous metals and rare earth elements).

Course Learning Outcomes On successful completion of this course, students should be able to: CLO 1 comprehend in some depth the nature of the issues confronting humankind as part of the Earth System

CLO 2 understand the basis of interrelationships through feedback loops within the Earth System

CLO 3 synthesize scientific data available from a variety of sources and apply the data to problem solving, particularly in areas of contemporary concern. CLO 4 understand how past and present activities on the planet will affect its future

Pre-requisites (and Co-requisites) 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 or ENVS3313.
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 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors
(A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all of the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to synthesize and apply knowledge to a wide range of complex, familiar and unfamiliar situations. Demonstrate critical use of data, literature reviews, and other sources to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to synthesize and apply knowledge to familiar and some unfamiliar situations. Demonstrate correct use of data, literature reviews, and other sources to draw appropriate conclusions. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to synthesize and apply knowledge to most familiar situations. Demonstrate mostly correct but some erroneous use of data, literature reviews, and other sources to draw appropriate conclusions. Apply moderately effective organizational and presentational skills. Demonstrate limited ability to use data, literature reviews, and other sources to draw appropriate conclusions. Apply limited or barely 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 data, literature reviews, and other sources to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fall Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to synthesize and apply knowledge to solve problems. Demonstrate misuse of data, literature reviews, and other sources and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Offering Department
Earth Sciences

Course Co-ordinator
Dr J A King, Earth Sciences

Teachers Involved
Dr J A King, Earth Sciences Dr A A G Webb, Earth Sciences

Course Objectives
The aims of a geological field camp activities are to provide:
1) essential training and experience in geological mapping techniques.
2) the opportunity to gain confidence in independently applying these skills to areas of structural and stratigraphic complexity.
3) opportunities to study at first-hand areas of particular geological interest and importance of an overseas locality.

The course requires integration of geological knowledge from multiple geological disciplines.

Course Contents
Students will visit areas of geological interest and will undertake independent and group mapping and problem solving exercises in each area. The curriculum comprised 3 x 6-day long projects (based on an ~2x5km area of interest), where each week long project is typically scheduled as follows:
Day 1-2: Instructor-lead learning.
Day 3-5: Technique application/independent field mapping.
Day 6: Site visit and technical application.
Day 7: Write up/Rest

For each project area students is required to produce:
A detailed geologic map of the area. (15% x 3 = 45%)
A cross-section of the area. (5% x 3 = 15%)
To accompany these maps, the students must prepare ONE report, including:
A stratigraphic column, with detailed lithological descriptions of each major rock unit in the area. (10%)
A field report on the tectonic evolution of region, synthesized from the all three projects and site visits, complete with interpretations of depositional environments, magmatic events and structural data. (20%)
To assess field skills:
A one-day field exam, where students, working independently of other students and faculty, construct a geologic map and cross sections in a small (~1km2) area that they have not previously visited. (10%)

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.

EASC4955
Integrated field studies (6 credits)

Offering Department
Earth Sciences

Quota
36

Course Co-ordinator
Dr J A King, Earth Sciences
(jessking@hku.hk)

Teachers Involved
Dr J A King, Earth Sciences Dr A A G Webb, Earth Sciences

Academic Year
2016

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

This capstone course is for Earth System Science Major students only.

Offering Department
Earth Sciences

Course Co-ordinator
Dr J A King, Earth Sciences

Teachers Involved
Dr J A King, Earth Sciences Dr A A G Webb, Earth Sciences

Course Objectives
The aims of a geological field camp activities are to provide:
1) essential training and experience in geological mapping techniques.
2) the opportunity to gain confidence in independently applying these skills to areas of structural and stratigraphic complexity.
3) opportunities to study at first-hand areas of particular geological interest and importance of an overseas locality.

The course requires integration of geological knowledge from multiple geological disciplines.

Course Contents
Students will visit areas of geological interest and will undertake independent and group mapping and problem solving exercises in each area. The curriculum comprised 3 x 6-day long projects (based on an ~2x5km area of interest), where each week long project is typically scheduled as follows:
Day 1-2: Instructor-lead learning.
Day 3-5: Technique application/independent field mapping.
Day 6: Site visit and technical application.
Day 7: Write up/Rest

For each project area students is required to produce:
A detailed geologic map of the area. (15% x 3 = 45%)
A cross-section of the area. (5% x 3 = 15%)
To accompany these maps, the students must prepare ONE report, including:
A stratigraphic column, with detailed lithological descriptions of each major rock unit in the area. (10%)
A field report on the tectonic evolution of region, synthesized from the all three projects and site visits, complete with interpretations of depositional environments, magmatic events and structural data. (20%)
To assess field skills:
A one-day field exam, where students, working independently of other students and faculty, construct a geologic map and cross sections in a small (~1km2) area that they have not previously visited. (10%)

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.
Department of Earth Sciences

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in the Geology Major. This must include either a PASS in, or student must be already enrolled in EASC3403, EASC3404 or EASC3405.
This capstone course is for Geology Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors (A+ to F)

A - Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Apply highly 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 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 presentational skills are minimally effective or ineffective.

Course Type
Field camps

Course Teaching & Learning Activities

Assessment Methods and Weighting

EASC4966
Earth sciences internship (6 credits)

Offering Department
Earth Sciences

Course Co-ordinator
Dr X R Zuo, Earth Sciences (xuranzuo@hku.hk)

Teachers Involved
Dr X R Zuo, Earth Sciences

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 School/Departments.

(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 instructed by the External Supervisor, with prior agreement of the Internal Supervisor.

Course Contents & Topics

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 2016 - 2017
Y 1st sem 2nd sem Summer Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors (Pass/Fail)
Pass - Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of "Distinction".

Fail - Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.

Course Type
Internship

Course Teaching & Learning Activities

Assessment Methods and Weighting

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
2016

470
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

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.

Offer in 2016 - 2017

Y Year long Offer in 2017 - 2018 : 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.

D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use first-hand data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of first-hand data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type

Project-based course

Course Teaching & Learning Activities

Activities Details No. of Hours
Reading / Self study The student is expected to spend at least 240 hours on the project 240

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Dissertation Dissertation and presentation 100 CLO 1,2,3

ENVS1401 Introduction to environmental science (6 credits)

Offering Department Earth Sciences

Quota ---

Course Co-ordinator Dr C Dingle, Earth Sciences (cdingle@hku.hk)

Teachers Involved Dr C Dingle, Earth Sciences Dr C Not, Earth Sciences

Course Objectives

To provide students with an inter-disciplinary introduction to Environmental Science highlighting the interconnections between biological, geological, and chemical processes. To convey the basic science behind environmental interactions and place it within the context of human impacts and dependence on the natural world. To better understand how humans interact, manage, and sustain the environment within the context of our economies, governments and individual choices.

Course Contents & Topics

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? Urban ecology and understanding 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 overusing our resources and compare different approaches to resolving specific problems presented in class.

Pre-requisites

NIL

Offer in 2016 - 2017

Y 1st sem Offer in 2017 - 2018 : Y Examination Dec

Grade Descriptors (A+ to F)

A
**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>
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<td>24</td>
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<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>
</tr>
<tr>
<td>Reading / Self study</td>
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<td>112</td>
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**Assessment Methods and Weighting**

<table>
<thead>
<tr>
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<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>50</td>
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</tr>
<tr>
<td>Examination</td>
<td></td>
<td>35</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Test</td>
<td>3 quizzes</td>
<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
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</table>

**Required/recommended reading and online materials**

- Keller and Botkin: Essential Environmental Science (Wiley, 2008)
- Tietenberg and Lewis: Environmental economics and policy

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**ENVS3004**

**Course Type**: Online course

**Offering Department**: Earth Sciences

**Teachers Involved**: Prof Y Q Zong, Earth Sciences (yqzong@hku.hk)

**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 human society is confronted. The course will focus on major environmental problems and explore how Environmental Economics can be applied for resource management and environmental protection. Students will analyze the nature of key natural resources such as land, air and water, 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
- Resource management for energy, land, water and air
- Management of waste
- 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: recognize 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: CHEM2041, EASC2404, ENVS2001 or ENVS2002

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
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<tbody>
<tr>
<td>A</td>
<td></td>
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<tr>
<td>B</td>
<td></td>
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<tr>
<td>C</td>
<td></td>
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<tr>
<td>D</td>
<td></td>
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<tr>
<td>Fail</td>
<td></td>
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</table>

**Course Type**: Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
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<tr>
<td>Lectures</td>
<td>12 sessions of 2 hrs</td>
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<td>Group work</td>
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<td>Reading / Self study</td>
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**Assessment Methods and Weighting**

<table>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Essay</td>
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<td>30</td>
<td>CLO 1,2,3</td>
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<td>Examination</td>
<td></td>
<td>40</td>
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<tr>
<td>Project reports</td>
<td></td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
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</table>

Tietenberg and Lewis: Environmental economics and policy

Keller and Botkin: Essential Environmental Science (John Wiley & Sons, 2008)
ENVS3007  
Natural hazards and mitigation (6 credits)  
Academic Year: 2016

Offering Department: Earth Sciences  
Course Co-ordinator: Prof Y Q Zong, Earth Sciences (yzong@hku.hk)  
Teachers Involved: Prof Y Q Zong, Earth Sciences  
Course Objectives: This course 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 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 2016 - 2017: Y 1st sem

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 presentional 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 presentional 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 presentional 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 presentional 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 presentional skills are minimally effective or ineffective.

Course Type: Lecture-based course

Course Teaching & Learning Activities:
- Activities: Lectures, Tutorials, Discussion, Reading / Self study
- Methods: Group discussion
- Weighting in final course grade (%): 50
- Assessment Methods: Examination, Project reports

Assessment Methods and Weighting:
- Methods: Examination, Project reports
- Details: 50 CLO 1
- Assessment Methods to CLO Mapping: CLO 1

ENVS3020  
Global change ecology (6 credits)  
Academic Year: 2016

Offering Department: Earth Sciences  
Course Co-ordinator: Dr C Dingle, Earth Sciences (cdingle@hku.hk)  
Teachers Involved: Dr C Dingle, Earth Sciences  
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 principally on the effects of climate change on organisms and ecosystems but will also investigate other topics registering on a global scale including land use change, biological invasions, and pollution, as well as 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:

- 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): Previous course code: ENVS2007

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 presentional 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 presentional 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 presentional 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 presentional 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 presentional skills are minimally effective or ineffective.

Course Type: Lecture-based course

Course Teaching & Learning Activities:
- Activities: Lectures, Tutorials, Discussion, Reading / Self study
- Methods: Group discussion
- Weighting in final course grade (%): 50
- Assessment Methods: Examination, Project reports

Assessment Methods and Weighting:
- Methods: Examination, Project reports
- Details: 50 CLO 1
- Assessment Methods to CLO Mapping: CLO 1
ENVS3042 Pollution (6 credits) Academic Year 2016

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>24</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
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<tr>
<td>Project work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Problem-based exercises</td>
<td>20</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>problem-based exercises (10%), continuous assessment (10%)</td>
<td>20</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Essay</td>
<td>Essay and presentation</td>
<td>30</td>
<td>CLO 1, 2</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>30</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

Recommended books:

Required articles:

Course Website
http://moodle.hku.hk/

Additional Course Information
This course will be offered subject to a minimum enrollment number and availability of teachers.

ENVS3042
Pollution (6 credits) Academic Year 2016

Offering Department
Earth Sciences

Quota
50

Course Co-ordinator
Dr B Thibodeau, Earth Sciences (bthib@hku.hk)

Course Objectives
To introduce students to the most important physical, chemical and biological contaminants that pollute the environment. The course will provide the basics of contaminant transport, toxicity, pollution monitoring and environmental risk assessment. The course will also explore in details the different mechanisms and pathways for water, atmosphere, soil and land pollution.

Course Contents & Topics
Overview of Global Pollution
Physical, Chemical and Biological Contaminants
Contaminants Transport Processes
Environmental Toxicology
Water Pollution
Atmospheric Pollution
Soil and Land Pollution
Monitoring and Risk Assessment Strategy
The Future 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)
Pass in BIOL2103 or ENVS2001; and
Pass in BIOL2103 or ENVS2001
## 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>30</td>
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<tr>
<td>Laboratory</td>
<td></td>
<td>24</td>
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<tr>
<td>Reading / Self study</td>
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<td>90</td>
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### Assessment Methods and Weighting

<table>
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<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Laboratory reports</td>
<td></td>
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<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Project report</td>
<td></td>
<td>15</td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Test</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials
Environmental and Pollution Science, Second Edition, 2006 by Ian L. Pepper (Author), Charles P. Gerba (Author), Mark L. Brusseau (Author)

### Additional Course Information
This class contains theoretical and case study-based laboratories

### Course Content & Topics
To provide students with a thorough introduction to coastal and ocean processes with key questions to highlight the importance of the (paleo)oceanographic processes to environmental and ecological conditions. To convey the basic science behind ocean-atmosphere and ocean-biosphere interactions and place it within the context of human’s connectedness to the physical world.

### Course Learning Outcomes
On successful completion of this course, students should be able to:

1. **CLO 1**: Describe the major surface and deep currents of the ocean.
2. **CLO 2**: Identify and describe important processes in the ocean controlling large scale circulation and nutrient transport.
3. **CLO 3**: Describe sources and distribution of critical chemicals and sea water properties in the ocean.
4. **CLO 4**: Illustrate connections between physical ocean processes, climate systems, and biological activity.

### Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in BIOL2306 or EASC2404 or ENVS2001 or ENVS2002

## Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2016 - 2017: Y</th>
</tr>
</thead>
<tbody>
<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. 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. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.</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. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate 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.</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>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>12 sessions x 2 hours</td>
<td>24</td>
</tr>
<tr>
<td>Laboratory</td>
<td>10 labs x 2 hours</td>
<td>20</td>
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<td>1 day field trip</td>
<td>8</td>
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<td>Project work</td>
<td>group presentation</td>
<td>12</td>
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<td>Reading / Self study</td>
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<td>90</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>
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</thead>
<tbody>
<tr>
<td>Test</td>
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<td>15</td>
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### Additional Course Information
This class contains theoretical and case study-based laboratories
ENVS3999  Directed studies in environmental science (6 credits)  
Offering Department: Earth Sciences  
Course Co-ordinator: Dr C Dingle, Earth Sciences (cdingle@hku.hk)  
Teachers Involved: Various teachers in the Department, Earth Sciences  
Course Objectives: To enhance students knowledge on a particular topic in environmental science and students self-directed learning and critical thinking skills.  
Course Contents & Topics: Students undertake extensive reading on a selected topic guided by a staff member. Reading should cover material beyond textbooks. Students are required to analyze the material read, formulate their own scientific argument, and present it in written form.  
Course Learning Outcomes: On successful completion of this course, students should be able to:  
- CLO 1. Complete a research task independently in one or more topical areas of the major.  
- CLO 2. Show competence in formulating their own scientific argument.  
Pre-requisites (and Co-requisites and Impermissible combinations): Pass in at least 24 credits of advanced level (level 3 or 4) disciplinary core/elective courses in Environmental Science Major.  
Cumulative GPA of 2.5 or above in Environmental Science Major.  
This capstone course is for Environmental Science Major students only.  
The earliest that a student is allowed to take this capstone course is their year 3 study.  
Offer in 2016 - 2017: Y  
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.  
Course Type: Project-based course  
Course Teaching & Learning Activities:  
Activity: Reading / Self study  
Details: Research work & report  
No. of Hours: 120  
Assessment Methods and Weighting:  
Methods: Oral presentation  
Details: 10  
Weighting in final course grade (%): CLO 1,2  
Assessment Methods to CLO Mapping:  
Research report  
90  
CLO 1,2  
ENVS4966  Environmental science internship (6 credits)  
Offering Department: Earth Sciences  
Course Co-ordinator: Dr C A Not, Earth Sciences (cnot@hku.hk)  
Teachers Involved: Dr C Dingle, 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: Students will be supervised by a staff member (the Internal Supervisor) within the University of Hong Kong as instructed by the Internal Supervisor. 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). 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 world 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 2016 - 2017: Y  
Grade Descriptors (Pass/Fail):  
Pass: Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report.
ENVS4999  Environmental science project (12 credits)

Offering Department  Earth Sciences
Quota  ---

Instructors Involved  Prof Y Q Zong, Earth Sciences (yqzong@hku.hk)  

Course Objectives  To enhance students knowledge and research skills in advanced level of environmental science.

Course Contents & Topics  Students undertake a research project in the form of an undergraduate dissertation under the supervision of a staff member. The project could be based on one of the four areas covered by the major and must show elements of interdisciplinary nature. The dissertation should show an element of originality and the research in a non-trivial manner.

Course Learning Outcomes  On successful completion of this course, students should be able to:

- Complete a dissertation project of undergraduate level in one of the four areas of the major.

Pre-requisites (and Co-requisites and Impermissible combinations)  
Students must have a cumulative GPA of 3.0 or above in Environmental Science Major. This capstone course is for Environmental Science Major students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2016 - 2017  Y  Year long  Offer in 2017 - 2018 : 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 presentation skills are minimally effective or ineffective.

Course Type  Project-based course

Assessment Methods and Weighting  
Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping

Dissertation  research work & report  100  CLO 1,2

Consent from major coordinator is required.
### MATH109

**Basic mathematics for business and economics (6 credits)**

**Offering Department**: Mathematics  
**Quota**: 380  
**Academic Year**: 2016

**Course Co-ordinator**: Dr Y M Chan (1st sem); Dr K H Law (2nd sem). Mathematics (ymchan@maths.hku.hk; lawkaho@maths.hku.hk)

**Teachers Involved**: Dr Y M Chan (1st sem), Mathematics  
Dr K H Law (2nd sem), 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**

<table>
<thead>
<tr>
<th>Course Contents &amp; Topics</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Logic</td>
<td></td>
</tr>
<tr>
<td>2. Linear Equations</td>
<td></td>
</tr>
<tr>
<td>3. Quadratic Equations</td>
<td></td>
</tr>
<tr>
<td>4. Graphs and Functions</td>
<td></td>
</tr>
<tr>
<td>5. Differentiation</td>
<td></td>
</tr>
<tr>
<td>6. Unconstrained optimization</td>
<td></td>
</tr>
<tr>
<td>7. Partial differentiation</td>
<td></td>
</tr>
<tr>
<td>8. Constrained optimization</td>
<td></td>
</tr>
<tr>
<td>9. Integration</td>
<td></td>
</tr>
<tr>
<td>10. Geometric series</td>
<td></td>
</tr>
<tr>
<td>11. Difference equations</td>
<td></td>
</tr>
<tr>
<td>12. Differential equations (optional)</td>
<td></td>
</tr>
<tr>
<td>13. Matrix algebra (optional)</td>
<td></td>
</tr>
</tbody>
</table>

**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**

NIL  
**and Co-requisites**

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 2016 - 2017**: Y  
**Examining Semester**: Y  
**Dec 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 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>Demonstrates poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.</td>
</tr>
</tbody>
</table>

**Methods & Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>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>

**Weighting in final course grade (%)**

- CLO 1: 50%  
- CLO 2: 50%  
- CLO 3: 40%

**Mapping**: CLO 1,2,3

**Assessment Methods**

- 

**Required/recommended reading and online materials**


**Course Website**: moodle.hku.hk

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### MATH111

**University mathematics I (6 credits)**

**Offering Department**: Mathematics  
**Quota**: ---  
**Academic Year**: 2016

**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 introducing 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.  
- Limits of algebraic, exponential and logarithmic functions.  
- Derivatives of algebraic, exponential and logarithmic functions.  
- Differentiation rules: addition, product, quotient and chain rule.  
- Maxima and minima.  
- Indefinite and definite integrals.  
- Area.  
- Integration by substitution.  
- Trapezoidal rule with error estimation.
### MATH1013: University Mathematics II (6 credits)

#### Offering Department
Mathematics

#### Course Co-ordinator
Dr C W Wong (1st sem); Dr Y M Chan (2nd sem), Mathematics (cwwongab@hku.hk; ymchan@maths.hku.hk)

#### Teachers Involved
Dr C W Wong (1st sem), Mathematics; Dr Y M Chan (2nd sem), Mathematics

#### 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; implicit differentiation; L'Hopital's rule.
- Higher order derivatives; maxima and minima; graph sketching.
- Radius, calculus of trigonometric functions.
- Definite and indefinite integrals; integration by substitutions; integration by parts; integration by partial fractions.
- Complex numbers, polar form, de Moivre's formula.
- Applications: Solving first order differential equations
- Basic matrix and vector (of orders 2 and 3) operations, determinants of 2x2 or 3x3 matrices. (optional)

#### Course Learning Outcomes
On successful completion of this course, students should be able to:

<table>
<thead>
<tr>
<th>CLO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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>2</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>3</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>4</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>5</td>
<td>Fail</td>
</tr>
</tbody>
</table>

#### Pre-requisites
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.

#### Offer in 2016 - 2017
Y 1st sem 2nd sem Offer in 2017 - 2018 : Y Examination Dec May
Department of Mathematics

MATH1821 Mathematical methods for actuarial science I (6 credits)  Academic Year 2016

Offering Department  Mathematics  Quota  --
Course Co-ordinator  Dr J T Chan, Mathematics (jtchan@hku.hk)

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.

Assessment Methods and Weighting  Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
Examination  50  CLO 1,2,3,4,5
Test  50  CLO 1,2,3,4,5

Required/recommended reading and online materials
To be decided by the course instructor.

MATH1641 Mathematical laboratory and modeling (6 credits)

Offering Department  Mathematics  Quota  20
Course Co-ordinator  Dr J T Chan, Mathematics (jtchan@hku.hk)

Course Objectives  This course introduces a powerful and free computer software Scilab for scientific research. The programming language will be taught via a number of mathematical models in Physics, Chemistry, Biology, Ecology, Statistics and Management. Some basic and important techniques in Calculus and Linear Algebra will also be covered.

Course Contents & Topics  Scilab. Elementary mathematical modeling, predator-prey models, epidemic models, host-parasite model etc. Data fitting models and simulation of simple random variable. Random walk models and inventory models. Differentiation and integration of one variable. Elementary linear algebra.

Course Learning Outcomes  On successful completion of this course, students should be able to:
- CLO 1 recognize the importance of numerical methods in mathematical modeling
- CLO 2 demonstrate basic algebraic and arithmetic computations in the Scilab environment
- CLO 3 write and interpret programs in Scilab programming language
- CLO 4 solve simple numerical problems using interactive Scilab commands
- CLO 5 solve moderately complicated numerical problems by writing Scilab programs

Pre-requisites (and Co-requisites and Impermissible combinations)  NIL

Grade Descriptors (A+ to F)
A  Demonstrate an excellent understanding of key concepts and Scilab skills by being able to identify the appropriate Scilab environments and their applications through correctly analysing problems, clearly and efficiently presenting correct algorithms and being able to solve numerical problems by writing Scilab programs carefully and correctly, and with some innovative approaches to solving problems.
B  Demonstrate a good understanding of key concepts and Scilab skills by being able to identify the appropriate Scilab environments and their applications through correctly analysing problems, but with some minor inadequacies in identifying the appropriate Scilab components or presenting correct algorithms or with some minor programming/computational errors.
C  Demonstrate an acceptable understanding of key concepts and Scilab skills by being able to correctly identify appropriate Scilab environments, but with some inadequacies in solving numerical problems with Scilab through incorrectly analysing problems with inappropriate Scilab environments or with a number of minor programming/computational errors.
D  Demonstrate some understanding of key concepts and Scilab skills by being able to correctly identify appropriate Scilab environments, but with substantial inadequacies in solving numerical problems with Scilab through incorrectly analysing problems with inappropriate Scilab environments or with substantial programming/computational errors.
Fail  Demonstrate poor and inadequate understanding by not being able to identify appropriate Scilab environments or their applications, or not being able to complete the solution.

Assessment Methods and Weighting  Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
Examination  50  CLO 1,2,3,4,5
Test  50  CLO 1,2,3,4,5

Additional Course Information  Students who have passed MATH1013 are not allowed to take MATH1009.

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)
Thomson Learning, 2003)
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)
Thomson Learning, 2003)

MATH1821 Mathematical methods for actuarial science I (6 credits)  Academic Year 2016

Offering Department  Mathematics  Quota  --
Course Co-ordinator  Dr J T Chan, Mathematics (jtchan@hku.hk)

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.
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

On successful completion of this course, students should be able to:

- 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.

Levels 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.

Offer in 2016 - 2017
Y 1st sem Offer in 2017 - 2018 : Y Examination Dec

Pre-requisites
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.

Course Website
moodle.hku.hk

Steven J. Leon: Linear Algebra with Applications (Pearson Prentice Hall)
George B. Thomas; as revised by Maurice D. Weir and Joel Hass: Thomas' Calculus (Addison Wesley, 12th edition)

Offering Department
Mathematics

Course Co-ordinator
Prof K M Tsang (1st sem); Dr Y K Lau (2nd sem), Mathematics (kmtsong@maths.hku.hk; yklau@maths.hku.hk)

Teachers Involved
Prof K M Tsang (1st sem), Mathematics Dr Y K Lau (2nd sem), Mathematics Prof K W Chow (1st & 2nd sem), Mechanical Engineering Dr W Li (2nd sem), Mechanical Engineering

Course Objectives
In this course, students will be introduced to fundamental concepts of calculus and ordinary differential equations with a view on applications in different engineering fields. A concrete foundation of mathematics that underpins the various engineering subjects will be built. Mathematical concepts and principles, as well as some typical engineering applications, would be emphasized so that students could enhance their mathematical skills in solving engineering problems, and be well prepared in learning a higher level of applied mathematics required in different engineering disciplines.

Course Contents & Topics
- Differential and integral calculus (single variable) [limits and continuity, derivatives, (higher-order) derivatives of elementary functions, derivatives by implicit differentiation, the mean value theorem, L'Hopital's rule, parametric representation of curves, polar coordinates, indefinite integrals, integration by parts, partial fractions decomposition, definite integrals, the fundamental theorem of calculus, and their applications]
- Ordinary differential equations [first order equations, integrating factors and linear equations, 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
Department of Mathematics

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>70</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<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

(Textbook) Introduction to Calculus and Differential Equations (Pearson)

Course Website
moodle.hku.hk

Additional Course Information
There will be no 'make-up' for a missed test or assignment under normal circumstances.
Students are not allowed to take MATH1851 and MATH1853 together in the same semester.
This course is offered by the Department of Mathematics and the Faculty of Engineering.

MATH1853 Linear algebra, probability and statistics (6 credits)

Offering Department Mathematics
Quota 640

Course Co-ordinator
Prof W K Ching (1st sem); Dr G Han (2nd sem), Mathematics (wching@hku.hk; ghan@maths.hku.hk)

Course Objectives
As the consecutive 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 skill to analytically tackle some typical engineering problems to prepare for all the engineering subjects.

Course Contents & Topics
- Linear algebra [vectors and scalars, dot product, vector product, triple scalar product, vector projection, linear dependence and independence, matrix, determinant, matrix inverse, system of linear equations, matrix equation, Gaussian elimination, Cramer's rule, matrix rank, eigenvalue, eigenvector, matrix diagonalization, positive, negative and semi-definiteness, and their applications]
- Elementary complex variables [arithmetics of complex numbers, representations of complex numbers, De 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
On successful completion of this course, students should be able to:

CLO 1 demonstrate knowledge and understanding of linear algebra, complex numbers, probability theory and statistics as well as their relationship with some typical physical/engineering applications: 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)
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.)
### MATH2012

**Fundamental concepts of mathematics (6 credits)**

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Y</th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Offer in 2017 - 2018</th>
<th>Y</th>
<th>Examination</th>
<th>Dec</th>
<th>May</th>
</tr>
</thead>
</table>

| Grade Descriptors (A+ to F) | | | | | | | |
|-----------------------------| | | | | | | |
| A | Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and methods and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems. |
| B | Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and methods and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors. |
| C | Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems and methods, but with some inadequacies in applying them through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors. |
| D | Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems and methods, but with substantial inadequacies in applying them through incorrectly analysing problems with poor argument or presentation or with substantial computational errors. |

| Fail | Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems and methods or their applications, or not being able to complete the solution. |

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
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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>20</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Examination</td>
<td></td>
<td>80</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### 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

moodle.hku.hk

### Additional Course Information

There will be no 'make-up' for a missed quiz or assignment under normal circumstances.
Students are not allowed to take MATH1851 and MATH1853 together in the same semester.
This course is offered by the Department of Mathematics and the Faculty of Engineering.

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### Course Objectives

To provide students with solid background on fundamental concepts of mathematics and methods of mathematical proofs. Such concepts and methods are important for subsequent studies in all higher level courses in mathematics. This course can be taken concurrently with other Level 2 or above courses.

### Course Contents & Topics

- Elementary set theory.
- Statement calculus.
- Mathematical proofs.
- Relations and functions.
- Finite and infinite sets.
- Natural numbers and mathematical induction.
- Axiomatic systems in mathematics.
- Real numbers and the limit of a sequence.
- Examples of groups.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand the definition of a set and apply set theory in simple daily life problems
- CLO 2 construct the truth table of a given statement
- CLO 3 apply different proof strategies (e.g. proof by contradiction and mathematical induction) in proving a mathematical statement
- CLO 4 demonstrate the basic properties of equivalence relations
- CLO 5 understand the definition of the limit of a sequence of real numbers
- CLO 6 demonstrate the operational properties of groups

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853)

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Y</th>
<th>1st sem</th>
<th>2nd sem</th>
<th>Offer in 2017 - 2018</th>
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<th>May</th>
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| Grade Descriptors (A+ to F) | | | | | | | |
|-----------------------------| | | | | | | |
| A | Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and methods and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems. |
| B | Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and methods and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors. |
| C | Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems and methods, but with some inadequacies in applying them through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors. |
| D | Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors. |

| Fail | Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution. |

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

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<tr>
<th>Activities</th>
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<td>36</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>
MATH2101 Linear algebra I (6 credits)  
**Academic Year:** 2016  
**Offering Department:** Mathematics  
**Course Co-ordinator:** Dr H Y Zhang, Mathematics  
**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.
- 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

**Pre-requisites (and Co-requisites and Impermissible combinations):**
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.

**Offer in 2016 - 2017:**
- **Y** 1st sem 2nd sem Offer in 2017 - 2018: **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 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.
- **B** 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.
- **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 analyzing 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 analyzing problems with poor argument or presentation or with substantial computational errors.
- **Fail** Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

**Course Type:** Lecture-based course  
**Course Teaching & Learning Activities**
- **Activities**  
  - **Lectures**  
  - **Tutorials**  
- **Reading / Self study**  
- **No. of Hours**  
  - **36**  
  - **12**

**Assessment Methods and Weighting**
- **Methods**
  - Examination  
  - Test
- **Details**
  - **Weighting in final course grade (%)**
  - 50  
  - 50
- **Assessment Methods to CLO Mapping**
  - **CLO 1,2,3,4,5**

**Course Website:** moodle.hku.hk
Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 handle matrix operations and use them in some practical problems
- CLO 2 solve systems of linear equations by Gauss-Jordan elimination and also compute inverses of square matrices
- CLO 3 understand the concept of vector spaces, basis, dimension, and linear transformations and compute the matrix representations of some linear transformations
- CLO 4 solve some simple eigenvalue problems and apply the theory to some practical problems
- CLO 5 solve some minimization problems by the least squares method

Pre-requisites

Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853)

Offer in 2016 - 2017

Y 1st sem 2nd sem Offer in 2017 - 2018 : 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.

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Course Type

Lecture-based course

Course Teaching & Learning Activities

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<td>Tutorials</td>
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Assessment Methods and Weighting

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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>assignments, participation, etc</td>
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<td>CLO 1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Test</td>
<td>2 tests</td>
<td>40</td>
<td>CLO 1, 2, 3, 4, 5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website

moodle.hku.hk

MATH2102 Linear algebra II (6 credits) Academic Year 2016

Offering Department Mathematics Quota --

Course Co-ordinator Prof W Zang, Mathematics (wzang@maths.hku.hk)

Teachers Involved Prof W Zang, Mathematics

Course Objectives

This is a follow-up of the course Linear Algebra I. It aims at introducing the general concept of vector spaces, subspaces, dimensions, inner product spaces, etc. The course prepares the foundation on linear algebra for students’ future study in mathematics and other disciplines. Many examples of applications will be drawn on different subject areas.

Course Contents & Topics

1. Vector spaces: definition of field, subspaces/quotient spaces, direct sum, existence of basis, dual space
2. Linear transformations: kernel and image, isomorphisms, matrix representations of linear transformations, determinant
3. Linear operator: eigenvalues and eigenspaces, algebraic/geometric multiplicity, diagonalizability, Cayley-Hamilton theorem, canonical form (optional)
4. Inner product space: inner product, orthonormal basis, orthogonal complement and projection
5. Linear operators on inner product space: adjoints of operators, orthogonal/unitary operators, orthogonal/unitary diagonalization of self-adjoint/normal operators, symmetric bilinear form and quadratic form
6. Additional selected topics up to the instructor

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 identify vector space structures and apply relevant knowledge to some practical problems
CLO 2 understand the notion of subspaces and compute basis, dimension, etc.
CLO 3 understand the base-free nature of linear transformations/operators. Relate the calculations of linear transformations to that of matrices by choosing particular basis
CLO 4 be able to solve eigenvalue problem for linear operators and apply it to the problem of diagonalization
CLO 5 understand the notions of inner product space and adjoints of operators. Be able to do calculation involving properties of adjoints

Pre-requisites

Pass in MATH2101 or (MATH1821 and MATH2822)
Course Type: Lecture-based course

Course Teaching & Learning Activities:

<table>
<thead>
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<th>Activities</th>
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<tbody>
<tr>
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<td></td>
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Assessment Methods and Weighting:

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</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:

- S. Friedberg, A. Insel, L. Spence: Linear algebra (Pearson, 4th edition)

Course Website:

- moodle.hku.hk

Additional Course Information:

- Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf
- S. Friedberg, A. Insel, L. Spence: Linear algebra (Pearson, 4th edition)

Course Grade (%):

- **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 inadequacies in 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.

**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; Stoke's and Gauss's Theorems.
- One of the required courses. This course is a pre-requisite of many mathematics courses of more advanced level.

**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

**Offering Department**

- Mathematics

**Course Co-ordinator**

- Dr C W Wong (1st sem); Prof W S Cheung (2nd sem), Mathematics (cwwongab@hku.hk; wscheung@maths.hku.hk)

**Teachers Involved**

- Dr C W Wong (1st sem), Mathematics
- Prof W S Cheung (2nd sem), Mathematics

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 students majoring in Mathematics/Physics, and is suitable for all students majoring in sciences, engineering, economics and finance and other students who will use multivariable calculus in their area of study. Students who want to minor in Mathematics may take this course as one of the required courses. This course is a pre-requisite of many mathematics courses of more advanced level.

**Pre-requisites**

- Pass in MATH1013 or MATH1821 or (MATH1851 and MATH1853)

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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<th>Offer in 2017 - 2018</th>
<th>Examination</th>
<th>Dec May</th>
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<td>Offer in 2017 - 2018</td>
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Assessment Methods to CLO Mapping

<table>
<thead>
<tr>
<th>Assessment Methods</th>
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<th>CLO 2</th>
<th>CLO 3</th>
<th>CLO 4</th>
<th>CLO 5</th>
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<tbody>
<tr>
<td>Assignments</td>
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<tr>
<td>Examination</td>
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<tr>
<td>Test</td>
<td>40</td>
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</table>

### MATH2241

**Introduction to mathematical analysis (6 credits)**

**Offering Department**: Mathematics

**Course Objectives**: To introduce students to the basic ideas and techniques of mathematical analysis.

**Teachers Involved**: Dr B Kane (1st sem), Mathematics

**Pre-requisites**: Pass in MATH1013 or (MATH1851 and MATH1853) or MATH2822.

**Quota**: --

**Offer in 2016 - 2017**: --

**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 sequences and Cauchy sequences, subsequences, series, tests of convergence for series.
- Continuity of real-valued functions: properties of continuous functions, the extreme value theorem, the intermediate value theorem, uniform continuity, limits of functions.
- Differentiation: properties of differentiable functions, the mean value theorem, Taylor's theorem and its applications.
- Integration: construction of the Riemann integral using Darboux sums and Riemann sums, the fundamental theorem of calculus.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- CLO 1 comprehend and use abstract mathematical arguments such as the epsilon-delta argument
- CLO 2 demonstrate convergence or non-convergence of a sequence/series using properties of convergent sequences/series
- CLO 3 elucidate important properties of continuous functions such as the extreme value theorem and the intermediate value theorem
- CLO 4 elucidate important properties of differentiable functions such as the mean value theorem, and to understand and apply Taylor's Theorem
- CLO 5 articulate the construction of the Riemann integral and its relation to differentiation

**Grade Descriptors (A+ to F)**

- A: Demonstrate a thorough mastery of the mathematical notions and proof techniques taught in the course by being able to handle abstract mathematical arguments, to apply appropriate theorems correctly, and to make use of those proof techniques in novel situations. Ability to present solutions clearly and logically, and the use of innovative ideas in solving problems are expected.
- B: Demonstrate a substantial command of the mathematical notions and proof techniques taught in the course by being able to handle abstract mathematical arguments, to apply appropriate theorems correctly, and, with guidance, to make use of those proof techniques in novel situations. Ability to present solutions clearly and logically, and evidence of innovative ideas in solving problems are expected.
- C: Demonstrate a good understanding of the mathematical notions and proof techniques taught in the course by being able to handle abstract mathematical arguments and to apply appropriate theorems correctly. Ability to present solutions clearly and logically is expected.
- D: Demonstrate some understanding of the mathematical notions taught in the course by being able to identify appropriate theorems for applications and to carry out logical arguments that are leading to complete solutions.
- Fail: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems for applications, or not being able to apply the theorems correctly.

**Course Type**

Lecture-based course

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Assessment Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Tutorials and Assignments</td>
<td>10</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>
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<tr>
<td>Test</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**: moodle.hku.hk

**Additional Course Information**: http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf

### MATH2822

**Mathematical methods for actuarial science II (6 credits)**

**Offering Department**: Mathematics

**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
- Matrices, systems of linear equations, determinants.
- Eigenvalues and eigenvectors, diagonalization of matrices.
- Quadratic functions and their standard forms.
- Vector spaces and subspaces.
- Functions of several variables; partial differentiation.
- Gradients and directional derivatives.
- Taylor approximation, Newton's method.
- Maxima and minima, Lagrange multipliers.
- Double and triple integrals, areas and volumes.

### Course Learning Outcomes
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 and Impermissible combinations)
Pass in MATH1821. For BSc(ActuarSc) students only.

### Offer in 2016 - 2017
Y 2nd sem  Offer in 2017 - 2018 : Y

### Grade Descriptors

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>A</td>
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<td>B</td>
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<td>C</td>
<td>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.</td>
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<td>D</td>
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<tr>
<td>E</td>
<td>Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.</td>
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### Assessment Methods and Weighting

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<tbody>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>2 tests</td>
<td>50</td>
<td>CLO 1,2</td>
</tr>
</tbody>
</table>

### Course Type
Lecture-based course

### Course Co-ordinator
George B. Thomas; as revised by Maurice D. Weir and Joel Hass: Thomas’ Calculus (Addison Wesley, 12th edition)  
Steven J. Leon: Linear Algebra with Applications (Pearson Prentice Hall)

### Course Website
moodle.hku.hk
conclusions. Contribute only in a limited way to fruitful and meaningful class discussions. Apply limited or barely effective organizational and presentational skills.

Fail
Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Misuse of information from sources and/or unable to draw appropriate conclusions. Make little or no meaningful contributions to class discussions. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
To be decided by the course instructor.

MATH3002
Mathematics seminar (6 credits)

Offering Department
Mathematics

Course Co-ordinator
TBC, Mathematics

Teachers Involved
TBC, Mathematics

Course Objectives
This is a seminar style course intended for those who have very strong interests and good ability in mathematics. Students will be given book chapters and elementary research articles for private study and then make presentations in front of the whole class. Individual meetings with the instructors will be arranged prior to their presentations. Active participation in all the discussions is expected. The aim of the course is to let students learn how to initiate self/independent study in mathematics.

Course Contents & Topics
Topics chosen by the instructors, including chapters from books and elementary research articles.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 Initiate private independent study on some interesting mathematical topics

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in MATH2012, MATH2101, MATH2211 and MATH2241
(This course is for second year BSc students only.)

Offer in 2016 - 2017
N

Offer in 2017 - 2018
N

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.

Course Type
Project-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting with supervisor</td>
<td>meeting of the whole class for two hours each teaching week</td>
<td>24</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>individual meetings with the instructors</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>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research report</td>
<td>written examination (30%), coursework (70%)</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Additional Course Information
Enrollment needs instructors’ approval. This course is for second year BSc students only.

MATH3301
Algebra I (6 credits)

Offering Department
Mathematics

Course Co-ordinator
Dr Y K Lau, Mathematics (yklau@maths.hku.hk)

Teachers Involved
Dr Y K Lau, Mathematics

Course Objectives
This course aims to present those fundamental topics and techniques of algebra that are finding wide applications in mathematics and the applied sciences. It is complete in itself, and may also be followed by MATH4302 Algebra II and MATH7502 Topics in Applied Discrete Mathematics.

Course Contents & Topics
- Groups: examples of groups, subgroups, cosets, Lagrange theorem, quotient groups, normal subgroups, group homomorphisms, direct product of groups, group actions.
- Rings: examples of rings, integral domains, ideals, fields of fractions, principal ideal domains, unique factorization domains.
Department of Mathematics

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 write down the precise definitions of the basic concepts in the "Course Contents"
- CLO 2 give examples for each of the concepts in the "Course Contents"
- CLO 3 understand basic properties of groups, rings, and fields

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH2101

### Offer in 2016 - 2017 Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
<th>No. of Hours</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>36</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>12</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>100</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></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></td>
</tr>
</tbody>
</table>

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>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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### Assessment Methods and Weighting

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<th>Weighting in final course grade (%)</th>
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</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>Test</td>
<td></td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

To be decided by the course instructor.


### Course Website

moodle.hku.hk

### Additional Course Information

http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf

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### MATH3303 Matrix theory and its applications (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>TBC, Mathematics</td>
<td>TBC, Mathematics</td>
<td>Matrix theory has a close connection with other mathematical subjects such as linear algebra, functional analysis, and combinatorics. It also plays an important role in the development of many subjects in science, engineering, and social sciences. In this course, students will be taught the fundamentals of matrix analysis and its application to various kinds of practical problems. Mathematical software may be used in the course, so that students can learn how to use the computer to solve matrix problems.</td>
</tr>
</tbody>
</table>

### Course Content & 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

On successful completion of this course, students should be able to:

- 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

### Offer in 2016 - 2017 Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
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</tbody>
</table>

### Offer in 2017 - 2018 Grade Descriptors (A+ to F)

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</tr>
</tbody>
</table>
MATH3304 Introduction to number theory (6 credits) Academic Year 2016

Offering Department Mathematics
Course Co-ordinator Prof K M Tsang, Mathematics (kmtsang@maths.hku.hk)

Course Objectives

To provide students with basic concepts about numbers, their properties and basic knowledge on the arithmetic of congruences. The prime numbers are the building blocks of all the natural numbers under multiplication. The interplay between the multiplicative and additive properties of prime numbers is particularly interesting. The course will study further properties and the distribution of the prime numbers, and some of the longstanding open problems concerning them. Important applications of number theory to modern cryptography will also be introduced.

Course Contents & Topics

- The course will begin with some basic notions in number theory, including divisibility, greatest common divisor, Euclidean algorithm, congruences, etc. It will then be followed by several fundamental theorems, such as Chinese remainder theorem, solutions of linear and polynomial congruences, Fermat's Little theorem, and the quadratic reciprocity law.
- Many well-known open problems will be introduced. Application of number theory to public key cryptography will be explained. Some current research on the prime numbers will be discussed.
- Depending on the time available, the course will cover a selection of further topics, such as the prime number theorem, sum of squares, Dirichlet's theorem on diophantine approximations, etc.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH2101 and MATH2211

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

Assessment

Lectures 36
Tutorials 12
Reading / Self study 100
Examination 50
Test 50

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

Required/recommended reading and online materials

- Jack L. Goldberg: Matrix Theory with Applications (McGraw-Hill, 1991)
- Steven J. Leon: Linear Algebra with Applications (Macmillan, 1994, 4th edition)
- Chris Rogers & Howard Anton: Applications of Linear Algebra (Wiley, 1984, 3rd edition)

Course Website moodle.hku.hk

Additional Course Information

http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf
**MATH3401**  
**Analysis I (6 credits)**  
**Academic Year**: 2016  
**Quota**: ---  
**Offering Department**: Mathematics  
**Course Co-ordinator**: Prof W S Cheung, Mathematics (wscheung@maths.hku.hk)  
**Teachers Involved**: Prof W S Cheung, Mathematics  
**Course Objectives**: This course extends to more general situations some basic results covered in Calculus and introduces some fundamental concepts which are essential for advanced studies in mathematical analysis.  
**Course Contents & Topics**: - Basic properties of metric spaces; openness; closedness; interior point; adherent point; accumulation point; boundary point; compactness; completeness; continuity; uniform continuity; uniform convergence; Banach's fixed point theorem.  
**Course Learning Outcomes**: On successful completion of this course, students should be able to:  
- CLO 1 demonstrate 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 boundary formulas to study analytic functions from different perspectives  
- CLO 3 apply such techniques to determine improper integrals such as those for certain rational functions on the real line  
**Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in MATH2211  
**Offer in 2016 - 2017**: Y  
**Grade Descriptors**: A (A+ to F)  
**Grade Descriptors**: A (A+ to F)  
**Offer in 2017 - 2018**: Y  
**Examination**: Dec  
**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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</tbody>
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</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50 CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50 CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>
**Required/recommended reading and online materials**:  
- Apostol: Mathematical Analysis  
- Rudin: Principles of Mathematical Analysis  
**Course Website**: moodle.hku.hk  
**Additional Course Information**: Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf

**MATH3403**  
**Functions of a complex variable (6 credits)**  
**Academic Year**: 2016  
**Quota**: ---  
**Offering Department**: Mathematics  
**Course Co-ordinator**: Prof T W Ng, Mathematics (ntw@maths.hku.hk)  
**Teachers Involved**: Prof T W Ng, Mathematics  
**Course Objectives**: This course is indispensable for studies in higher mathematical analysis and the more theoretical aspects of physics. In this course, the students are introduced to the fundamental concepts and properties of analytic functions and are shown how to look at analyticity from different points of view. At the same time, the techniques of solving problems without losing sight of the geometric picture are emphasized.  
**Course Contents & Topics**: - Complex number system.  
- Analytic functions and elementary functions.  
- The Cauchy-Riemann equations.  
- Cauchy's theorem and its applications.  
- Taylor's series.  
- Laurent's series.  
- Zeros, singularities and poles.  
- The Residue Theorem and its applications.  
**Course Learning Outcomes**: On successful completion of this course, students should be able to:  
- CLO 1 recognize the theory of functions of a complex variable as a rigorous and foundational subject in mathematics  
- CLO 2 grasp the techniques from Cauchy-Riemann equations, power series expansion and Cauchy integral boundary formulas to study analytic functions from different perspectives  
- CLO 3 compute contour integrals by calculating residues  
- CLO 4 apply such techniques to determine improper integrals such as those for certain rational functions on the real line  
**Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in MATH2211 and MATH2241  
**Offer in 2016 - 2017**: Y  
**Grade Descriptors**: A (A+ to F)  
**Offer in 2017 - 2018**: Y  
**Examination**: Dec
Department of Mathematics

**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>
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<tr>
<th>Methods</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Pre-requisites and Co-requisites**

- Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822) and Co-requisites

**Required/Recommended Reading and Online Materials**

- R.B. Ash and W.P. Novinger: Complex Variables (Dover, 2nd edition)
- J. Bak & D.J. Newman: Complex Analysis, Undergraduate Texts in Mathematics (Springer-Verlag)
- K. Kodaira: Introduction to Complex Analysis (Cambridge)
- E.C. Titchmarsh: The Theory of Functions (OUP)

**Course Website**
moodle.hku.hk

**Additional Course Information**
Course Website: http://hkumath.hku.hk/course/MATH3403/
Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf

**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

**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 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 and presentation or a number of minor computational errors.
- **D**: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
- **Fail**: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

**Assessment Methods and Weighting**

<table>
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<tr>
<th>Methods</th>
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<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>
MATH3408  Computational methods and differential equations with applications (6 credits)  Academic Year 2016

Offering Department  Mathematics  Quota  ---

Course Co-ordinator  Dr C W Wong, Mathematics  (cwwongab@hku.hk)

Teachers Involved  Dr C W Wong, Mathematics

Course Objectives  This course covers topics in the fields of differential equations 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.
- 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.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1  construct and implement numerical methods for numerical integration and differentiation, and the solution of linear and nonlinear system of equations

CLO 2  explain mathematical ideas of numerical methods in solving linear difference equations, ordinary and partial differential equations

CLO 3  construct one-step and linear multistep methods for the numerical solution of initial-value problems for ordinary differential equations and systems of such equations and analyze their stability and accuracy properties

CLO 4  construct finite difference methods for the numerical solution of partial differential equations and analyze their stability and accuracy properties

CLO 5  implement numerical methods for solving initial and boundary value problems by software packages like Scilab

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 computational methods and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

B  Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and computational methods and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems and computational methods or their applications and presentation or with some minor computational errors.

C  Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems and computational methods, but with some inadequacies in applying them through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

D  Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems and computational methods, but with substantial inadequacies in applying them through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail  Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems and computational methods or their applications, or not being able to complete the solution.

Course Type  Lecture-based course

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
Test  50  CLO 1,2,3,4,5

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)

Course Website  moodle.hku.hk

Additional Course Information  Tutorial timetable:  "http://hkumath.hku.hk/~math/"Timetable/tutorials1617_S2.pdf"
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) Triangulation, Euler characteristics, classification of graphs and surfaces and its application to data networks.
(iii) Brouwer fixed point theorem, winding number and its application in quantum mechanics.
(iv) Fundamental groups, covering spaces.

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 "course contents"
CLO 3 understand basic ideas of fundamental groups and its application to the surface classification problem

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH2101 and MATH2241.
Students are recommended to have passed or already enrolled in MATH3301 and MATH3401.

Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2017 - 2018</th>
<th>Examination</th>
<th>Y</th>
<th>2nd sem</th>
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<td>B</td>
<td>Students are recommended to have passed or already enrolled in MATH3301 and MATH3401.</td>
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<td>C</td>
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<td>D</td>
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</table>

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 - Demonstrates poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type

Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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<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>100</td>
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Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
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<tr>
<td>Assignments</td>
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<td>Examination</td>
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<tr>
<td>Test</td>
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<td>CLO 1,2,3</td>
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</tbody>
</table>

Required/recommended reading and online materials

Recommended reference:
2. M. A. Armstrong: Basic topology (UTM), Springer

Course Website

moodle.hku.hk

Additional Course Information

Tutorial timetable:
http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf

MATH3600

Discrete mathematics (6 credits)

Offering Department
Mathematics

Course Co-ordinator
Dr K H Law, Mathematics

Course Objectives
To introduce students to the basic ideas and techniques of discrete mathematics.

Course Contents & Topics
- Combinatorial analysis, generating functions.
- Counting: combinations, permutations, pigeonhole principle, inclusion-exclusion, recurrence relations, and generating functions.
- Graph theory: paths, circuits, trees, connectivity, planarity, etc.
- Applications of counting techniques and graph theory.

Course Learning Outcomes

On successful completion of this course, students should be able to:
CLO 1 understand basic constructions in point-set topology
CLO 2 give examples and counter examples for concepts in "course contents"
CLO 3 understand basic ideas of fundamental groups and its application to the surface classification problem

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in (MATH1013 and any 1 of Level 2 MATH courses) or (MATH1851 and MATH1853 and any 1 of level 2 MATH courses) or MATH2014 or (MATH1821 and MATH2822)

Offer in 2016 - 2017

<table>
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<tr>
<th>Grade Descriptors (A+ to F)</th>
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<tr>
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<td>B</td>
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<td>D</td>
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</table>

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 - Demonstrates poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.
MATH3601 Probability theory (6 credits) Academic Year 2016

Offering Department
Mathematics

Course Co-ordinator
Dr Z Zhang, Mathematics (zhangzw@maths.hku.hk)

Course Objectives
This course covers both the theoretical and practical aspects of numerical analysis. Emphasis will be on basic principles and numerical methods of solution, using high speed computers.

Course Contents & Topics
- Round off errors.
- Polynomial interpolation.
- Solution of equations of one variable.
- Direct and iterative methods for solving linear systems.
- Numerical differentiation and integration.
- Simple initial value problems for Ordinary Differential Equations.

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 construct and implement algorithms to find the zeros of functions, apply the bisection, Newton, Secant and fixed point iteration methods; and construct and implement Newton's method to solve a system of nonlinear equations

CLO 2 apply direct and iterative methods for solving linear equation systems

CLO 3 construct interpolation polynomials in Lagrange, Newton, Hermite and spline forms

CLO 4 understand the basic numerical integration and differentiation methods

CLO 5 solve initial value problems using Taylor series and Runge-Kutta methods of varying orders

CLO 6 use software package such as Scilab or Matlab to solve numerical problems

Prerequisites (and Co-requisites and Impermissible combinations)
Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)

Offer in 2016 - 2017
Y 1st sem Offer in 2017 - 2018: Y Examination Dec

Grade Descriptors
(A+ to F)

A Demonstrate an excellent understanding of key concepts and methods by being able to identify the appropriate theorems/algorithms and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out numerical procedures carefully and correctly, and with some innovative approaches to solving problems.

B Demonstrate a good understanding of key concepts and methods by being able to identify the appropriate theorems/algorithms and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate algorithms or their applications or with some minor computational errors.

C Demonstrate an acceptable understanding of key concepts and methods by being able to correctly identify appropriate theorems/algorithms, but with some inadequacies in applying the theorems/methods through incorrectly analysing problems with poor argument and presentation or with a number of minor computational errors.

D Demonstrate some understanding of key concepts and methods by being able to correctly identify appropriate theorems/algorithms, but with substantial inadequacies in applying the theorems/methods through incorrectly analysing problems with poor argument and presentation or with substantial computational errors.

Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems/algorithms or their applications, or not being able to complete the solution.

Required reading and online materials
A.Ralston and P. Rabinowitz: A First Course in Numerical Analysis (McGraw-Hill)

Additional Course Information
http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf
### Department of Mathematics

**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)

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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**Lecture-based course**

**Course Teaching & Learning Activities**

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<tr>
<td>Assignments</td>
<td>Coursework assessment</td>
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<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>Test</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td>Two midterm tests</td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**Course Website**
moodle.hku.hk

**Additional Course Information**

Tutorial timetable: [http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf](http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf)

**Course Contents & Topics**

- Linear Programming
- Duality Theory
- Sensitivity Analysis and Parametric Linear Programming
- Network Flow Problems
- Matrix Games

**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. There is an equal emphasis on all three aspects of understanding, algorithms and applications. The course serves, together with a course on network models, as essential concept and background for more advanced studies in operations research.

**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 transportation simplex algorithm
- CLO 3 understand and apply the theory of LP duality such as in sensitivity analysis, matrix games and network flow problems

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in MATH2014 or MATH2101 or MATH2102

**Offer in 2016 - 2017**

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<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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<td>Examination</td>
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<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td>Two midterm tests</td>
<td>40</td>
<td>CLO 1,2,3</td>
</tr>
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</table>

Required/recommended reading and online materials

- J.P. Ignizio: Goal Programming and Extensions (Lexington Books, 1976)
- P.R. Thie: An Introduction to Linear Programming and Game Theory (Wiley 2/e 1988)

Course Website

moodle.hku.hk

Additional Course Information

Tutorial timetable: http://hkumath.hku.hk/~math/TimeTable/tutorials1617_S2.pdf

MATH3904 Introduction to optimization (6 credits) Academic Year 2016

Offering Department Mathematics

Course Coordinator Prof W Zhang, Mathematics (wzang@maths.hku.hk)

Teachers Involved Prof W Zhang, Mathematics

Course Objectives

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 solve various optimization problems encountered in practice
- CLO 3 understand the connection between the purely analytical character of an optimization problem and the behavior of algorithms for solving it

Course Learning Outcomes

- Unconstrained and constrained optimization.
- Necessary conditions and sufficient conditions for optimality, convexity, duality.
- Algorithms and numerical examples.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)

Offer in 2016 - 2017

Y 1st sem Offer in 2017 - 2018: 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.

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D Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type Lecture-based course

Course Teaching & Learning Activities

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<tr>
<td>Test</td>
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<td>50</td>
<td>CLO 1,2,3</td>
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Required/recommended reading and online materials

- Instructor's lecture notes

Course Website

moodle.hku.hk

Additional Course Information

Tutorial timetable: http://hkumath.hku.hk/~math/TimeTable/tutorials1617_S2.pdf

MATH3905 Queueing theory and simulation (6 credits) Academic Year 2016

Offering Department Mathematics

Course Coordinator Dr Z Zhang, Mathematics (zhangzw@maths.hku.hk)

Teachers Involved Dr Z Zhang, Mathematics

Course Objectives

This course introduces students to the models and theory of queueing system, as well as the technique of simulation as a practical tool of analysis.
Course Contents & Topics
- Markovian queueing networks, Imbedded Markov-chain queueing models.
- Simulation of queueing models and discrete-event systems.
- Introduction of the Markov Chain Monte Carlo (MCMC) methods.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 understand the terminology and nomenclature appropriate to queueing theory
CLO 2 demonstrate knowledge and understanding of various queueing models
CLO 3 formulate concrete problems using queueing theoretical approaches
CLO 4 become familiar with fundamental principles of simulation and compare different simulation techniques
CLO 5 use Monte Carlo method and Markov Chain Monte Carlo method to conduct numerical simulations

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822)

Offer in 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : Y Examination May

Grade Descriptors (A+ to F)
A 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 to solve problems with some innovative approaches.
B Demonstrate a good understanding of key concepts and ideas by being able to identify appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
C Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
D Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type Lecture-based course
Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures
Tutorials
Reading / Self study

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods
Examination 50 CLO 1,2,3,4,5
Test 50 CLO 1,2,3,4,5

Required/recommended reading and online materials
R.B. Cooper: Introduction to Queueing Theory (Edward Arnold, 1981, 2nd ed.)
S.M. Ross: A Course in Simulation (Macmillan, 1991)

Course Website moodle.hku.hk
Additional Course Information Tutorial timetable:
http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf

MATH3906 Financial calculus (6 credits)
Offering Department Mathematics
Academic Year 2016
Course Co-ordinator Dr S P Yung, Mathematics (spyung@hku.hk)
Quota ---
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 Itô'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 (MATH2101 and MATH2211) or MATH2014 or (MATH1821 and MATH2822) or STAT2601

Offer in 2016 - 2017
Y 1st sem Offer in 2017 - 2018 : 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 application through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and to solve problems with some innovative approaches.
B Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
C Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
D Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

Course Type Lecture-based course
### MATH3943 Network models in operations research (6 credits)

**Academic Year**: 2016

**Offering Department**: Mathematics

**Course Co-ordinator**: Dr Z Zhang, Mathematics (zhangzw@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 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.

**Required/recommended reading and online materials**: L.C. Thomas: Games, Theory and Applications (Dover Publications, 1993)

**Course Website**: http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf

**Additional Course Information**: Tutorial timetable

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### MATH3911 Game theory and strategy (6 credits)

**Academic Year**: 2016

**Offering Department**: Mathematics

**Course Co-ordinator**: Dr K H Law, Mathematics (lawkaho@maths.hku.hk)

**Teachers Involved**: Dr K H Law, 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.

**Course Contents & Topics**: - 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.

**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)


**Exam**: Examination May

**Assessment Methods**: Pass / Fail

**Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping**

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<th>CLO 1,2,3,4</th>
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<tbody>
<tr>
<td>50</td>
<td>Examination</td>
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<td>50</td>
<td>Test</td>
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**Grade Descriptors (A+ to F)**

- A: Demonstrate an excellent understanding of key concepts and ideas of Game Theory by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and 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 of Game Theory by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
- C: Demonstrate an acceptable understanding of key concepts and ideas of Game Theory by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
- D: Demonstrate some understanding of key concepts and ideas of Game Theory by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
- Fail: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

**Course Type**: Lecture-based course

**Course Teaching & Learning Activities**

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<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
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<tbody>
<tr>
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<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**

<table>
<thead>
<tr>
<th>Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>5</td>
<td>Assignments</td>
<td>assignments, participation etc</td>
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<tr>
<td>50</td>
<td>Examination</td>
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<td>CLO 1,2,3</td>
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<tr>
<td>20</td>
<td>Project reports</td>
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<tr>
<td>25</td>
<td>Test</td>
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<td>CLO 1,2,3</td>
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**Information**:http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf

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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; and Pass in MATH3901, or already enrolled in this course.

Offer in 2016 - 2017
N Offer in 2017 - 2018 : Y Examination ---

Grade Descriptors (A+ to F)
A Demonstrate an excellent understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and to solve problems with some innovative approaches.
B Demonstrate a good understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
C Demonstrate an acceptable understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
D Demonstrate some understanding of key concepts and ideas by being able to identify basic principles, appropriate theorems, algorithms and their applications but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
Fail Demonstrate poor and inadequate understanding by not being able to identify basic principles, appropriate theorems, algorithms or their applications, or not being able to complete or compute the solution.

Course Type
Lecture-based course

Course Teaching & Learning Activities
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
M.S. Bazaraa, J.J. Jarvis and H.D. Sherali: Linear Programming and Network Flows. (2/e 1990)

Course Website
moodle.hku.hk

Additional Course Information
Tutorial timetable:
http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf

MATH3999 Directed studies in mathematics (6 credits)

Academic Year
2016

Offering Department
Mathematics

Course Co-ordinator
Prof W K Ching, Mathematics (wching@hku.hk)

Teachers Involved
All teaching staff, Mathematics

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 understand how mathematical theories are applied and/or extended in problem-solving
CLO 3 gain experience in project writing and oral presentation

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX or MATH7XXX) in the Mathematics, and Mathematics/Physics Majors, in addition to a pass in MATH2101, MATH2102, MATH2211 and MATH2241.

Subject to approval by the Department.

This capstone course is for Mathematics, 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 2016 - 2017
Y 1st sem 2nd sem Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors (A+ to F)
A Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Insightful use and critical evaluation of information drawn from a broad range of high quality sources and to reference aptly. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills.
B Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to reference aptly. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to reference aptly. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.
Fail
Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type: Project-based course

Course Teaching & Learning Activities:
- Activities: Reading / Self study
- Details: independent work & to attend meetings & seminars
- No. of Hours: 120

Assessment Methods and Weighting:
- Methods: Dissertation
- Details: Written report plus oral presentation
- Weighting in final course grade (%): 100
- Assessment Methods to CLO Mapping: CLO 1.2, 3

MATH4302
Algebra II (6 credits)

Academic Year: 2016

Offering Department: Mathematics
Quota: --

Course Co-ordinator: Prof J H Lu, Mathematics (jhlu@maths.hku.hk)

Teachers Involved: Prof J H Lu, Mathematics

Course Objectives:
This course is an extension of MATH3301 and goes deeper into the various topics treated in that course. Together, the two courses are complete in themselves, and may be followed by MATH47501 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, elements of Galois theory;
- Abelian groups and canonical forms of matrices;
- Structure theorem for finitely generated modules of principal ideal domains with applications to finitely generated abelian groups and canonical forms of matrices;
- Field extensions, elements of 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 2016 - 2017: Y
Offer in 2017 - 2018: 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 incorrect reasoning of arguments with poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.
- 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 incorrect reasoning of arguments with poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.
- Fail: Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type: Lecture-based course

Course Teaching & Learning Activities:
- Activities: Lectures, Tutorials, Reading / Self study
- No. of Hours: 36, 12, 100

Assessment Methods and Weighting:
- Methods: Assignments, Examination, Test
- Weighting in final course grade (%): 10, 50, 40
- Assessment Methods to CLO Mapping: CLO 1.2, 3, 4

Required/recommended reading and online materials:
- F.M. Goodman: Algebra Abstract and Concrete (Online book)

Course Website: moodle.hku.hk

Additional Course Information:
- Tutorial timetable:
  - http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf

MATH4402
Analysis II (6 credits)

Academic Year: 2016

Offering Department: Mathematics
Quota: --

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:
- Integration in R^n: Basic definitions, measure zero and content zero sets, integrability, Fubini’s Theorem, partition of unity, change of variables.
### 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., 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., to determine the differentiability and integrability of specific functions).
- **CLO 3** think creatively and laterally to generate innovative solutions to novel problems (e.g., to do integration of specific functions on chains).

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in MATH3401

### Offer in 2016 - 2017

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<thead>
<tr>
<th>Grade Descriptors</th>
<th>Examination</th>
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<tbody>
<tr>
<td>A</td>
<td>May</td>
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<td>B</td>
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<td>D</td>
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<td>Fail</td>
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### 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>
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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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<td>100</td>
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### Assessment Methods and Weighting

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<th>Details</th>
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<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</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

moodle.hku.hk

### Additional Course Information

Tutorial timetable:
http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf

### MATH4404

**Functional analysis (6 credits)**

**Offering Department**: Mathematics

**Course Co-ordinator**: Dr T K Wong, Mathematics (takkwong@hku.hk)

**Teachers Involved**: Dr T K Wong, Mathematics

**Course Objectives**

This course introduces students to the basic knowledge of linear functional analysis, an important branch of modern analysis.

**Course Contents & Topics**

- Riesz’s representation theorem. Adjoint operator, self-adjoint, normal and unitary operators.
- Spectral theory of linear operators.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** compare and contrast (i) finite and infinite dimensional linear spaces, (ii) complete and incomplete linear space, and (iii) normed and inner product spaces; in particular, recognize the importance of completeness and discuss how vectors are represented in these spaces.
- **CLO 2** understand the notions of Banach spaces and Hilbert Spaces. State and apply fundamental theorems in these spaces.
- **CLO 3** discuss the dual spaces of some standard Banach spaces.
- **CLO 4** discuss the boundedness of linear operators and the spectra of special linear operators.

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in MATH2101, MATH2102, MATH2211, MATH2241 and MATH3401

**Offer in 2016 - 2017**

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<tr>
<th>Grade Descriptors</th>
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<td>B</td>
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<td>D</td>
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<tr>
<td>Fail</td>
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**Integration on chains**: tensors, alternating tensors, vector fields, differential forms, Poincare Lemma, Stokes' Theorem.
# MATH4406 Introduction to partial differential equations (6 credits)

**Offering Department**: Mathematics  
**Course Co-ordinator**: Dr H Y Zhang, Mathematics (hyzhang@maths.hku.hk)  
**Teachers Involved**: Dr H Y Zhang, Mathematics

**Course Objectives**: This course introduces students to the basic techniques for solving partial differential equations as well as the underlying theories.

- Green's function, generalized functions and fundamental solutions.  
- Maximum principle, existence, uniqueness and continuous dependence on data.  
- If time permits Cauchy-Kowalevski theorem, variational method, nonlinear partial differential equations.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:  
- CLO 1 apply the tools of calculus, linear algebra, mathematical analysis in a coherent way to PDE problems  
- CLO 2 understand the basic theory of partial differential equations and the methods to solve them  
- CLO 3 apply the knowledge of partial differential equations to physical sciences and engineering

**Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in MATH2101, MATH2102, MATH2241; and Pass in MATH3405, or already enrolled in this course.

**Offer in 2016 - 2017**: Y 2nd sem  
**Examination**: May

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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<th>No. of Hours</th>
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<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>36</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>12</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 correctly analysing problems with poor argument and presentation or a number of minor computational errors.</td>
<td>100</td>
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**Assessment Methods and Weighting**

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<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Test</td>
<td>50</td>
<td>CLO 1,2,3</td>
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**Required/recommended reading and online materials**


**Course Website**: moodle.hku.hk

**Additional Course Information**: Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf

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# MATH4501 Geometry (6 credits)

**Offering Department**: Mathematics  
**Course Co-ordinator**: Dr J Fullwood, Mathematics (fullwood@maths.hku.hk)  
**Teachers Involved**: Dr J Fullwood, Mathematics

**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.

<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>
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<td>50</td>
<td>CLO 1,2,3</td>
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**Required/recommended reading and online materials**

- W. K. Allard: An Introduction to Differential Geometry with the Use of the Tensor Calculus (Dover Books on Mathematics)  
- A. Pressley: Element of Differential Geometry (Springer-Verlag)  
- S. Fisher: A Short History of the Differential Geometry of Curves and Surfaces (Springer-Verlag)  
- J. Oprea: Differential Geometry: Connections, Curvature and Characteristic Classes (Pure and Applied Mathematics)  
- M. Do Carmo: Differential Geometry of Curves and Surfaces (Dover Books on Mathematics)

**Course Website**: moodle.hku.hk

**Additional Course Information**: Tutorial timetable: http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf

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**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

**Assessment Methods and Weighting**

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<td>CLO 1,2,3</td>
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**Grade Descriptors (A+ to F)**

- A: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.
- 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: 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.
- 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.
On successful completion of this course, students should be able to:

- The Gauss map, Gaussian and mean curvatures, Gauss's Theorema Egregium, Gauss-Bonnet Theorem.

- Review on functions of several variables, inverse mapping theorem, implicit function theorem.

- Integration on manifolds.

- Maps between manifolds, submanifolds. Differential forms and exterior differentiation.

- Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

- Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

- Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

- Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

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.

On successful completion of this course, students should be able to:

- The tangent bundle, distributions and Frobenius Theorem.

- Integration on manifolds.

- Further topics.

- Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

- Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

- Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

- Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

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.

On successful completion of this course, students should be able to:

- Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

- Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

- Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

- Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

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.

On successful completion of this course, students should be able to:

- Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

- Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

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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.

On successful completion of this course, students should be able to:

- Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.

- Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.

- Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

- Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

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.
<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</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></td>
</tr>
<tr>
<td>Test</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Dennis Barden and Charles B. Thomas: An Introduction to Differential Manifolds (Imperial College Press, 2003)

**MATH4602 Scientific computing (6 credits) Academic Year 2016**

**Offering Department**
Mathematics

**Course Co-ordinator**
TBC, Mathematics

**Teachers Involved**
TBC, Mathematics

**Course Objectives**
This course introduces mathematical theories and computational techniques for solving various kinds of matrix computation problems that are often encountered in scientific or industrial applications.

**Course Contents & Topics**
- Introduction to scientific computing, systems of linear equations, direct methods, matrix norms, von Neumann series, iterative methods, eigenvalues, power method, spectral radius, Schur's Theorem, Gershgorin's Theorem.
- Some selected topics: multigrid methods, projection methods, recursion methods, fast Fourier transform, linear least squares, singular values, boundary value problems, partial differential equations, parallel computing, etc.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1: apply direct method in solving a linear system
- CLO 2: analyze the complexity of a numerical algorithm
- CLO 3: give a proof for Schur's Theorem and Gershgorin's Theorem
- CLO 4: apply iterative methods in solving a linear system
- CLO 5: compute the singular values of a matrix

**Pre-requisites**
Pass in MATH3601

**Offer in 2016 - 2017**
N Offer in 2017 - 2018: 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 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.

B
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.

C
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.

D
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.

Fail
Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems and numerical algorithms or their applications, or not being able to complete the solution.

**Course Type**
Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**MATH4902 Operations research II (6 credits) Academic Year 2016**

**Offering Department**
Mathematics

**Course Co-ordinator**
Dr G Han, Mathematics (ghan@maths.hku.hk)

**Teachers Involved**
Dr G Han, Mathematics

**Course Objectives**
The objective is to provide a fundamental account of the basic results and techniques of integer programming (IP), dynamic programming (DP) and Markov decision processes (MDP) 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**
- Integer programming and heuristics.
- Dynamic programming (deterministic/stochastic).
- Markov decision process (discounted/average costs).

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1: understand the terminology and nomenclature appropriate to integer programming, dynamic programming and Markov decision process
- CLO 2: explain the typical techniques employed in integer programming, dynamic programming and Markov decision process
- CLO 3: demonstrate the knowledge on algorithms for a variety of problems in operations research

**Pre-requisites**
Pass in MATH2101 and MATH2211; and Pass in MATH3901, or already enrolled in this course.
### MATH4907

**Numerical methods for financial calculus (6 credits)**

<table>
<thead>
<tr>
<th>Offer Year</th>
<th>Academic Year</th>
<th>Course Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td></td>
<td>Lecture-based course</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-requisites and Co-requisites (and Co-requisites and Impermissible combinations)</th>
<th>Offer in 2016 - 2017</th>
<th>Offer in 2017 - 2018</th>
<th>Exam Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>2nd sem</td>
<td>1st sem</td>
<td>May</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2016 - 2017 Course Type</th>
<th>Course Teaching &amp; Learning Activities</th>
<th>Assessment Methods and Weighting</th>
<th>Course Website</th>
<th>Additional Course Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Lecture-based course</td>
<td>Activities</td>
<td>Methods</td>
<td>Moodle.hku.hk</td>
<td>Tutorial timetable:</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>Details</td>
<td>Weighting in final course grade (%)</td>
<td></td>
<td><a href="http://hikmath.hku.hk/~math/Timetable/tutorials1617_S1.pdf">http://hikmath.hku.hk/~math/Timetable/tutorials1617_S1.pdf</a></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>Reading / Self study</td>
<td>Assessment Methods to CLO Mapping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>No. of Hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td></td>
<td>Lecture</td>
<td>Examination: 50 CLO 1,2,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tutorials</td>
<td>Test: 50 CLO 1,2,3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
<th>Assessment to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>P. Thie: Markov Decision Processes (COMAP, Inc. 1983)</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>J. Strikwerda: Finite Difference Schemes and PDEs (Wadsworth &amp; Brooks, 1989)</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Alison Etheridge: A Course in Financial Calculus (Cambridge University Press)</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>P. Glasserman: Monte Carlo Methods in Financial Engineering (Latest Edition) (Springer-Verlag)</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Course Contents &amp; Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course aims at providing effective numerical methods as well as their theoretical aspects for solving problems arising from financial derivatives and asset pricing.</td>
<td>- Introduction to the mathematical theory of vanilla and exotic options, both the PDE and the Martingale approach.</td>
</tr>
</tbody>
</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 demonstrate knowledge and understanding of the martingale theory in option pricings as well as related financial derivatives</td>
<td></td>
</tr>
<tr>
<td>CLO 2 implement and analyse various numerical methods on the Black-Scholes pricing differential equation</td>
<td></td>
</tr>
<tr>
<td>CLO 3 understand the connection between the binomial tree method and the finite difference method of the Black-Scholes pricing differential equation</td>
<td></td>
</tr>
<tr>
<td>CLO 4 implement and analyse Monte Carlo simulation methods on the martingale pricing formula</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examination Methods 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 CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>50 CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teachers Involved</th>
<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr C Wong, Mathematics</td>
<td>Pass in MATH3906</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Co-ordinator</th>
<th>Teachers Involved</th>
<th>Course Objectives</th>
<th>Course Contents &amp; Topics</th>
<th>Course Learning Outcomes</th>
<th>Examination Methods Details</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Dr C W Wong, Mathematics</td>
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<td>- Introduction to the mathematical theory of vanilla and exotic options, both the PDE and the Martingale approach.</td>
<td>On successful completion of this course, students should be able to:</td>
<td>Examination: 50 CLO 1,2,3</td>
<td>Test: 50 CLO 1,2,3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examinations</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>50 CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>50 CLO 1,2,3</td>
<td></td>
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</table>

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<thead>
<tr>
<th>Assessment Methods Details</th>
<th>Weighting in final course grade (%)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>50 CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>50 CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Website</th>
<th>Additional Course Information</th>
</tr>
</thead>
</table>

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# Department of Mathematics

### MATH4910 Senior mathematics seminar (6 credits)

**Course Type**
Senior seminar (6 credits)

**Offering Department**
Mathematics

**Course Co-ordinator**
Prof T W Ng, Mathematics (twn@maths.hku.hk)

**Teachers Involved**
Prof T W Ng, Mathematics Dr B Kane, Mathematics Prof J H Lu, Mathematics

**Course Objectives**

This seminar style capstone course aims to provide students 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 idea. 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 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**

Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics, and Mathematics/Physics Majors including MATH3301, MATH3401, and MATH3403.

Subject to approval by the Department.

This capstone course is for Mathematics, 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 2016 - 2017**

<table>
<thead>
<tr>
<th>Year</th>
<th>2nd sem</th>
<th>Offer in 2017 - 2018</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>May</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 clear and critical analysis, coherent synthesis, and effective 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 inadequate understanding of the material by barely effective or ineffective presentation. Little or no participation in and contribution to group discussion. Demonstrate inadequate or ineffective analysis, synthesis, and application of the knowledge through writing and oral presentation using mathematical language.

**Course Type**
Project-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting with supervisor</td>
<td>Seminars: Students take turns to give presentations to the whole class; group discussions.</td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>Reading material and preparation for presentations and discussions; writing of reports/research papers.</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>Dissertation</td>
<td>Coursework assessment: Based on class participation and group discussions.</td>
<td>20</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>Seminar presentations by students</td>
<td>30</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Research report</td>
<td>Written report / research paper: Individual and/or group reports/research papers totally no more than 10,000 words.</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
TBC

**Course Website**
moodle.hku.hk

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### MATH4911 Mathematics capstone project (6 credits)

**Course Type**
Capstone project (6 credits)

**Offering Department**
Mathematics

**Course Co-ordinator**
Dr S P Yung, Mathematics (spyung@hku.hk)

**Teachers Involved**
Dr S P Yung, Mathematics

**Course Objectives**

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.

**Course Contents & Topics**

Students will work collaboratively in small groups on a project under the guidance of their supervisor(s). Emphasis of 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 lectures, development of solution plan for the
Course Learning Outcomes
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)
Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics, and Mathematics/Physics Majors. Subject to approval by the Department.

Offer in 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : Y Examination No Exam

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.

Required/recommended reading and online materials
TBC

Course Website
moodle.hku.hk

MATH4966 Mathematics internship (6 credits) Academic Year 2016

Offering Department Mathematics Quota ---

Course Co-ordinator Prof T W Ng, Mathematics (rtw@maths.hku.hk)

Teachers Involved All teaching staff, Mathematics

Course Objectives This course aims to offer students the opportunities to gain work experience in the industry related to their major of study. The workplace learning experience would be of great 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.

Course Learning Outcomes On successful completion of this course, students should be able to:

- CLO 1: Gain work experience in an industry related to mathematical sciences.
- CLO 2: Have an understanding of how mathematics is used to solve real-world problems.

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in at least 24 credits of advanced level disciplinary core/elective mathematics courses (MATH3XXX, MATH4XXX, or MATH7XXX) in the Mathematics, and Mathematics/Physics Majors.

Offer in 2016 - 2017 Y 1st sem 2nd sem Summer Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors (Pass/Fail)

- Pass: Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of "Distinction".
- Fail: Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.
# MATH7101 Intermediate complex analysis (6 credits)

**Offering Department**: Mathematics  
**Course Co-ordinator**: Prof N Mok, Mathematics (nmok@hku.hk)  
**Teachers Involved**: Prof N Mok, Mathematics  

## Course Objectives
The objective is to familiarize students with analytic, algebraic and geometric concepts and techniques in the study of Complex Analysis in a single variable beyond an introductory course on functions of a single variable. 

- 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, Poincare series, the Mittag-Leffler Problem and the Weierstrass Problem on compact Riemann surfaces and on open Riemann surfaces. 
- In the course of study of meromorphic functions, sheaf cohomology theory and cohomology theories in terms of differential forms will be introduced. 
- A choice of other topics will be included. Examples of possible topics include normal families, the Riemann Mapping Theorem, geometric theory of holomorphic mappings, potential theory in one complex variable, complex dynamics, and special functions.

## Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 deal with rational functions on the Riemann Sphere and deal with elliptic functions, equivalently meromorphic functions on elliptic curves.
### Pre-requisites (and Co-requisites and Impermissible combinations)

- Pass in a first course in Complex Analysis such as MATH3403, and approval by the course coordinator.

### 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:
  - (i) Riemannian geometry: affine and Levi-Civita connection, Riemann curvature tensor, spinor bundles, Laplace and Dirac operators, harmonic forms and spinors, applications in relativity;
  - (ii) Symplectic geometry: symplectic vector spaces, symplectic manifolds, Lagrangian submanifolds, Hamiltonian group actions, moment maps, symplectic quotients, convexity theorems, localization;
  - (iii) 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 key points of the particular subject chosen and be ready to learn other topics in Geometry

### Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in (MATH4402 or MATH4501) and (MATH4511 or the approval of the course coordinator)

### Course Type

Lecture-based course

### Course Teaching & Learning Activities

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<thead>
<tr>
<th>Activities</th>
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<th>No. of Hours</th>
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### Assessment Methods and Weighting

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4</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)

### Course Grade (%)

- **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.
- **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.
- **C**: Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some minor inadequacies in applying the theorems through correctly analysing problems, or some minor computational errors.
- **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, or with some minor computational errors.
- **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.
  
### CLO to Mapping

- **CLO 1**: Identify the key elements in the theoretic foundation of various additional topics covered in the course and to make use of them in solving problems.
- **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.
- **CLO 4**: Identify the key elements in the theoretic foundation of various additional topics covered in the course and to make use of them in solving problems.

### Course Grade (%)

- **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.
- **A**: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, or with some minor computational errors.
- **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, 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 minor inadequacies in applying the theorems through incorrectly analysing problems with poor argument and 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.
- **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.

### CLO to Mapping

- **CLO 1**: Identify the key elements in the theoretic foundation of various additional topics covered in the course and to make use of them in solving problems.
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- **CLO 4**: Identify the key elements in the theoretic foundation of various additional topics covered in the course and to make use of them in solving problems.

### Course Grade (%)

- **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.
- **A**: Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, or with some minor computational errors.
- **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, 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 minor inadequacies in applying the theorems through incorrectly analysing problems with poor argument and 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.
- **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.

### CLO to Mapping

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### Course Grade (%)

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### CLO to Mapping

- **CLO 1**: Identify the key elements in the theoretic foundation of various additional topics covered in the course and to make use of them in solving problems.
- **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.
MATH7202

Complex manifolds (6 credits)

**Offering Department**
Mathematics

**Course Co-ordinator**
TBC, Mathematics

**Teachers Involved**
TBC, Mathematics

**Course Objectives**
This course aims to present the foundation of the theory of compact 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 compact manifolds including sheaf cohomology, cohomology theories in terms of differential forms, Hermitian and Kahler manifolds, and Hermitian holomorphic vector bundles.
- It proceeds to introduce the theory of harmonic forms, establishing fundamental results on compact complex manifolds including Serre duality, the Kodaira Vanishing Theorem, the Kodaira Embedding Theorem and Hodge decomposition on compact Kahler manifolds.
- The course concludes with a choice of topics on analytic and geometric aspects of the theory of complex manifolds. Examples of such topics include
  (i) Siegel's Theorem on the field of meromorphic functions on a compact complex manifold;
  (ii) geometry of compact quotients of bounded symmetric domains and Hermitian symmetric manifolds;
  (iii) an introduction to the deformation theory of compact complex submanifolds in a complex manifold;
  (iv) an introduction to the deformation theory of complex structures on a compact complex manifold.

**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 theoretic foundation of various additional topics covered in the course and to make use of them in solving problems.

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in a first course in Complex Analysis such as MATH3403, a first course in Differential Geometry such as MATH4501, and approval by the course coordinator.

**Offer in 2016 - 2017**
N

**Offer in 2017 - 2018**
Y

**Grade Descriptors (A+ to F)**

- **A** Demonstrate an excellent understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation and being able to carry out computations carefully and correctly, and with some innovative approaches to solving problems.
- **B** Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, identifying the appropriate theorems or their applications and presentation or with some minor computational errors.
- **C** Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.
- **D** Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.
- **Fail** Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

**Course Type**
Lecture-based course

**Course Teaching & Learning Activities**

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<td>36</td>
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**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>50</td>
<td>CLO 1,2,3,4</td>
<td></td>
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</table>

**Required/recommended reading and online materials**

K. Kodaira: Complex Manifolds and Deformation of Complex Structures (Grundlehren der mathematischen Wissenschaften 283, Springer-Verlag, Berlin-Heidelberg 1986)

MATH7217

Topics in financial mathematics (6 credits)

**Offering Department**
Mathematics

**Course Co-ordinator**
Dr J. Song, Mathematics (txjsong@hku.hk)

**Teachers Involved**
Dr J. Song, Mathematics

**Course Objectives**
This course aims at introducing students to fundamental knowledge in financial mathematics and risk management. It can help preparing students to research or take more advanced courses in those directions.

**Course Contents & Topics**
- Investment models and portfolio theory.
- Interest rate modeling.
- Mathematics of financial derivatives, pricing and hedging.
- Estimation and modeling of volatilities.
- Risk measures and risk management.

On successful completion of this course, students should be able to:

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512
MATH7219 Topics in applied functional analysis (6 credits)  

**Offering Department**  
Mathematics  

**Course Co-ordinator**  
TBC, Mathematics ()  

**Teachers Involved**  
TBC, Mathematics  

**Course Objectives**  
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 Learning Outcomes**  
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.

**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.

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<tbody>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
<td></td>
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<tr>
<td>Assignments</td>
<td>50</td>
<td>CLO 1,2,3</td>
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**Course Type & Learning Activities**

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**Grade Descriptors**

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- 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.
### MATH7224

**Topics in advanced probability theory (6 credits)**

**Offering Department:** Mathematics  
**Course Co-ordinator:** TBC, Mathematics

**Course Type:** LECTURE-BASED COURSE

**Course Objectives:**
This course aims at introducing fundamental knowledge in probability theory to graduate students and senior undergraduate students. It can help preparing these students for advanced research in probability theory and its wide-range applications.

**Course Content & Topics:**
- Measure theory, law of large numbers, central limit theorems, random walks, martingales, Markov chains, ergodic theorems, Brownian motion.

**Course Learning Outcomes:**
On successful completion of this course, students should be able to:
1. **CLO 1** demonstrate in-depth understanding of basic concepts and terminologies in probability theory.
2. **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.

**Pre-requisites (and Co-requisites and Impermissible combinations):**
Pass in MATH3603 and MATH4402, and approval of the course coordinator.

**Offer in 2016 - 2017:** N

**Grade Descriptors (A+ to F):**

<table>
<thead>
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<th>Grade</th>
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<tbody>
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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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</table>

**Course Type:** Lecture-based course

**Course Teaching & Learning Activities:**

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<td>Assignments</td>
<td></td>
<td>50</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2</td>
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</tbody>
</table>

**Required/recommended reading and online materials:**

### MATH7501

**Topics in algebra (6 credits)**

**Offering Department:** Mathematics  
**Course Co-ordinator:** Dr Z Hua, Mathematics (huazheng@maths.hku.hk)

**Course Type:** LECTURE-BASED COURSE

**Course Objectives:**
To provide students specializing in mathematics with the opportunity to study some topics in algebra in greater depth.

**Course Content & Topics:**
- A selection of advanced topics in algebra such as group theory; rings and modules; Galois theory; quadratic forms; multilinear algebra; algebraic number theory; group representations; commutative algebra; Grobner basis theory; introduction to algebraic geometry. Topics may vary from year to year.

**Course Learning Outcomes:**
On successful completion of this course, students should be able to:
1. **CLO 1** acquire knowledge in the covered topics to considerable depth
2. **CLO 2** if he/she wishes, pursue more advanced studies in areas of algebra

**Pre-requisites (and Co-requisites and Impermissible combinations):**
Pass in MATH4302

**Offer in 2016 - 2017:** Y

**Grade Descriptors (A+ to F):**

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**Course Type:** Lecture-based course

**Course Teaching & Learning Activities:**

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<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>One 2.5-hour written examination</td>
<td>50</td>
<td>CLO 1, 2</td>
<td></td>
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</table>

**Required/recommended reading and online materials**

To be decided by the course instructor.

**Course Website**
moodle.hku.hk

**Additional Course Information**

http://hkumath.hku.hk/~math/Timetable/tutorials1617_S1.pdf

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**MATH7502**

**Topics in applied discrete mathematics (6 credits)**

**Academic Year**: 2016

**Offering Department**: Mathematics

**Course Co-ordinator**: Prof W Zang, Mathematics (wzang@maths.hku.hk)

**Teachers Involved**: Prof W Zang, Mathematics  Dr K Cai, Mathematics

**Course Objectives**

This is a follow-up of the course MATH2600/MATH3600. It introduces students to some powerful linear algebra and probabilistic methods that have been used with striking success in discrete mathematics, and covers some of the most fundamental and beautiful results obtained by these methods.

**Course Contents & Topics**

1. Linear algebra method: rank argument, eigenvalue technique, polynomial technique, general position method.
3. Additional techniques if time permits.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 demonstrate knowledge and understanding of some research areas of applied discrete mathematics
- CLO 2 solve various discrete mathematics problems using linear algebra and probabilistic methods

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in (MATH3301 or MATH3600), and approval of the course coordinator.

**Offer in 2016 - 2017**

Y 1st sem Offer in 2017 - 2018 : N

**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 incorrectly analysing problems with poor argument and presentation or a number of minor computational errors.

D Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.

Fail Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

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**MATH7503**

**Topics in mathematical programming and optimization (6 credits)**

**Academic Year**: 2016

**Offering Department**: Mathematics

**Course Co-ordinator**: TBC, Mathematics

**Teachers Involved**: TBC, Mathematics

**Course Objectives**

A study in greater depth of some special topics in mathematical programming or optimization. It is mainly intended for students in Operations Research or related subject areas.

**Course Contents & Topics**

- A selection of advanced topics, which may include convex, quadratic, geometric, stochastic programming, multi-objective programming and goal programming; or discrete and combinatorial optimization. The selection may vary from year to year.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 understand the advanced concept and approach of the mathematical programming topic(s) and/or optimization approaches as appropriate in Operations Research
- CLO 2 demonstrate knowledge and understanding of the underlying theory and techniques of the various formulations and algorithms plus their extensions

**Pre-requisites (and Co-requisites)**

Pass in MATH3901, MATH3904 and MATH4902
### MATH7504 Geometric topology (6 credits)

**Offering Department:** Mathematics  
**Quota:** ---  
**Course Co-ordinator:** TBC, Mathematics ()  
**Teachers Involved:** TBC, Mathematics  
**Course Objectives:** This course gives a geometric introduction to some of the methods of algebraic topology. The emphasis throughout will be on the geometric motivations and applications of the theory.  
**Course Learning Outcomes:** On successful completion of this course, students should be able to:  
- CLO 1 understand basic ideas and constructions which are important both in pursuing the deeper theories as well as in many applications in algebraic topology  
- CLO 2 understand the ideas of attaching space, complexes, lifting and extension properties, and surgery on manifolds  
**Pre-requisites:** Pass in MATH3301 and MATH3401  
**Offer in 2016 - 2017:** N  
**Grade Descriptors (A+ to F):**  
- A: 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.  
- B: Demonstrate a good understanding of key concepts and ideas by being able to correctly identify appropriate theorems, 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 and presentation or a number of minor computational errors.  
- D: Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation or with substantial computational errors.  
- Fail: Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, or not being able to complete the solution.  
**Course Type:** Lecture-based course  
**Course Teaching & Learning Activities:**  
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td><strong>Assessment Methods and Weighting:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methods</td>
<td>Details</td>
<td>Weighting in final course grade (%)</td>
</tr>
<tr>
<td>Assignments</td>
<td>coursework assessment based on assignments and two class tests</td>
<td>50</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2.5-hour written examination</td>
<td>50</td>
</tr>
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</table>

**Required/recommended reading and online materials:**  
- J.P. Ignizio: Introduction to Linear Goal Programming (Beverly Hills: Sage, 1985)
**Teachers Involved**
Prof K M Tsang, Mathematics

**Course Objectives**
The aim of the course is to introduce the basic ideas and techniques of measure theory and the Lebesgue integral.

**Course Contents & Topics**
- Lebesgue Measure on R: Measurable sets and Lebesgue measure, Measurable functions.
- The Lebesgue Integral: The Lebesgue integral, modes of convergence.
- Differentiation and Integration: Functions of bounded variation, Differentiation of an integral, absolute continuity.
- General Measure and Integration Theory: Measurable spaces, measurable functions, integration, convergence theorems, the Radon-Nikodym theorem.
- The L^p Spaces: The L^p spaces, convergence and completeness, bounded linear functionals.

**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.
- 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 features of L^p spaces.

**Pre-requisites**
Pass in MATH3401

**Offer in 2016 - 2017**
Y 2nd sem Offer in 2017 - 2018 : Y Examination May

**Grade Descriptors (A+ to F)**

- **A**
  Demonstrate a thorough understanding of all concepts and ideas by being able to draw complex connections among various concepts and apply the theorems through correctly analysing problems, clearly and elegantly presenting correct logical reasoning and argumentation, and with some innovative approaches to solving problems.

- **B**
  Demonstrate a good understanding of key concepts and ideas by being able to identify the appropriate theorems and their applications through correctly analysing problems, but with some minor inadequacies in arguments, reasoning, identifying the appropriate theorems, applications, or presentation.

- **C**
  Demonstrate an acceptable understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with some inadequacies in applying the theorems through incorrectly analysing problems with acceptable argument and presentation.

- **D**
  Demonstrate some understanding of key concepts and ideas by being able to correctly identify appropriate theorems, but with substantial inadequacies in applying the theorems through incorrectly analysing problems with poor argument or presentation.

- **Fail**
  Demonstrate poor and inadequate understanding by not being able to identify appropriate theorems or their applications, and not being able to complete the solution.

**Course Type**
Lecture-based course

**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>CLO 1,2,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>2.5-hour written final examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Test</td>
<td>40</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
- H.L. Royden: Real Analysis (Pearson)
- W. Rudin: Real and Complex Analysis (McGraw Hill)

**Course Website**
moodle.hku.hk

**Additional Course Information**
http://hkumath.hku.hk/~math/Timetable/tutorials1617_S2.pdf
<table>
<thead>
<tr>
<th>PHYS1050</th>
<th>Physics for engineering students (6 credits)</th>
<th>Academic Year</th>
<th>2016</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 M H Xie, Physics (<a href="mailto:mhxie@hku.hk">mhxie@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof M H Xie (Sem 1), Physics Prof K S Cheng (Sem 2), Physics Dr M K Yip (Sem 1 and 2), Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course offers a comprehensive training of physics for engineers. It covers the major physical laws on mechanics, electricity and magnetism. A calculus-based approach is adopted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>This course will introduce and discuss the following topics: Units and Dimensional Analysis, Motion of a Particle in One and Two Dimensions, Newton's Laws of Motion, Friction, Circular Motion, Force, Impulse and Momentum, Force Polygon and Static Equilibrium, Work and Energy, System of Particles, Moment of Inertia and Rotation of a Rigid Body, Simple Harmonic Motion and Pendulum; Electrostatic Fields and Potential, Gauss's Law, DC circuits, Magnetic field due to Moving Charges, Force on a Moving Charge in Magnetic Field, Biot-Savart law, Ampere's law, Electromagnetic Induction, Faraday's Law, Eddy Currents, AC circuits, Phases in Capacitive and Inductive Circuits, Power, DC and AC Generators, Transformer.</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 describe and explain the physical principles of mechanics, electricity and magnetism CLO 2 apply these principles to situations of the physical and engineering world CLO 3 analyze and solve basic problems using the calculus-based approach CLO 4 acquire and interpret experimental data to examine the physical laws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</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) (This course is exclusive for Engineering students.)</td>
<td></td>
<td></td>
</tr>
<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. 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.</td>
<td></td>
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<tr>
<td>Course Type</td>
<td>Lecture with laboratory component course</td>
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<td></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></td>
<td>36</td>
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<tr>
<td></td>
<td>Laboratory</td>
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<td>6</td>
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<td></td>
<td>Tutorials</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Reading / Self study</td>
<td></td>
<td>72</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>
</tr>
<tr>
<td></td>
<td>Examination</td>
<td>2-hour written exam</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Laboratory reports</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Test</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>Lecture notes provided by Course Coordinator R. Serway and J.W. Jewett: Physics for Scientists and Engineers (Thomson, 2009, 8th edition) R. D. Knight: Physics for Scientists and Engineers (Pearson, 2008, 2nd edition)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Website</td>
<td><a href="http://moodle.hku.hk">http://moodle.hku.hk</a></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PHYS1055</th>
<th>How things work (6 credits)</th>
<th>Academic Year</th>
<th>2016</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 M K Yip, Physics (<a href="mailto:mankit@bohr.physics.hku.hk">mankit@bohr.physics.hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr M K Yip, Physics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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 &quot;magical&quot; things in everyday life can be predictable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Topics include: the science in the household and the science of driving, sports and amusement. Daily applications are explored with simple and lucid explanations. Developments in optical recording, medical imaging for diagnosis and the magnetic levitated trains in public transportation are introduced as examples of the modern technology. Contents of the course are constantly updated to reflect the advances in modern science and technology.</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 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</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites)</td>
<td>NIL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PHYS1056 Weather, climate and climate change (6 credits)

Offering Department
Physics

Course Co-ordinator
Dr K M Lee, Physics (kmlee@phy.physics.hku.hk)

Teachers Involved
Dr K M Lee, Physics Dr T C Lee, Hong Kong Observatory Dr P W Li, 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 students to 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. They will also supervise course projects that involve a 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
NIL

Offer in 2016 - 2017
Y 1st sem Offer in 2017 - 2018: Y

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
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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

<table>
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<tr>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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</thead>
<tbody>
<tr>
<td>CLO 1,2,3,4</td>
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<tr>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
<tr>
<td>CLO 1,2,3,4</td>
<td></td>
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</tbody>
</table>

Required/recommended reading and online materials

Course Website
http://www.physics.hku.hk/~phys1055/
### Department of Physics

<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>25</td>
<td>CLO 1,2,3,4,5</td>
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<tr>
<td>Examination</td>
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<td>2-hour written exam</td>
<td>50</td>
<td>CLO 1,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td></td>
<td>25</td>
<td>CLO 1,3,4,5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Lecture notes provided by Course Coordinator


**Course Website**

http://moodle.hku.hk

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### PHYS1057

**Course**

Kitchen science (6 credits)

**Academic Year**

2016

**Offering Department**

Physics

**Quota**

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**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.

**Course Contents & Topics**

The course will introduce basic scientific concepts and principles necessary to understand different methods of food preparation, as well as kitchen tools. The introduced concepts will be illustrated in recipes and practical demonstrations. The topics include: basic food molecules (water, carbohydrates, fats, protein); foams and bubbles (various examples, beer, sodas, ice-cream); colloids, emulsions, gelation (various sauces, jelly); crystallization (sugar, sugar syrups, honey, chocolate); taste and flavor (herbs, spices); cooking processes and chemical reactions (Maillard reactions, caramelization, etc.); chemical reactions for rising dough with application to cakes, bread and cookies; fermentation (alcoholic beverages, fermented dairy products, tofu); pH values in cooking, natural and artificial food colorings, culinary curiosities; culinary curiosities; molecular gastronomy (novel flavors and textures); principles of operation of kitchen tools, such as non-stick cookware, pressure cookers, induction heating ranges, microwave ovens, etc.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- **CLO 1** describe principles of operation of kitchen tools encountered in daily life
- **CLO 2** explain basic physical and chemical processes involved in food preparation
- **CLO 3** illustrate how preparation method affects the flavor and texture of food
- **CLO 4** analyze common methods of food preparation and understand scientific reasons for performing procedures in certain ways

**Pre-requisites**

NIL

**Offer in 2016 - 2017**

N Offer in 2017 - 2018 : 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. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- **Fail**
  - Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

- **Activities**
  - **Lectures**: 36
  - **Tutorials**: including demonstration (12 hours)
  - **Reading / Self study**: 72

**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 &amp; student presentations</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</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


Peter Barham: *The Science of Cooking* (Springer-Verlag, Berlin, 2001)


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### PHYS1150

**Problem solving in physics (6 credits)**

**Academic Year**

2016

**Offering Department**

Physics

**Quota**

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**Course Co-ordinator**

Dr S Z Zhang, Physics (shizhong@hku.hk)

**Teachers Involved**

Dr S Z Zhang, Physics

**Course Objectives**

This course provides a basic training on the methods and tools that are commonly used in physics. It prepares students the necessary knowledge to learn the subject. Students will explore the basic ideas, methods and skills through tackling physical problems. Rudimentary of analytic as well as numerical calculation using Matlab will be
This course introduces the principles and theories of various tools that are useful to read physics and solve its problems. Topics include: Dimensional analysis, polynomials and complex numbers, rudimentary of matrix operation, conic sections and topics related to practical calculus: limits, differentiation and integration. Applications to physical systems and various practical problems solving skills are discussed. Whenever applicable, Matlab will be used to illustrate the topics discussed.

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
- CLO 5: Formulate and operate physical problems both qualitatively and quantitatively
- CLO 6: Interpret and judge the physical meaning of result after calculations

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

This course is equivalent to PHYS1250, or may also be followed by Methods in Physics I. This course can be regarded as a survival guide in physics study.

**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Assessment Methods</th>
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<th>Weighting in final course grade (%)</th>
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</thead>
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<tr>
<td>Assignments</td>
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<tr>
<td>Examination</td>
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<td>Laboratory reports</td>
<td>10</td>
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<tr>
<td>Test</td>
<td>20</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. 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 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 observation skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and 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.

**Required recommended reading and online materials**

- Lecture notes provided by Course Coordinator

**Course Website**

http://moodle.hku.hk
**Course Type**: Lecture-based course

**Course Teaching & Learning Activities**

<table>
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**Required/recommended reading and online materials**

Lecture notes provided by Course Coordinator:

**Course Website**

http://moodle.hku.hk

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**Offering Department**: Physics

**Course Co-ordinator**: Dr M K Yip (mankit@bohr.physics.hku.hk)

**Pre-requisites and (and Co-requisites and Impermissible combinations)**

- Level 3 or above in HKDSE Physics or equivalent;
- Students without Level 3 or above in HKDSE Physics but having a pass in PHYS1240 may be allowed to take this course;
- Not for students who have passed in PHYS1050, or already enrolled in this course.

**Course Contents & Topics**

Topics include: Mechanics, Wave Motions, Geometric and Physical Optics, Thermodynamics, Electromagnetism, and Modern Physics.

**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

**Offer in 2016 - 2017**

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<td>B</td>
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**Course Type**: Lecture with laboratory component course

**Course Teaching & Learning Activities**

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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 prentational 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 most familiar and some unfamiliar situations. Apply effective organizational and prentational 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 familiar and some unfamiliar situations. Apply effective organizational and prentational skills. Apply effective lab 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 analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective organizational and prententional skills. Apply moderately 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 prententional 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.
**PHYS1650**  
**Nature of the universe (6 credits)**  
**Academic Year**: 2016

**Offering Department**: Physics  
**Quota**: --

**Course Co-ordinator**: Dr K M Lee, Physics (kmlee@lily.physics.hku.hk)

**Teachers Involved**: Dr K M Lee, Physics

**Course Objectives**: This general education course is designed for students in all disciplines and all years. No prior knowledge in astronomy, physics, and higher mathematics is required, but will help.

**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 2016 - 2017**: Y  
**1st sem** 2nd sem  
**Offer in 2017 - 2018**: Y  
**Examination**: Dec May

**Grade Descriptors (A+ to F)**

- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, 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 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 observation skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

- **D** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective observation skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

- **Fail** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective observation skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

**Course Type**: Lecture with laboratory component course

**Course Teaching & Learning Activities**

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**Required/recommended reading and online materials**: E. Chaisson and S. McMillan: Astronomy Today (Pearson, 2011)

**Course Website**: http://moodle.hku.hk

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**PHYS2055**  
**Introduction to relativity (6 credits)**  
**Academic Year**: 2016

**Offering Department**: Physics  
**Quota**: --

**Course Co-ordinator**: Dr K M Lee, Physics (kmlee@lily.physics.hku.hk)

**Teachers Involved**: Dr K M Lee, Physics

**Course Objectives**: This course aims at introducing students the essence of special relativity. It is designed as an elective for students in all disciplines and all years with science background.

**Course Contents & Topics**: Topics include: "Common-sense" concepts of space and time versus Einstein's conceptions of space and time, Examples of time dilation and space contraction, Paradoxes of relativity including the famous twin paradox and the "pole-in-the-barn", Four vectors and Lorentz invariant.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- **CLO 1** recall the setup and significance of Michelson-Morley experiment
- **CLO 2** state the basic postulates and the spacetime concept of special relativity
PHYS2150 Methods in physics I (6 credits)  

Offering Department  
Department of Physics  

Course Co-ordinator  
Dr F K Chow, Physics (judychow@hku.hk)  

Teachers Involved  
Dr F K Chow, Physics  

Course Objectives  
This course provides students with experience in using mathematical tools and techniques to solve problems in physics. It is complete in itself, or may also be followed by Methods in Physics II.  

Course Contents & Topics  
Solutions of ordinary differential equations in first, second and higher orders and their applications in particle dynamics, circuit theories and nuclear physics; Principles of vectors; Analytic geometry in three dimensions; Vector functions; Cartesian, cylindrical and spherical coordinates; Partial derivatives, extremes of multi-variable functions and the Taylor series in two-variable functions; Double and triple integrals in Cartesian, cylindrical and spherical coordinates; Change of variables and the Jacobians; Calculations of centers of mass, moments of inertia, and electric potentials.  

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 interpret and judge the physical meaning of result after calculations  

Pre-requisites (and Co-requisites and Impermissible combinations)  
Pass in PHYS1050 or PHYS1150 or PHYS1250  

Offer in 2016 - 2017  
Y 2nd sem Offer in 2017 - 2018 : Y  

Grade Descriptors (A+ to F)  
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.  
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.  
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.  
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.  
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.  

Course Type  
Lecture-based course  

Course Teaching & Learning Activities  
Activities Details No. of Hours  
Lectures 36  
Tutorials 12  
Reading / Self study 80  

Assessment Methods and Weighting  
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping  
Assignments 25 CLO 2,4  
Examination 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
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**Required/recommended reading and online materials**


**Course Website**

http://www.physics.hku.hk/~phys2150/

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**PHYS2155**

**Methods in physics II (6 credits)**

**Academic Year**: 2016

**Offering Department**: Physics

**Course Co-ordinator**: Dr F K Chow, Physics (judychow@hku.hk)

**Teachers Involved**: Dr F K Chow, Physics

**Course Contents & Topics**

- A review on coordinate systems in three dimensions: Gradient, divergence, curl and Laplacian; Line integrals, surface integrals and volume integrals; Conservative fields and potentials; Green's theorem, divergence theorem and the Stokes' theorem; Curvilinear coordinates; Applications of vector calculus in classical mechanics and electrodynamics; Vector spaces and matrix algebra; Properties of some special matrices: Hermitian matrices and unitary matrices, etc. Quadratic forms; Eigenvalue problems and diagonalization of matrices; Applications of matrix theory in physical problems; Numerical methods for finding roots of equations; Numerical differentiation and integration.

**Course Objectives**

This course provides students with experience in using mathematical tools and techniques to solve problems in physics. It is complete in itself, or may also be taken after Methods in Physics I.

**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 MATH1011 or MATH1013 or MATH1851 or PHYS1150

**Offer in 2016 - 2017**

- **Y**: 2nd sem
- **Y**: Offer in 2017 - 2018 : Y

**Grade Descriptors (A+ to F)**

- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some 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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**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://www.physics.hku.hk/~phys2155/

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**PHYS2250**

**Introductory mechanics (6 credits)**

**Academic Year**: 2016

**Offering Department**: Physics

**Course Co-ordinator**: Dr M K Yip, Physics (mankiet@bohr.physics.hku.hk)

**Teachers Involved**: Dr M K Yip (1st sem), Physics Prof J Gao (2nd sem), Physics

**Course Objectives**

This course covers the foundation of mechanics 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 mechanics are emphasized.

**Course Contents & Topics**

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 describe and explain the fundamental physical principles
CLO 2 apply these principles, together with logical and mathematical reasoning, to situations of the physical world
CLO 3 analyse and solve problems with the aids of mathematics
CLO 4 acquire and interpret experimental data to examine the physical laws

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in PHYS1050 or PHYS1250

Offer in 2016 - 2017

Y 1st sem 2nd sem Offer in 2017 - 2018 : Y Examination Dec May

Grade Descriptors (A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, 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 knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type

Lecture with laboratory component course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
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</thead>
<tbody>
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Assessment Methods and Weighting

<table>
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<tr>
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<tbody>
<tr>
<td>Assignments</td>
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<td>10 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>Laboratory reports</td>
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<tr>
<td>Test</td>
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Required/recommended reading and online materials

Lecture notes provided by Course Coordinator


Course Website

http://moodle.hku.hk
# Course Type
Lecture with laboratory component course

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<td>CLO 1,2,3</td>
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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)

## Online Resources
- Course Website: http://moodle.hku.hk
- http://ccling@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. 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.

- **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 able 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 limitedly 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 Outcomes

- **CLO 1**: describe and explain the fundamental physical principles
- **CLO 2**: apply these principles, together with logical and mathematical reasoning, to situations of the physical world
- **CLO 3**: analyse and solve problems with the aids of mathematics
- **CLO 4**: acquire and interpret experimental data to examine the physical laws

## Pre-requisites (and Co-requisites and Impermissible combinations)

- Pass in PHYS1050 or PHYS1250

## Offering

- **Offering Department**: Physics
- **Offering Year**: 2016
- **Quota**: ---

## 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

## Examinations

- **Examination**: Offer in 2017 - 2018: Y

## Examination Details

- **Dec**: 2-hour written exam

## Course Website

- http://moodle.hku.hk

## Course Type

Lecture with laboratory component course

<table>
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## Assessment Methods and Weighting

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**PHYS2265**  
Modern physics (6 credits)  
Academic Year: 2016  

| **Offering Department** | Physics |
| **Course Co-ordinator** | Dr F K Chow, Physics (judycho@hku.hk) |
| **Teachers Involved** | Prof H F Chau (1st sem), Physics  
Dr F K Chow (2nd sem), Physics |
| **Course Objectives** | This course covers the foundation of modern physics 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 modern physics are emphasized. |

**Course Contents & Topics**  
Topics include:  

**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: analyze and solve problems with the aids of mathematics  
- CLO 4: acquire and interpret experimental data to examine the physical laws  

**Pre-requisites (and Co-requisites and Impermissible combinations)**  
- Pass in PHYS1050 or PHYS1250  

**Offer in 2016 - 2017 Grade Descriptors (A+ to F)**  
<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>CLO Mapping</th>
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<tbody>
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<td>CLO 1,2,3,4</td>
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<td>CLO 1,2,3</td>
</tr>
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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. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.</td>
<td>CLO 1,2</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>
<td>CLO 1</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.</td>
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**Course Type**  
Lecture with laboratory component course  

<table>
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<tr>
<th><strong>Course Teaching &amp; Learning Activities</strong></th>
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**Assessment Methods and Weighting**  
Methods | Details | Weighting in final course grade (%) | Assessment Methods to CLO Mapping |
<table>
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<tr>
<td>Test</td>
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<td>25</td>
<td>CLO 1,2,3</td>
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**Required/recommended reading and online materials**  
Lecture notes provided by Course Coordinator  
P. A. Tipler and G. Mosca: Physics for Scientists and Engineers Extended Version (Freeman, 2008, 6th edition)  

**Course Website**  
http://moodle.hku.hk  

**PHYS2850**  
Atomic and nuclear physics (6 credits)  
Academic Year: 2016  

| **Offering Department** | Physics |
| **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:  
- CLO 1
Course Type: Lecture-based course

Course Contents & Topics:
This course will introduce and address the following topics: Application of complex variables including the Cauchy's integral formula and calculus of residues, Partial differential equations (the general wave equation, the Schrodinger equation, the Poisson equation, and the diffusion equation), Properties of special functions widely used in Physics (Gamma functions, Beta functions, Bessel functions, spherical harmonics etc.), Fourier Series, and Fourier Transform.

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 describing, respectively, any periodic function and wave

Pre-requisites (and Co-requisites and Impermissible combinations):
Pass in PHYS2265

Offer in 2016 - 2017
Offer in 2017 - 2018: N

Grade Descriptors (A+ to F)
A
- Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.

B
- Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

C
- Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

D
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

Fail
- Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organizational 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
- Assignments: 20% CLO 1,2,3,4
- Examination: 50% CLO 1,2,3,4
- Test: 30% CLO 1,2,3,4

Course Website:
http://www.physics.hku.hk/~phys2628/
## Course Teaching & Learning Activities

<table>
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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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<td>Test</td>
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## Required/recommended reading and online materials

- Lecture notes provided by Course Coordinator
- Steven Thornton and Jerry Marion: Classical Dynamics of Particles and Systems, (Cengage Learning India, 2012)

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**PHYS3350**

**Classical mechanics (6 credits)**

**Academic Year**: 2016

**Offering Department**: Physics

**Quota**: ---

**Course Co-ordinator**: Dr S Z Zhang, Physics (shizhong@hku.hk)

**Course Objectives**:

Build on the foundation course PHYS2250, this course discusses classical mechanics in the advanced undergraduate level using Lagrangian formalism. It serves as a core course for physics major students as well as an elective core for those who are interested in gaining a deep understanding of classical mechanics and to apply related techniques in their own majors. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines. Both conceptual ideas and mathematical treatment are emphasized.

**Course Contents & Topics**: This course will be essentially divided into two parts. In the first part, fundamental concepts related to Lagrangian mechanics will be treated. Topics include the variational principle, conservation laws and its relation to Newtonian mechanics. In the second part, we shall discuss applications of the Lagrangian mechanics. Topics include the central force problem, the coupled harmonic oscillators and rigid-body dynamics. Lagrangian mechanics in non-inertial frame will also be discussed.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

1. **CLO 1** understand the logical structure of Lagrangian mechanics and its advantage over the Newtonian formulation;
2. **CLO 2** write down the form of Lagrangian for a mechanical system and solve the dynamic equations in simple cases;
3. **CLO 3** understand the general feature of a many-body system and the role of center of mass frame in two-body, as well as many-body and rigid body dynamics.

**Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in PHYS2250

**Offer in 2016 - 2017**: 1st sem

**Grade Descriptors (A+ to F)**:

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**Course Type**: Lecture with laboratory component course

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**Required/recommended reading and online materials**

- Lecture notes provided by Course Coordinator
- Steven Thornton and Jerry Marion: Classical Dynamics of Particles and Systems, (Cengage Learning India, 2012)
- http://moodle.hku.hk

**PHYS3351**

**Quantum mechanics (6 credits)**

**Academic Year**: 2016

**Offering Department**: Physics

**Quota**: ---

**Course Co-ordinator**: Dr W Yao, Physics (wangyao@hku.hk)
Assessment Methods

Outcomes

Course Learning

On successful completion of this course, students should be able to:

CLO 1 describe the statistical interpretation of quantum mechanical systems, and calculate expectation values and uncertainty of physical observables

CLO 2 formulate energy eigenvalue problems, and solve them in examples where potentials have simple analytical forms

CLO 3 formulate time evolution of the wavefunction and the expectation value of physical observables with known energy eigenfunctions

CLO 4 judge the applicability of time-independent perturbation theory and formulate leading order energy corrections in certain perturbations applied to the physical system

CLO 5 acquire and interpret experimental data to examine the physical laws

Pre-requisites

and Impermissible combinations)

Offer in 2016 - 2017

Grade Descriptors

(A+ to F)

Offer 2017 - 2018

A

Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Critical use of data and results to draw appropriate and insightful conclusions.

B

Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

C

Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some 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. Correct but some erroneous use of data and results to draw appropriate conclusions.

D

Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

Fail

Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type

Lecture with laboratory component course

Course Teaching & Learning Activities

Activities Details No. of Hours

Lectures 36

Laboratory 6

Tutorials 8

Reading / Self study 80

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping

Assignments 10 CLO 1,2,3,4

Examination 3-hour written exam 60 CLO 1,2,3,4

Laboratory reports 10 CLO 5

Test 20 CLO 1,2,3,4

Required/recommended reading and online materials

Lecture notes provided by Course Coordinator


Course Website

http://moodle.hku.hk

PHYS3450 Electromagnetism (6 credits) Academic Year 2016

Offering Department Physics

Course Co-ordinator Prof X D Cui, Physics (xd cui@hku.hk)

Teachers Involved Prof X D Cui, Physics

Course Objectives

Build on the foundation course PHYS2255, this course discusses electromagnetism in the advanced undergraduate level with vigorous mathematical treatment. It serves as a core course for physics major students as well as an elective core for those who are interested to gain a deep understanding of electromagnetism and to apply related techniques in their own majors. This is also an essential course for those who plan to pursue postgraduate studies in physics or related disciplines. Both conceptual ideas and mathematical treatment are emphasized.

Course Contents & Topics

Topics include electric fields and potential, methods in electrostatics, conductors and dielectrics, magnetostatics and electromagnetic induction, magnetic properties of materials and Maxwell's equations.

Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 identify the fundamental physics in electrostatics and magnetism

CLO 2 apply mathematical tools to describe electrostatics and magnetism

CLO 3 use the Maxwell's equations to explain various electrostatic and magnetic phenomena

CLO 4 differentiate between electrostatics in vacuum and in dielectric materials

Department of Physics
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

CLO 5 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 presnetational skills. Critical use of data and results to draw appropriate and insightful conclusions.

CLO 6 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 presnetational skills. Apply effective lab skills and techniques. Critical use of data of results to draw appropriate conclusions.

CLO 7 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 presnetational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

CLO 8 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.

CLO 9 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 presnetational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type

Lecture with laboratory component course

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>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</td>
</tr>
<tr>
<td>Examination</td>
<td>3-hour written exam</td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Laboratory reports</td>
<td></td>
<td>10</td>
<td>CLO 1,6</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

CLO 1: Differentiate between magnetism in vacuum and in magnetic materials

CLO 2: Apply essential skills of making measurements with appropriate instruments in physics, experiments; Interpret the experimental data and compare with the prediction of underlying physical principle

CLO 3: Analyse and solve problems with the aids of mathematics

CLO 4: Acquire and interpret experimental data to examine the physical laws

CLO 5: 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 presnetational skills. Critical use of data and results to draw appropriate and insightful conclusions.

CLO 6: 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 presnetational skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

CLO 7: 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 presnetational skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

CLO 8: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Organization and presnetational 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.

CLO 9: 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 presnetational 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.
PHYS3551
Introductory solid state physics (6 credits)

Academic Year: 2016

Course Type: Lecture with laboratory component course

Course Teaching & Learning Activities:

- Lectures: 36 hours
- Laboratory: 6 hours
- Tutorials: 8 hours
- Reading / Self study: 80 hours

Assessment Methods and Weighting:

<table>
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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</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 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>

Required/recommended reading and online materials:

Daniel V. Schroeder: An Introduction to Thermal Physics (Pearson, 2014).
Lecture notes provided by Course Coordinator

Course Website: http://moodle.hku.hk
PHYS3650
Offering Department
Physics
Course Co-ordinator
Dr J J L Lim, Physics (jjlim@hku.hk)
Teachers Involved
Dr J J L Lim, Physics

Course Objectives
An introduction to tools of contemporary observation astronomy, with a focus on those used at optical wavelengths, as well as an introduction to observational aspects of stars and galaxies at optical wavelengths. An emphasis is placed on a hands-on approach for students to gain experience in doing astronomical observations and data reduction.

Course Contents & Topics
Topics include: properties and configurations of optical telescopes; properties of light, atmospheric effects on observations; properties of astronomical detectors (PMT, CCD); astronomical imaging and magnitude system; astronomical spectroscopy; observations of stars and galaxies including blackbody radiation, color-magnitude system, emission and absorption spectrum, and astronomical redshifts.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 describe and explain the workings of astronomical telescopes and modern astronomical detectors at optical wavelengths
CLO 2 describe the effects of the properties of light and Earth's atmosphere on astronomical observations
CLO 3 explain how the methods of astronomical photometry and spectroscopy are applied to the observations of stars, galaxies, and the universe
CLO 4 operate a small optical telescope to conduct simple day and night sky observations

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS1650 and (PHYS2250 or PHYS2265)

Offer in 2016 - 2017
Y 1st sem Offer in 2017 - 2018 : 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. Limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type
Lecture with laboratory component course

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 30 CLO 1,2,3
Examination 50 CLO 1,2,3
Laboratory reports 10 CLO 4
Test 10 CLO 1,2,3

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator
Frederick R. Chromey: To Measure the Sky

PHYS3651
The physical universe (6 credits)

Offering Department
Physics
Course Co-ordinator
Dr S C Y Ng, Physics (ncy@bohr.physics.hku.hk)
Teachers Involved
Dr S C Y Ng, 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 2016 - 2017
Y 1st sem Offer in 2017 - 2018 : 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.
**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>
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**Assessment Methods and Weighting**

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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td>12</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>60</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>13</td>
<td>CLO 2,4</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**
Lecture notes provided by Course Coordinator

George B. Rybicki and Alan P. Lightman, Radiative Processes in Astrophysics (Wiley-Interscience, 1985)
F. Mandi, Statistical Physics, 2nd ed. (John Wiley & Sons, 1988)

**Course Website**
http://www.physics.hku.hk/~phy3651/

**PHYS3652 Principles of astronomy (6 credits)**

**Offering Department**
Physics

**Course Co-ordinator**
Dr J J L Lim, Physics (jjlim@hku.hk)

**Teachers Involved**
Dr J J L Lim, Physics

**Course Objectives**
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 (and Co-requisites and Impermissible combinations)**
Pass in PHYS1650 and (PHYS2250 or PHYS2265)

**Offer in 2016 - 2017**
Y 2nd sem Offer in 2017 - 2018 : Y

**Grade Descriptors (A+ to F)**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery 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.</td>
</tr>
<tr>
<td>B</td>
<td>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, evidence of original thought, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentation 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, logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentation 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 presentation 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>

**Required/recommended reading and online materials**
Lecture notes provided by Course Coordinator


**PHYS3750 Laser and spectroscopy (6 credits)**

**Offering Department**
Physics

**Course Co-ordinator**
Prof S J Xu, Physics (sjxu@hku.hk)
The course aims at providing a broad introduction to major types of lasers and modern laser spectroscopy. Lasers as spectroscopic light sources. Components of spectroscopic instruments. Photoluminescence. Raman spectra.

On successful completion of this course, students should be able to:

CLO 1: Restate the properties of fundamental optical processes
CLO 2: Describe fundamental operation principle of modern lasers
CLO 3: Demonstrate solid knowledge of modern laser spectroscopic techniques
CLO 4: Identify main components of modern optical spectroscopic instruments
CLO 5: Employ laser photoluminescence setup to measure low-temperature photoluminescence spectra of solid samples
CLO 6: Interpret the experimental data and compare with the prediction of underlying physical principles.

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: Demonstrate physical properties of carbon nanotubes and semiconductor nanowires
CLO 4: Describe the basic physics of carbon nanotubes and semiconductor nanowires
CLO 5: Explain physical properties of zero-dimensional quantum dots and nanocrystals


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.

Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective. Apply minimally effective or ineffective lab skills and techniques. Misuse of data and results and/or unable to draw appropriate conclusions.

Course Type
Lecture with laboratory component course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures 36
Laboratory 10
Tutorials 8
Reading / Self study

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments
Examination 2-hour written exam 60 CLO 1,2,3,4
Laboratory reports 20 CLO 1,2,3,4
CLO 5,6

Required/recommended reading and online materials
Lecture Notes prepared by Course Coordinator

PHYS3751
Physics of nanomaterials (6 credits)
Academic Year 2016

Offering Department
Physics

Course Co-ordinator
TBC, Physics

Teachers Involved
TBC, Physics

Course Objectives
This course is designed to let senior undergraduate students and fresh postgraduate students know fundamental concepts and physical properties of nanomaterials including two-dimensional quantum wells, one-dimensional quantum wires and zero-dimensional quantum dots.

Course Contents & Topics
Introduction to nanomaterials and quantum size effect. Dimensionalities and density of states of various nanomaterials. Optical and transport properties of quantum wells, superlattices and two-dimensional electron gas. Physical properties of carbon nanotubes and semiconductor nanowires. Physical properties of quantum dots and nanocrystals. Fundamental principles of scanning tunneling microscopy and advanced thin-film growth techniques such as molecular beam epitaxy and metalorganic chemical vapor deposition.

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
Pass in PHYS3551; and
Pass in PHYS3551, or already enrolled in this course.

Offer in 2016 - 2017
N

Grade Descriptors

A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
### Course Type
- Lecture-based course

### Assessment Methods and Weighting

#### Activities
- **Lectures**: 36
- **Laboratory**: 6
- **Tutorials**: 8
- **Reading / Self study**: 80

#### Methods
- **Assignments**: 15
- **Examination**: 60
- **Laboratory reports**: 10
- **Test**: 15

#### Weighting in final course grade (%)
- **Assessment Methods to CLO Mapping**
  - **CLO 1**: 3
  - **CLO 2**: 3

### Course Content & Topics
- Mathematical theory of wave motion and the electromagnetic theory of light, the propagation of light and the laws of reflection and refraction; superposition and Fourier analysis of waves; theories, experimental observation and applications of polarization, interference and diffraction, thick lenses.

### Course Objectives
- To give a coherent introduction to the development of modern physical optics, with particular attention to the wave properties of light and optic application.

### Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in PHYS2255 and PHYS2260

### Offer in 2016 - 2017
- **Y** 1st sem
- **Offer in 2017 - 2018**: **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 the knowledge and skills required for attaining 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 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 observation skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

#### D
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems using limited or barely effective organizational and presentational skills.

#### Fail
- Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
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. Emphasis will be put on practical application of quantum mechanics as well as conceptual framework of atomic and nuclear physics. If time permits, other topics of current interest will be also discussed, such as laser cooling and trapping.

Topics include: Atomic structure of hydrogen and hydrogen-like atom, multi-electron atom, atom in electromagnetic field, spectroscopy; nuclear structure, shell model and nuclear reactions. Applications of the basic principles of atomic and nuclear physics will be mentioned when appropriate.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 apply general considerations of quantum mechanics to atomic and nuclear system; make general orders of magnitude of estimation of physical effects
- CLO 2 explain how light interacting with atom
- CLO 3 recognize the general features of multi-electron atomic system
- CLO 4 apply quantum mechanics to understand the basic features of simple nuclei, binding of deuteron et al

Pre-requisites
Pass in PHYS3351

Offer in 2016 - 2017
Y 2nd sem  Offer in 2017 - 2018 : Y

Course Type
Lecture with laboratory component course

Assessment Methods
details

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 10 CLO 1,2,3,4
Examination 60 CLO 1,2,3,4
Laboratory reports 10 CLO 1
Test 20 CLO 1,2,3,4

Grade Descriptors
(A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentional 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 presentional 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 presentional 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 some evidence of some coherent and logical abilities, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentional skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of 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. May use knowledge to solve problems. Use data and results minimally to draw conclusions.

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures 36
Laboratory 6
Tutorials 8
Assessment 80

Required/recommended reading and online materials

Directed studies in physics (6 credits)

Director of Studies in Physics (Physics Department)

Teachers Involved
Prof J Wang, Physics (jianwang@hkbu.hk)

Course Objectives
This capstone course is offered to students majoring in physics, math/physics or astronomy. It should be taken normally in their final year of study. It provides students with the opportunity to study a small problem by themselves, either theoretical, experimental or numerical, under the supervision of an academic staff member. The available projects range from small scale research, critical literature review and comment, and to development of university-level physics or astronomy teaching tools.

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.

Students will receive training in research literature reading and reviewing, under the supervision of a staff member. For theoretical project, students may need to fill in mathematical gaps of some sophisticated derivations and then critically analyze the research methods used in the field. For numerical projects, students need to use computers to reproduce existing numerical or simulation results. For experimental projects, students have to understand the design of the experiment, carrying it out and analyze the sources of errors.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- 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 critique 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

Grade Descriptors
(A+ to F)

Solutions of analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentional 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 some evidence of some coherent and logical abilities, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentional skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of 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. May use knowledge to solve problems. Use data and results minimally to draw conclusions.

Critical use of data and results to draw appropriate conclusions.

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.

Critical use of data of results to draw appropriate conclusions.

Apply highly effective organizational and presentional skills. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.

Apply moderately effective organizational and presentional skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

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 effective organizational and presentional skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show some evidence of some coherent and logical abilities, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentional skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

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. May use knowledge to solve problems. Use data and results minimally to draw conclusions.

Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentional skills. Apply moderately effective lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.

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. Apply highly effective lab skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.

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 effective organizational and presentional skills. Apply effective lab skills and techniques. Correct use of data of results to draw appropriate conclusions.

Grade Descriptors
(A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentional skills. 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 presentional 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 presentional 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 abilities, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentional skills. Apply partially effective lab skills and techniques. Limited ability to use data and results to draw appropriate conclusions.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of 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. May use knowledge to solve problems. Use data and results minimally to draw conclusions.
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.

Pre-requisites
Pass in at least 24 credits of advanced level (3XXX level or above) disciplinary core/elective courses of the Physics Major, Mathematics/Physics Major or Astronomy Major curriculum.
This capstone course is for Astronomy, Mathematics/Physics, and Physics Majors students only.
The earliest that a student is allowed to take this capstone course is their year 3 study.

Grade Descriptors
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 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 relevance 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. 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 ineffectual.

Course Type
Project-based course

Course Teaching & Learning Activities
Meet with supervisor
Reading / Self study

Assessment Methods and Weighting
Oral presentation including supervisor's comments (10%)
Research report

Required/recommended reading and online materials
To be provided by individual project supervisor

PHYS4150
Computational physics (6 credits)

Offering Department
Physics

Quota
---

Course Co-ordinator
Prof J Wang, Physics (jianwang@hku.hk)

Teachers Involved
Prof J Wang, Physics

Course Objectives
The aim of the course is to show how the power of computers enables to computational approach to solving physics problems to be adopted, which is distinct from, and complimentary to, traditional experimental and theoretical approaches. The material covered will be found useful in any project or problem solving work that contains a strong computational or data analysis element. The course is designed such that a significant fraction of the student's time is spent actually programming specific physical problems rather than learning abstract techniques.

Course Contents & Topics
The course will cover the following problems: Introductory computational physics and computer algebra, integration and differentiation, interpolation and extrapolation, ordinary differential equation such as those of classical mechanics, partial differential equations (such as the Maxwell's equation, the diffusion equation, and the Schroedinger equation), matrix methods (such as systems of equations and eigenvalue problems applied to Poisson's equation and electronic structure calculations), Monte Carlo (Metropolis algorithm) and other simulation methods (such as molecular dynamics), and several physics projects.

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 Monte Carlo method and other simulation methods to solve deterministic as well as probabilistic physical problems
CLO 3 employ appropriate numerical method to interpolate and extrapolate data collected from physics experiments
CLO 4 use appropriate numerical method to solve the differential equations governing the dynamics of physical systems

Pre-requisites
Pass in (MATH3301 or MATH401 or MATH3403 or MATH3405 or PHYS3150); and
Pass in any three of the following courses: PHYS3350, PHYS3351, PHYS3450, PHYS3550

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. Correct use of data of results to draw appropriate conclusions.

B
Demonstrate substantial command of a broad range of knowledge and skills required for attaining 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. Mostly correct but some erroneous 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 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
**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>12</td>
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<tr>
<td>Tutorials</td>
<td></td>
<td>8</td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>80</td>
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</tbody>
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**Assessment Methods and Weighting**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tr>
<td>Assignments</td>
<td></td>
<td>20</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>2-hour written exam</td>
<td>40</td>
<td>CLO 1,2</td>
</tr>
<tr>
<td>Presentation</td>
<td></td>
<td>15</td>
<td>CLO 1</td>
</tr>
<tr>
<td>Project report</td>
<td></td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Course Contents & Topics**
Topics include basic data analysis techniques, linear and non-linear fittings, determining the goodness of the fit, basic hypothesis testing techniques, modeling physical and related systems via differential (ordinary and/or partial), difference equations as well as discrete models such as cellular automata, introduction to complex systems, complex adaptive systems and nonlinear dynamics, the use of computer package such as Matlab in modeling and data analysis. The emphasis is on the basic principles and concepts rather than the use of computer packages. This course provides a solid foundation for students who intend to do computational physics and complex systems research. It also prepares students to work in related industries.

**Course Objectives**
This course covers general modeling and data analysis techniques used 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 and concepts rather than the use of computer packages. This course provides a solid foundation for students who intend to do computational physics and complex systems research. It also prepares students to work in related industries.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- **CLO 1** describe and explain state-of-the-art modeling methods used in physics
- **CLO 2** apply basic modeling techniques, together with logical and mathematical reasoning, to situations of the physical world
- **CLO 3** analyse and solve problems with the aid of computer packages such as Matlab
- **CLO 4** critically interpret experimental data from physics experiments

**Pre-requisites**
Pass in (MATH3301 or MATH3401 or MATH3403 or MATH3405 or PHYS3150); and Pass in any one of the following courses: PHYS3350, PHYS3351, PHYS3450, PHYS3550

**Offer in 2016 - 2017**
N Offer in 2017 - 2018 : N

**Grade Descriptors (A+ to F)**

- **A** Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills. Apply highly effective computer modeling skills and techniques. Critical use of data and results to draw appropriate and insightful conclusions.
- **B** Demonstrate substantial command of the knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities, reasoned logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations using effective organizational and presentational skills. Apply effective computer modeling 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 computer modeling 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 computer modeling 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 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.
PHYS4350  Advanced classical mechanics (6 credits)  Academic Year 2016
Offering Department  Physics
Course Co-ordinator  Prof S Q Shen, Physics (sshen@hku.hk)
Teachers Involved  Prof S Q Shen, Physics
Course Objectives  Build on the 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 mechanics 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 2016 - 2017  Y 1st sem  Offer in 2017 - 2018 : 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 the knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods and Weighting  
Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping
Assignments  20  CLO 1,2,3,4
Examination  3-hour written exam  60  CLO 1,2,3,4
Test  20  CLO 1,2,3,4

Course Type  Lecture-based course
Course Teaching & Learning Activities  Activities  Details  No. of Hours
Lectures  36
Tutorials  12
Reading / Self study  80

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)  Academic Year 2016
Offering Department  Physics
Course Co-ordinator  Dr W Yao, Physics (wangyao@hku.hk)
Teachers Involved  Dr W Yao, Physics
Course Objectives  Build on the advanced undergraduate level course PHYS3351, this course further discusses concepts and mathematical techniques in quantum mechanics through special topics and applications. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.
Course Learning Outcomes  On successful completion of this course, students should be able to:

- CLO 1 review the perturbation theory and some other approximation methods on various quantum systems
- CLO 2 apply physics principles to describe the physical properties of various quantum systems
- CLO 3 demonstrate knowledge and discuss the underlying physical concepts associated with the selected quantum systems

Pre-requisites (and Co-requisites and Impermissible combinations)  Pass in PHYS3351


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.
PHYS4450 Advanced electromagnetism (6 credits) Academic Year 2016
Offering Department Physics Quota ---
Course Co-ordinator Prof X D Cui, Physics (xdcui@hku.hk)
Teachers Involved Prof X D Cui, Physics
Course Objectives Build on the advanced undergraduate level course PHYS3450, this course further discusses concepts and mathematical techniques in electromagnetism through special topics and applications. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.
Course Contents & Topics Topics include Maxwell's Equations, 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 Pass in PHYS3450
Grade Descriptors (A+ to F) A
B
C
D
Fail

Organization and presentation skills are minimally effective or ineffective.

Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 20 CLO 1,2,3
Examination 3-hour written exam 60 CLO 1,2,3
Test 20 CLO 1,2,3

Course Website http://www.physics.hku.hk/~phys4351/

PHYS4550 Advanced statistical mechanics (6 credits) Academic Year 2016
Offering Department Physics Quota ---
Course Co-ordinator Dr Y J Tu, Physics (yanjuntu@hku.hk)
Teachers Involved Dr Y J Tu, Physics
Course Objectives Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C

Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D

Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail

Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 10 CLO 1,2,3,4
Examination 3-hour written exam 60 CLO 1,2,3,4
Test 30 CLO 1,2,3,4

Required/recommended reading and online materials Lecture notes provided by Course Coordinator D. J. Griffiths: Introduction to Electrodynamics, 3rd ed., (Prentice-Hall, 1999).
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

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 2016 - 2017 Y 2nd sem Offer in 2017 - 2018 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 presenational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presenational skills.

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.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presenational skills are minimally effective or ineffective.

Course Type Lecture-based course

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 80

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 20 CLO 1,2,3
Examination 50 CLO 1,2,3
Test 30 CLO 1,2,3

Required/recommended reading and online materials
Lecture notes provided by Course Coordinator

PHYS4650 Stellar physics (6 credits) Academic Year 2016
Offering Department Physics Quota ---
Course Co-ordinator Dr S C Y Ng, Physics (ncy@bohr.physics.hku.hk)
Teachers Involved Dr S C Y Ng, Physics

Course Objectives
To introduce the basic theory of stellar structure and evolution. It follows a vigorous mathematical treatment that stresses on the underlying physical processes. Knowledge in quantum mechanics and statistical mechanics will be advantageous.

Course Contents & Topics

Course Learning Outcomes
On successful completion of this course, students should be able to:

CLO 1 describe what is stars and to classify different types of stars

CLO 2 analytically calculate and solve problems related to the structure and evolution of stars including the use of stellar structure equations and Saha equations

CLO 3 critically examine the physical processes occurring in stars and how these processes affect the evolution of stars

CLO 4 assess selected research papers in the field of stellar astrophysics

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS3351 and PHYS3651

Offer in 2016 - 2017 Y 2nd sem Offer in 2017 - 2018 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 presenational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presenational skills.

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.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presenational skills are minimally effective or ineffective.
Course Type: Lecture-based course
Course Teaching & Learning Activities:
- Activities: Lectures, Tutorials, Reading / Self study
  - Lectures: 36
  - Tutorials: 12
  - Reading / Self study: 80

Assessment Methods and Weighting:
- Methods: Assignments, Examination, Project reports, Test
  - Assignments: 10 CLO 1,2,3,4
  - Examination: 2-hour written exam 60 CLO 1,2,3
  - Project reports: 10 CLO 1,2,3,4
  - Test: 20 CLO 1,2,3

Required/recommended reading and online materials:
- Lecture notes provided by Course Coordinator
- Francis, LeBlanc, An Introduction to Stellar Astrophysics (Wiley, 2010)
- Lecture notes provided by Course Coordinator

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:

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:
Pass in PHYS3351 or PHYS3450 or PHYS3550 or PHYS3651

Offer in 2016 - 2017: 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 analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type: Lecture with laboratory component course
Course Teaching & Learning Activities:
- Activities: Lectures, Laboratory, Tutorials, Reading / Self study
  - Lectures: 36
  - Laboratory: 8
  - Tutorials: 8
  - Reading / Self study: 80

Assessment Methods and Weighting:
- Methods: Assignments, Examination, Laboratory reports, Presentation, Test
  - 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
This course provides students with a modern advanced-level understanding of the properties of our Solar System and planetary systems around other stars and of the physical, chemical, and geological processes that govern them.

**Course Contents & Topics**

Terrestrial planets, giant planets, moons and minor bodies in our Solar System; planetary dynamics; energy transport; planetary atmospheres, surfaces, and interiors; planet formation; extrasolar planets.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 describe key aspects of our Solar System and extrasolar planetary systems acquired through observations and experiments
- CLO 2 explain essential elements of the processes governing the properties of planetary bodies
- CLO 3 apply physical principles to construct models for some basic aspects of the structure, formation and evolution of planetary bodies

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in PHYS3651 or (PHYS3350 and PHYS3550)

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2017 - 2018</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Offer in 2017 - 2018 : Y</td>
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</tbody>
</table>

**Asessment Methods**

<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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<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>

<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</td>
<td></td>
</tr>
<tr>
<td>Essay</td>
<td>15</td>
<td>CLO 1,2,3</td>
<td></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>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

**PHYS4653 Cosmology (6 credits)**

**Offering Department** Physics

**Course Co-ordinator** Prof K S Cheng, Physics (hrspksc@hku.hk)

**Teachers Involved** Prof K S Cheng, Physics

**Course Objectives**

The aim of the course is to offer an advanced introduction to cosmology, to familiarize students with the mathematical formulation used to model the evolution and dynamics of the universe, and to provide an up to date discussion of the big bang theory and structure and galaxy formation.

**Course Contents & Topics**


**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 apply physics principles to describe the observational/experimental aspects of cosmology
- CLO 2 explain the observed phenomena of cosmology
- CLO 3 demonstrate knowledge and discuss the underlying physical concepts associated with the cosmological evolution of the universe and with the dynamic interactive processes that take place in the universe

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in PHYS3651 or PHYS3652

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Offer in 2017 - 2018</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>1st sem Offer in 2017 - 2018 : N</td>
<td>---</td>
</tr>
</tbody>
</table>

**Grade Descriptors**

- A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability 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.

**Organization and presentational skills**

- 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 general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Website**

http://moodle.hku.hk

**PHYS4653 Cosmology (6 credits)**

**Offering Department** Physics

**Course Co-ordinator** Prof K S Cheng, Physics (hrspksc@hku.hk)

**Teachers Involved** Prof K S Cheng, Physics

**Course Objectives**

The aim of the course is to offer an advanced introduction to cosmology, to familiarize students with the mathematical formulation used to model the evolution and dynamics of the universe, and to provide an up to date discussion of the big bang theory and structure and galaxy formation.

**Course Contents & Topics**


**Course Learning Outcomes**

On successful completion of this course, students should be able to:

- CLO 1 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
PHYS4654 General relativity (6 credits) Academic Year 2016-2017
Offering Department Physics
Teachers Involved Dr M Su, Physics
Course Objectives To introduce students to the field of general relativity. To provide conceptual skills and analytical tools necessary for astrophysical and cosmological applications of the theory.
Pre-requisites Pass in PHYS2055 and PHYS3350
Offer in 2016 - 2017 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 some of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
D
- Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
Fail
- Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
Course Type Lecture-based course
Assessment Methods and Weighting
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>8</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>7</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>
<tr>
<td>Examination</td>
<td>60</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>
| Lecture notes provided by Course Coordinator
Required/recommended reading and online materials
B. Schutz: A First Course in General Relativity (Cambridge University Press, 2009)
Course Website http://moodle.hku.hk

PHYS4655 Interstellar medium (6 credits) Academic Year 2016
Offering Department Physics
Teachers Involved Dr M H Lee, Physics
Course Objectives
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>8</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
<td></td>
</tr>
<tr>
<td>Laboratory reports</td>
<td>7</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>
| Lecture notes provided by Course Coordinator
Required/recommended reading and online materials
B. Schutz: A First Course in General Relativity (Cambridge University Press, 2009)
Course Website http://moodle.hku.hk

Department of Physics
http://moodle.hku.hk
Course Website
online materials
reading and
Required/recommended reading and online materials
http://moodle.hku.hk
Course Website
This course provides students with an advanced-level understanding of the processes responsible for the absorption and emission of continuum and line radiation from gas and dust in stellar atmospheres and interstellar space, and their astrophysical applications and implications.

**Course Contents & Topics**
Gas, dust, atoms, molecules, radiation; physical and radiative properties of hydrogen, helium and heavier elements; hydrogen clouds, molecular clouds; HI regions, nebulae, supernovae.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1 express what exists between stars in spiral and elliptical galaxies
- CLO 2 apply physical principles to describe excitation/ionization and de-excitation/recombination of atoms and ions
- CLO 3 recognize which process or processes occur or dominate in which object or phase of the interstellar medium

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in PHYS3651 or (PHYS3351 and PHY3550)

**Offer in 2016 - 2017 Grade Descriptors (A+ to F)**
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Assessment Methods and Weighting**
- Assignments 20 CLO 1,2,3
- Essay 15 CLO 1,2,3
- Examination 2-hour written exam 50 CLO 1,2,3
- Test 15 CLO 1,2,3

**Required/recommended reading and online materials**
Lecture notes provided by Course Coordinator
This course discusses both theoretical and experimental aspects of particle physics. It serves as an elective course to better prepare students for their postgraduate studies in physics or other related disciplines.

**Course Contents & Topics**
Topics include: fundamental particles, symmetry and conservation law, Feynman diagrams, scattering cross section, electroweak theory, QCD, particle accelerator and detector, neutrino mass and oscillation, Higgs particle.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1 describe and explain the fundamental physical principles for the standard model of particle physics.
- CLO 2 apply these principles, together with logical and mathematical reasoning, to analyze particle physics processes.
- CLO 3 capture the frontier and progress of particle physics.

**Pre-requisites**
Pass in PHYS3351

**Offer in 2016 - 2017**
Y  2nd sem  Offer in 2017 - 2018 : Y  Examination  May

**Grade Descriptors (A+ to F)**
A  Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B  Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C  Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail  Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**  Lecture-based course

**Course Teaching & Learning Activities**
<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>
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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></td>
<td>20</td>
<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1, 2, 3</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>30</td>
<td>CLO 1, 2, 3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
Lecture notes provided by Course Coordinator


**PHYS4966**  Physics internship (6 credits)

**Offering Department**  Physics

**Course Co-ordinator**  Dr J C S Pun, Physics (jcsun@hku.hk)

**Teachers Involved**  NIL, Physics

**Course Objectives**
This capstone course is offered to students majoring in physics, math/physics or astronomy. It should be taken normally in the summer immediately before their final year of study. It provides students with the opportunity to gain working experience in the field of physics or astronomy through intern placement. Students are expected to use what they have learnt in their majors in this intern.

**Course Contents & Topics**
Students will work as an intern for at least 160 hours within the University or outside the University in a company, government department or NGO. The work nature must be related to physics or astronomy. The internship should be arranged by the Department or obtained by students themselves. In the latter case, it must be approved before the commencement of the internship.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

- CLO 1 apply physics or astronomy knowledge students have learnt in their majors to real working environment
- CLO 2 help to create, propose or design part of the project he/she is working on during the internship
- CLO 3 employ effective technical and inter-personal communication skills

**Pre-requisites (and Co-requisites and Immissible combinations)**
Pass in at least 24 credits of advanced level (3XXX level or above) disciplinary core/elective courses of the Physics Major, Physics/Physics Major or Astronomy Major curriculum.

This capstone course is for Astronomy, Mathematics/Physics, and Physics Majors students only.

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

**Offer in 2016 - 2017**
Y  Summer  Offer in 2017 - 2018 : Y  Examination  No Exam

**Grade Descriptors (Pass/Fail)**
Pass  Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of "Distinction".

Fail  Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.

**Course Type**  Internship

**Course Teaching & Learning Activities**
<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>
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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>Written report</td>
<td></td>
<td>100</td>
<td>CLO 1, 2, 3</td>
</tr>
</tbody>
</table>
PHYS4999  Physics project (12 credits)  
Offering Department  Physics  
Course Co-ordinator  Prof J Wang, Physics (jianwang@hku.hk)  
Teachers Involved  Various teachers in the department, Physics  
Course Objectives  This capstone course is offered to students majoring in physics, math/physics or astronomy. It is designed for those who are interested in tackling a research project in physics and/or astronomy. It should be taken normally in their final year of study. It provides students with the opportunity to study a specific problem by themselves, either theoretical, experimental or numerical, under the supervision of an academic staff using the knowledge the student gained in all years of his/her major study. The available projects are close to postgraduate level research in physics and/or astronomy.

Course Contents & Topics  Students interested in taking this course should contact their prospective supervisors in May to determine the contents and the nature of their projects in the coming academic year. They must get the approval from both the prospective supervisor and the course coordinator to take this course.

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 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 (for theoretical or computational projects)
- CLO 6 propose and execute physics experiments or astronomical observances, analyze results and sources of errors of the experiment or observation in comparison with predictions (for experimental projects)

Pre-requisites  Pass in at least 24 credits of advanced level (3XXX level or above) disciplinary core/elective courses of the Physics Major, Mathematics/Physics Major or Astronomy Major curriculum.

This capstone course is for Astronomy, Mathematics/Physics, and Physics Majors students only. The earliest that a student is allowed to take this capstone course is their year 3 study.

Offer in 2016 - 2017  Y Year long  Offer in 2017 - 2018 : Y  Examination  No Exam  
Grade Descriptors  (A+ to F)  
A  Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Insightful use and critical analysis/evaluation of information drawn from a full range of high quality sources and to quote/reference aptly. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills. Work of A+ should show considerable additional work beyond that is required in wider areas relevant to the topic.

B  Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C  Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D  Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and referense of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fail  Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type  Project-based course  
Course Teaching & Learning Activities  
Activities  Details  No. of Hours  
Meeting with supervisor  
Reading / Self study  12S

Assessment Methods and Weighting  
Methods  Details  Weighting in final course grade (%)  Assessment Methods to CLO Mapping  
Oral presentation  including supervisor's comments (10%)  30 CLO 2,4,5,6
Research report  70 CLO 1,2,3,4,5,6  
To be provided by individual project supervisor
<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>Assessment Methods and Weighting</td>
<td>Methods</td>
</tr>
<tr>
<td>Required/recommended reading and online materials</td>
<td>TBC</td>
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</tbody>
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**PHYS7350**  
*Graduate classical mechanics (6 credits)*

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>TBC, Physics (<a href="mailto:sshen@hku.hk">sshen@hku.hk</a>)</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></td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in PHYS4350</td>
</tr>
<tr>
<td>Offer in 2016 - 2017</td>
<td>N</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

**PHYS7351**  
*Graduate quantum mechanics (6 credits)*

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof S Q Shen, Physics (<a href="mailto:sshen@hku.hk">sshen@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof S Q Shen, Physics</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course introduces postgraduates and senior undergraduates to theory and advanced techniques in quantum mechanics, and their applications to select topics in condensed matter physics.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>The course will cover the following topics: Dirac notation, quantum dynamics, the second quantization, symmetry and conservation laws, permutation symmetry and identical particles, perturbation and scattering theory, introduction of relativistic quantum mechanics.</td>
</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 PHYS4351</td>
</tr>
<tr>
<td>Offer in 2016 - 2017</td>
<td>Y</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of the knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</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. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option</th>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>
### PHYS7450: Graduate Electromagnetism (6 credits)

<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>
<tr>
<td>Course Objectives</td>
<td>The aim of this course is to provide students with the advanced level of comprehending on the theory of electromagnetic field, enabling them to master key analytical tools for solving real physics problems.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>This course will introduce and discuss the following topics: Boundary-value problems in electrostatics and Green Function method, Electrostatics of Media, Magneto-statics, Maxwell's equations and conservation laws, Gauge transformations, Electromagnetic waves and wave guides.</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 analyse and solve various electrostatic and magnetostatic problems with Green's Function</td>
</tr>
<tr>
<td></td>
<td>CLO 2 comprehend and explain many electromagnetic phenomena</td>
</tr>
<tr>
<td></td>
<td>CLO 3 recognise and comprehend the important concepts of conservation laws and gauge transformations, which should be very helpful for doing research in future</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in PHYS4450</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
<tr>
<td>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>Tutorials</td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td>12</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping</td>
</tr>
<tr>
<td>Assignments</td>
<td>30</td>
</tr>
<tr>
<td>Examination</td>
<td>70</td>
</tr>
<tr>
<td>3-hour written exam</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

### PHYS7550: Graduate Statistical Mechanics (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Co-ordinator</td>
<td>Prof J Wang, Physics (<a href="mailto:jianwang@hku.hk">jianwang@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Prof J Wang, Physics</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>This course intends to introduce some advanced topics in the field of equilibrium statistical physics.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Ensemble theory: the micro-canonical ensemble, the canonical ensemble, and the grand canonical ensemble. Quantum mechanical ensemble theory. Theory of simple gases, ideal Bose systems, ideal Fermi systems. Statistical mechanics of interacting systems. Some topics in the theory of phase transition may be selected.</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 discuss the various classical ensembles and quantum ensembles</td>
</tr>
<tr>
<td></td>
<td>CLO 2 solve the statistical mechanics problems using ensemble theory</td>
</tr>
<tr>
<td></td>
<td>CLO 3 explain the connection between classical statistical mechanics and quantum statistical mechanics</td>
</tr>
<tr>
<td></td>
<td>CLO 4 explain the concept of density matrix</td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in PHYS4450</td>
</tr>
<tr>
<td>Offer in 2016 - 2017</td>
<td>Y 1st sem Offer in 2017 - 2018 : N</td>
</tr>
<tr>
<td>Grade Descriptors (A+ to F)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
</tbody>
</table>
### PHYS7551: Solid state physics (6 credits)

**Offering Department**: Physics  
**Course Co-ordinator**: Prof J Wang, Physics (jianwang@hku.hk)  
**Teachers Involved**: Prof J Wang, Physics  
**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.  
**Pre-requisites**: Pass in PHYS3551 and PHYS4351  
**Offer in 2016 - 2017**:  
**Grade Descriptors (A+ to F)**

- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**: Demonstrate substantial command of the knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities 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 & 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>3-hour written exam</td>
<td>70</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**

- Lecture notes provided by Course Coordinator
- R.K. Pathria: Statistical mechanics
- M. Plischke and B. Bergersen: Equilibrium statistical physics

**Required Texts**


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### PHYS7650: Stellar atmospheres (6 credits)

**Offering Department**: Physics  
**Course Co-ordinator**: TBC, Physics  
**Teachers Involved**: TBC, Physics  
**Course Objectives**: TBC  
**Offer in 2016 - 2017**:  
**Grade Descriptors (A+ to F)**

- **A**: 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.
- **B**: 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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- **D**: 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 & Weighting**

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<td>Assignments</td>
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<td>15</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>3-hour written exam</td>
<td>70</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**

- Lecture notes provided by Course Coordinator
Course Contents & Topics
PHYS7750 Nanophysics (6 credits)

Offering Department Physics
Course Co-ordinator Prof S J Xu, Physics (sjxu@hku.hk)
Teachers Involved Prof S J Xu, Physics

Course Objectives
This course is designed to let fresh postgraduate students know fundamental concepts and principles of nano physics, such as two-dimensional electron gas, quantum Hall effects, one-dimensional electron system, quantum wires and nanotubes, zero-dimensional electron systems, single electron effects and quantum dots. Introduction to nano physics and quantum size effect. Dimensionalities and density of states. Optical and transport properties of two-dimensional electron gas formed at heterostructures and within novel graphene monolayers with external fields. Quantum Hall Effects. Physics of one-dimensional electron systems including carbon nanotubes and semiconductor nanowires. Fundamental physics of zero-dimensional electron systems. Single electron effects, Quantum dots and nanocrystals. Fundamental principles and applications of scanning tunneling microscopy in the study of nano physics. If time permits, the making and application aspects of nanomaterials 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 optical and transport properties of two-dimensional electron gas with external fields, especially quantum Hall effects
- CLO 3 recognize the fundamental principles and important applications of scanning tunneling microscopy in the study of nano physics
- CLO 4 describe the basic physics of one-dimensional electron systems including carbon nanotubes and semiconductor nanowires
- CLO 5 understand the central physics of zero-dimensional quantum dots and nanocrystals, single electron effects

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in PHYS3551 and PHYS4351


Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
B Demonstrate substantial command of the knowledge and skills required for attaining most of the course learning outcomes. Show evidence of analytical and critical abilities, reasoned logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations using effective organizational and 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. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems using limited or barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%)
Reading / Self study 80 TBC
Tutorials 12 TBC
Lectures 36 TBC

Assessment to CLO Mapping
CLO 1 Recognize the fundamental principles and important applications of scanning tunneling microscopy in the study of nano physics
CLO 2 Identify and compare optical and transport properties of two-dimensional electron gas with external fields, especially quantum Hall effects
CLO 3 Describe the basic physics of one-dimensional electron systems including carbon nanotubes and semiconductor nanowires
CLO 4 Understand the central physics of zero-dimensional quantum dots and nanocrystals, single electron effects

Course Type Lecture-based course

Exam Details

Methods No. of Hours
Reading / Self study 80
Tutorials 12
Lectures 36
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.

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.

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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 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 (and Co-requisites and Impermissible combinations)**

Pass in CHEM2041 or ENVS2001 or ENVS2002 or PHYS2260

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>Offer in 2017 - 2018</th>
<th>Examination</th>
<th>May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>2nd sem</td>
<td>Offer in 2017 - 2018</td>
<td>Y</td>
<td></td>
</tr>
</tbody>
</table>

**Grade Descriptors (A+ to F)**

- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<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>debate questions</td>
<td>10</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>Presentation</td>
<td></td>
<td>40</td>
<td>CLO 2,3</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**

Lecture notes provided by Course Coordinator


**Course Website**

http://moodle.hku.hk
SCNC1111  Scientific method and reasoning (6 credits)  Academic Year 2016
Offering Department Faculty
Course Co-ordinator Dr K F Lam, Statistics & Actuarial Science (hmtdk@hku.hk)
Teachers Involved Dr K F Lam, Statistics & Actuarial Science  Dr W M Y Cheung, 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 to 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
a. Mathematics with topics selected from
- Foundation of mathematics,
- Mathematics and advancement of science - an introduction,
- Mathematical modelling - an introduction,
- Guessimation,
- Difference equations,
- Linear algebra and matrices,
- Calculus and differential equations, and/or
- Fractals and Chaos.

b. Statistics
- Probability rules
- Probabilistic methods
- Statistical inference
- Confidence intervals estimation
- Hypothesis testing
- Decision making with statistics
- Statistical modelling, and use and misuse of statistics

Pre-requisites (and Co-requisites and Impermissible combinations)
NIL
(This course is compulsory for all students taking a Science major offered by the Faculty of Science. Students should take this course in their first year.)

Offer in 2016 - 2017 Grade Descriptors (A+ to F)
Y 1st sem 2nd sem Offer in 2017 - 2018 : Y Examination Dec May

Course Learning Outcomes On successful completion of this course, students should be able to:
CLO 1 describe key aspects of scientific methodology
CLO 2 describe the key elements of the foundation of mathematics and statistics
CLO 3 identify the mathematics that underlies scientific problems
CLO 4 apply logical and quantitative reasoning to re-formulate both real life and scientific problems in mathematical terms, and to interpret their solutions

Assessment Methods and Weighting
Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 20 CLO 1,2,3,4
Examination 2-hour examination 40 CLO 1,2,4
Project reports 20 CLO 1,3,4
Test 20 CLO 1,2

Required/recommended reading and online materials
TBC

SCNC1112  Fundamentals of modern science (6 credits)  Academic Year 2016
Offering Department Faculty
Course Co-ordinator Dr J C S Pun, Physics (jcspun@hku.hk)
Teachers Involved Dr J C S Pun (1st sem), Physics  Prof A S C Cheung (1st & 2nd sem), Chemistry  Prof A S T Wong (1st sem), Biological Sciences  Dr G W Porter (2nd sem), Faculty of Science  Dr M H Lee (2nd sem), Earth Sciences
### 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.

### Course Contents & Topics
(1) Universal principles and unifying concepts of science  
- Structure of matter  
- The quantum world  
- Elementary particles and standard model  
(2) Atoms and molecules  
- Matters and atoms: The periodic table  
- Chemical bonds and chemical reactions  
- Important molecules: water, carbon, molecular cluster  
- Nanoscience and nanotechnology  
(3) DNA/Genetic  
- Molecules of life  
- Genomics and DNA: Genetics and inheritance  
(4) Cells and systems  
- The origin and evolution of life  
- Ecology and environment  
(5) Earth and Beyond  
- Solid Earth, Earth's atmosphere and hydrosphere  
- Earth's motion in space  
- Planets, the Sun, and the solar system  
- Cosmology

### Course Learning Outcomes
On successful completion of this course, students should be able to:

- **CLO 1** acquire an understanding of the historical development of modern science, the essence and spirit of scientific inquiry methods, and the role of science in the advancement of civilization over time  
- **CLO 2** understand and be familiar with the fundamental scientific principles and concepts  
- **CLO 3** appreciate the diversity of different scientific disciplines and develop multidisciplinary and interdisciplinary perspectives on scientific issues  
- **CLO 4** critically and creatively appraise received ideas and established knowledge  
- **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

### Pre-requisites (and Co-requisites and Impermissible combinations)
NIL  
(This course is compulsory for all students taking a Science major offered by the Faculty of Science. Students should take this course in their first year.)

### Offer in 2016 - 2017
Y 1st sem 2nd sem Offer in 2017 - 2018 : Y  
Examination Dec May

### Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Details</td>
<td>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.</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 lab skills and techniques.</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 lab skills and techniques. Mostly correct but some erroneous use of data and results to draw appropriate conclusions.</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show 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>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Apply minimally effective or ineffective lab / 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.</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Hours</td>
<td>36</td>
<td>12</td>
<td>94</td>
<td></td>
<td></td>
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</tbody>
</table>

### Course Type
Lecture with laboratory component course

### Course Teaching & Learning Activities
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<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>94</td>
</tr>
<tr>
<td>Assessment</td>
<td>1 hour in-class quiz</td>
<td>1</td>
</tr>
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</table>

### Assessment Methods and Weighting
<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>tutorials and homework</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td>50</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Presentation</td>
<td>project presentation</td>
<td>20</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Test</td>
<td></td>
<td>10</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

### Required/recommended reading and online materials

### SCNC1113
The big history of our planet: a scientific perspective on everything that has ever happened (6 credits)

### Academic Year
2016

### Offering Department
Faculty

### Quota
50

### Course Co-ordinator
Dr W M Y Cheung, Faculty (willmyc@hku.hk)
### 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)
- Level 3 or above in at least one science subject at the pre-university level (HKDSE Physics, Chemistry, Biology, Combined/Integrated Science or equivalent).

### Offer in 2016 - 2017
- Y 1st sem
- Offer in 2017 - 2018 : Y
- Examination No Exam

### Grade Descriptors (A+ to F)

- **A** Demonstrate thorough mastery of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, 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.
- **B** Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Carry out computations mostly in a correct and careful way, but commit some minor computational errors. Apply effective organizational and presentational skills.
- **C** Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Commit a number of minor computational errors. Apply moderately effective organizational and presentational skills.
- **D** Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Commit some substantial computational errors. Apply limited or barely effective organizational and presentational skills.
- **Fail** Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Commit serious computational errors. Organization and presentational skills are minimally effective or ineffective.

### Course Type
- Lecture-based course

### Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
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<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>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>
SCNC2121 Sustainable food production (6 credits)  Academic Year 2016

Offering Department Faculty  Quota 32

Course Co-ordinator Dr H S El-Nezami, Biological Sciences (elnezami@hku.hk)

Course Objectives
This course is designed to provide students with the opportunity to experience the inner-workings of a sustainable, campus farming operation, and to make connections between the ecosystems that nourish the thriving, urban communities surrounding the farm. Students will participate in plenary sessions with course instructors and guest lecturers from the UBC Faculty of Land and Food Systems, in guided group discussions, field trips on and off-campus, and in a variety of seasonal, hands-on farming activities.

Course Contents & Topics
The MacMillian 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 Goleib, and the wiggle worm project in the Student Union Building/SUB. Students will also venture off-campus to two the Vancouver Farmers’ Market and to Granville Island Public Market to provide a comparative view of marketing systems and the regionally grounded food system context.

The main approach to learning with this course is student-centered learning and hands-on experience. To meet course learning objectives, students are expected to attend and participate in all sessions, to contribute to group discussions and the group oral presentation, and to complete a series of reflective journals on each of the four main course themes—soils, biodiversity, seeds, marketing.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 connect underlying agroecosystem concepts and soil science fundamentals with principles and practices of sustainable farming
- CLO 2 observe and compare multiple models of agricultural food production in an urban and campus farm setting
- CLO 3 identify multiple strategies for creating on-farm biodiversity
- CLO 4 demonstrate a basic understanding of composting fundamentals
- CLO 5 demonstrate the ability to perform a select set of basic crop maintenance, harvest, washing, and packing techniques in a sustainable campus farm setting
- CLO 6 demonstrate best practices with post-harvest handling and food safety protocols

Pre-requisites (and Co-requisites and Impermissible combinations) Students are expected to have passed at least 30 credits of level 1 and/or level 2 science courses. Students will also need to pass an interview in order to be enrolled in the course.

Offer in 2016 - 2017 Y Summer  Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors (A+ to F)
A Clear understanding of the basics from sustainable farming to marketing strategies used by sustainable farming operations. Ability to perform crop maintenance, harvest, washing, and packing in a sustainable campus farm setting. Ability to demonstrate solid team-based skills for performance of fieldwork, and satisfactory performance in different assessment components.

B Clear understanding of the basics from sustainable farming to marketing strategies used by sustainable farming operations. Ability to perform crop maintenance, harvest, washing, and packing in a sustainable campus farm setting. Ability to demonstrate solid team-based skills for performance of fieldwork, and distinct performance in different assessment components.

C Understanding of the basics from sustainable farming to marketing strategies used by sustainable farming operations. Ability to perform crop maintenance, harvest, washing, and packing in a sustainable campus farm setting. Ability to demonstrate solid team-based skills for performance of fieldwork, and distinct performance in different assessment components.

D Knowing some of the basics of sustainable farming. Active participation in team-based fieldwork, and satisfactory performance in different assessment components.

Fail Fail to follow the basics of sustainable farming as demonstrated by unsatisfactory performance in assignments and/or fieldwork.

Course Type Field camps

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Field work</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Presentation</td>
<td>Group discussion / Project</td>
<td>10</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Assessment</td>
<td>End of trip report</td>
<td>30</td>
</tr>
</tbody>
</table>

Assessment Methods and Weighting

<table>
<thead>
<tr>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>To be announced by UBC Faculty of Land and Food Systems</td>
<td>40</td>
<td>CLO 1,2,4,5</td>
</tr>
<tr>
<td>Report</td>
<td>Students will be 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.</td>
<td>60</td>
<td>CLO 3,5,6</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
UBC Faculty of Land and Food Systems will give reading materials to students.

Course Website http://www.scifac.hku.hk/news/bsc/ubc-summer-course

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 be 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 2016

Offering Department Faculty
Quota 32

Course Co-ordinator Dr T Vengatesen, Biological Sciences (rajan@hku.hk)
Teachers Involved Dr T Vengatesen, Biological Sciences, Prof S Kwok, Earth Sciences, Prof G A Williams, Biological 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 inhabitable planet, to appreciate the dynamics of marine biodiversity, the complex interactions between the physical and biological components, fishery, and the services the coastal ocean provide to human. This course will provide an excellent opportunity for students to experience the diversity of marine life in the other side of the Pacific.

Course Contents
Lectures from both HKU and UBC teachers will introduce ‘marine life science’, with a focus on biodiversity, abundance and distribution of species, productivity, coastal pollution, fisheries, aquaculture and climate change. The course will also introduce the commercial aspects of marine life, i.e. eel-grass, aquaculture and climate change mitigation through management of coastal ecosystems. All these lectures will be discussed through a series of field observations, presentations from guest lecturers and group discussions. There will be an excellent opportunity to touch and learn about Canada’s wonderful marine life diversity in the Vancouver Aquarium, and northern Vancouver Fish Hatchery. Students will be learning Canada’s coastal plankton biodiversity through visiting the 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.


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.

B Clear understanding of the basics of marine science. Ability to explain how marine organisms have adapted to their particular environments. Knowing the common views on the reasons why the diversity of marine life and their habitats are so important to human society. Knowing the common views on how human induced threats such as climate change, pollution and habitat change will affect marine life, its diversity and their ecosystem services.

C Demonstrate partial and limited command of knowledge and understanding of the basics of marine science, biodiversity and coastal ecosystem services. Develop little ability to explain how marine organisms have adapted to their particular environments. Knowing the common views on the reasons why the diversity of marine life and their habitats are so important to human society. Knowing the common views on how human induced threats such as climate change, pollution and habitat change will affect marine life, its diversity and their ecosystem services.

D Knowing some of the basics of marine science. Developing ability to explain how marine organisms have adapted to their particular environments. Fail to follow the basics of marine science and/or how marine organisms have adapted to their particular environments.

Course Teaching & Learning Activities

Field camps

Activities Details No. of Hours
Lectures 10 sessions x 2.5 hours 25
Field work Field observation and work: about 5 to 6 field study 36
Presentation Group discussion / Project: 1 group project with presentation 10
Reading / Self study

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Group project work (30-mins presentation) 25 CLO 2
Report 2-hour written examination 50 CLO 1.4
Test Field observation activities & reports 25 CLO 3.4

Reference reading materials will be put on Moodle.
## SCNC3111: Frontiers of Science Honours Seminar Course (6 Credits)

### Offering Department
- Faculty

### Course Co-ordinator
- Dr R K W Lui, Faculty (lui2012@hku.hk)

### Teachers Involved
- Five to six professors from different departments: Dr W M Y Cheung, Dr E K M Leung, Dr R K W Lui, Dr E J Pickett, Dr G W Porter & Dr T D Wotherspoon, Faculty of Science

### Course Objectives
- To introduce the research being done by our Faculty's star 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 in a small group setting
- 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

### Course Contents & Topics
- To six professors from different departments will be featured in the honours seminar course, and they will discuss their latest research with students. The topics will span the areas of Biological Sciences, Chemistry, Earth Sciences, Physics, as well as Mathematics/Statistics & Actuarial science. In addition, the following topics to prepare students for conducting and communicating research will also be introduced: Introduction to Different Search Engines for Scientific Journals and/or Decoding a Scientific Paper and/or Effective Communication for Scientists (Writing, Oral and Poster Presentations).

### Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1 describe and discuss in an informed manner the fields of research of some of our research professors
  - CLO 2 identify how professors with different scientific training solve their research problems
  - CLO 3 apply literature search skills to identify and develop a research topic
  - CLO 4 practice and master scientific writing and presentation skills
  - CLO 5 demonstrate interpersonal skills in collaborating with their peers in a scientific setting
  - CLO 6 devise a research proposal and evaluate their peers' works

### Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in SCNC1111, SCNC1112 and a level 2 science course.
- Students who participated or will participate in ORF/SRF must take 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 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>
<tr>
<td>D</td>
<td>Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
</tr>
</tbody>
</table>

### Course Type
- Lecture-based course

### Course Teaching & Learning Activities
- **Activities**
  - Lectures: 36
  - Tutorials: 12
  - Reading / Self study: 100

### Assessment Methods and Weighting
- **Methods**
  - Assignments: A series of writing and reflection assignments will be given
  - Presentation: Students will give a 30-minute group presentation during the last week of the instruction
  - Project reports: In-class formative assessment: activities for students to work in groups

- **Weighting in final course grade (%)**
  - Assignments: 40
  - Presentation: 40
  - Project reports: 20

### Assessment Methods to CLO Mapping
- CLO 1, 2, 4
- CLO 3, 4, 5, 6
- CLO 1, 2, 4, 5

### Offer in 2016 - 2017
- **Offer in 2016 - 2017**: Y
- **2nd sem**
- **Offer in 2017 - 2018**: Y
- **Examination**: No Exam
### STAT1600
**Statistics: ideas and concepts (6 credits)**

**Offering Department**
Statistics & Actuarial Science

**Course Co-ordinator**
Dr Y K Chung, Statistics & Actuarial Science (yukchung@hku.hk)

**Course Objectives**
The course aims at providing a broad overview of statistics for students who aspire to major in Statistics or Risk Management. It focuses on the roles of statistics as a scientific tool with applications to a wide spectrum of disciplines, and as a science of reasoning which has revolutionized modern intellectual endeavours. It lays a panoramic foundation for a formal study of statistics at the university level.

**Course Contents & Topics**
- Data collection: observational studies versus designed experiments
- Data presentation: tables; graphs; frequency distributions, correlations; trends
- Probability: randomness; probability models; distributions; measures of central tendency and dispersion
- Inference: estimation; tests of significance and hypotheses; confidence intervals; regression; prediction
- Further issues: controversies; misuse of statistics; ethics.

**Course Learning Outcomes**

| Grade Descriptors | Offer in 2016 - 2017 | Grade Descriptors | Offer in 2017 - 2018 | Methods | Assessment Methods and Weighting | Assessment Methods to CLO Mapping | Application
<table>
<thead>
<tr>
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<tr>
<td>A</td>
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<td>Y</td>
<td>Examination One 2-hour written examination 40</td>
<td>CLO 1,2,3,4,5</td>
<td>60 CLO 1,2,3,4,5</td>
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<tr>
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<td>Coursework (assignments, class test(s) and project(s)) 60</td>
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<tr>
<td>C</td>
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<td>CLO 5 pursue a major study in Statistics or Risk Management with a well-established conceptual foundation</td>
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</table>

**Required/recommended reading and online materials**

**Course Website**
moodle.hku.hk

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### STAT1601
**Elementary statistical methods (6 credits)**

**Offering Department**
Statistics & Actuarial Science

**Course Co-ordinator**
Dr R W L Wong, Statistics & Actuarial Science (rwong@hku.hk)

**Course Objectives**
Research findings are usually supported by data. Data collected in an experiment/survey are often concerned with situations involving variability and uncertainty. They are used to estimate the true value of a certain quantity or to test the acceptability of a certain new hypothesis. Valid methods of analysing the data are thus essential to any successful investigation. The course aims to present the fundamentals of statistical methods widely used by researchers. Microsoft Excel might be used to carry out some statistical analysis. There is no demand of sophisticated technical mathematics.

**Course Contents & Topics**
Presentation of data, Measures of Central Tendency, Measures of Variability and Uncertainty, Basic Probability Laws, Common Probability Distributions such as Uniform, Binomial, Poisson, Hyper-geometric, Geometric and Normal distributions, Random Sampling, Distribution of the Mean, Normal Sampling Theorem, Point Estimation, Confidence Intervals, Sample Size Determination, Hypothesis Testing, Inferences for Mean and Proportion, Chi-squared tests, Simple Regression and Correlation

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1 select and use appropriate statistical methods to analyze data
- CLO 2 perform statistical analysis with calculator and Microsoft Excel
- 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 write appropriate conclusions based on the statistical results
## Course Objectives

The discipline of statistics is concerned with situations involving uncertainty and variability. Variability greatly affects the interpretation of data. Thus statistics forms an important descriptive and analytical tool. This elementary course, which is taught without much technical mathematics, presents many standard situations of data analysis and interpretation with emphases on business examples. The statistical tests of these situations are presented. Microsoft Excel might be used to carry out some statistical analysis.

## Course Contents & Topics

The course will introduce and discuss the following topics: Presentation of Data, Measures of Central Tendency, Measures of Variability and Uncertainty, Elementary Probability Rules and Basic Probability Distributions such as Binomial, Normal, Poisson, Hyper-geometric and Geometric, Random Sampling, the Normal Sampling Theorem, Point Estimation, Confidence Intervals and Sample Size Determination, Hypothesis Testing involving Inferences for Means and Proportions as well as the Chi-square tests, Simple Regression and Correlation, Elementary Time Series and Index Numbers.

## Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand the methods for describing sets of data
- CLO 2 perform statistical analysis with calculator and Microsoft Excel, draw conclusions from data using numerical summaries
- CLO 3 understand and apply basic concepts of probability
- CLO 4 gain familiarity with the fundamental concepts of random variables
- CLO 5 make inferences on a population based on sample data
- CLO 6 determine the most appropriate statistical method to use for a given statistical problem
- CLO 7 gain familiarity with the fundamental concepts of statistical inference as they apply to a variety of problems
- CLO 8 understand the basic principles of simple linear regression and correlation and their applications to practical problems in today's society

## Assessment Methods and Weighting

<table>
<thead>
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<td>75</td>
<td>CLO 1, 2, 3, 4, 5, 6, 7, 8</td>
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## Course Website

moodle.hku.hk

## Additional Course Information

Calculator: CASIO fx-50FH (This model has SD-MODE, REG-MODE, nCr and Normal Probability Function which is very suitable for this course.)
Course Type: Lecture-based course

Course Teaching & Learning Activities

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<tr>
<td></td>
<td>Gerald Keller: Managerial Statistics (Cengage Learning, 2009, 8th edition)</td>
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<td>Berk, K.N. &amp; Carey, P.: Data Analysis with Microsoft EXCEL (Duxbury press, Update Office 2007)</td>
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Course Website

moodle.hku.hk

STAT1603 Introductory statistics (6 credits)

Offering Department: Statistics & Actuarial Science

Course Co-ordinator: Dr E K F Lam, Statistics & Actuarial Science

Course Objectives:

The discipline of statistics is concerned with situations involving uncertainty and variability. The interpretation of data needs special techniques when variability plays a role, as it usually does. Thus statistics forms an important descriptive and analytical tool of many scientific disciplines. Candidates with a mathematical background will find this course suitable, because the language of mathematics allows the subject of statistics to be presented with economy and clarity.

Course Contents & Topics:


Pre-requisites (and Co-requisites and Impermissible combinations):

(Level 2 or above in HKDSE Mathematics Extended Module 1 or 2 or equivalent) or (Pass in MATH1009 Basic mathematics for business and economics or MATH1011 or MATH1013, or already enrolled in these courses); and Not for students who have passed or already enrolled in any of these courses: STAT1601, STAT1602, STAT2601, STAT2901


Grade Descriptors (A+ to F):

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type: Lecture-based course

Course Teaching & Learning Activities

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Course Website

moodle.hku.hk
Additional Course Information

Students who intend to major in “Decision Analytics” or “Risk Management” or “Statistics” should take STAT2601 instead of this course.

Other references:

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STAT2601

Probability and statistics I (6 credits)

Academic Year: 2016

Offering Department: Statistics & Actuarial Science

Quota: ---

Course Co-ordinator: Dr W Kwan, Statistics & Actuarial Science (cwkwang@hku.hk)

Teachers Involved: Dr W Kwan, Statistics & Actuarial Science; Dr K P Wat, Statistics & Actuarial Science

Course Objectives:

The discipline of statistics is concerned with situations in which uncertainty and variability play an essential role and forms an important descriptive and analytical tool in many practical problems. Against a background of motivating problems this course develops relevant probability models for the description of such uncertainty and variability.

Course Contents & Topics:

Sample spaces; Operations of events; Probability and probability laws; Conditional probability; Independence; Discrete random variables; Cumulative distribution function (cdf); Probability mass function (pmf); Bernoulli, binomial, geometric, and Poisson distributions; Continuous random variables; Cumulative distribution function (cdf); Probability density function (pdf); Exponential, Normal, and Normal distributions; Functions of a random variable; Joint distributions; Marginal distributions; Independent random variables; Functions of jointly distributed random variables; Expected value; Variance and standard deviation; Covariance and correlation.

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 problem by using probability calculations
CLO 4: Pursue their further studies in statistics

Pre-requisites (and Co-requisites and Impermissible combinations):

Pass in MATH1013, or already enrolled in STAT1603, or already enrolled in this course; or
Pass in MATH1885 and MATH1883, for students admitted in 2013 or before; or
Not for students who have passed in STAT1603, or already enrolled in this course; or
Not for students who have passed in STAT2901, or already enrolled in this course; or
Not for BSc(Actuarial) students.

Offer in 2016 - 2017:

Y 1st sem 2nd sem Offer in 2017 - 2018: Y

Grade Descriptors (A+ to F):

Decide: Mastering the course material
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 a wide range of complex, familiar and unfamiliar situations. Apply highly 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 analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
Fail: Demonstrates little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type: Lecture-based course

Course Teaching & Learning Activities:

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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>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1, 2, 3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials:


Course Website:
moodle.hku.hk

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STAT2602

Probability and statistics II (6 credits)

Academic Year: 2016

Offering Department: Statistics & Actuarial Science

Quota: ---

Course Co-ordinator: Dr K Zhu, Statistics & Actuarial Science (mazhuke@hku.hk)

Teachers Involved: Dr K Zhu, Statistics & Actuarial Science

Course Objectives:

This course builds on STAT2601, introducing further the concepts and methods of statistics. Emphasis is on the two major areas of statistical analysis: estimation and hypothesis testing. Through the disciplines of statistical 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-
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 2016 - 2017

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<th>Grade Descriptors (A+ to F)</th>
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<th>2nd sem</th>
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<th>Examination</th>
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<td>Y</td>
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<td>May</td>
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<td>Fail</td>
<td>Dec</td>
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Course Type

Lecture-based course

Course Teaching & Learning Activities

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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4</td>
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</table>

Required/recommended reading and online materials


Course Website

moodle.hku.hk

STAT2603

Data management with SAS (6 credits)

Offering Department Statistics & Actuarial Science
Quota 50

Course Co-ordinator Dr C W Kwan, Statistics & Actuarial Science (ckwkan@hku.hk)

Teachers Involved Dr G C S Lui, Statistics & Actuarial Science Dr C W Kwan, Statistics & Actuarial Science

Course Objectives

This course is designed for students who want to learn a statistical software (SAS) for data management and elementary data analysis. This course focuses on using SAS to manage data set input and output, work with different data types, manipulate and transform data, perform random sampling and descriptive data analysis, and create summary reports and graphics.

Course Contents & Topics


Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1: access online help and document.
- CLO 2: use Data Step to create data files.
- CLO 3: summarize data by PROC MEANS, PROC FREQ, and PROC UNIVARIATE.
- CLO 4: work with numeric, character, and date variables and functions in Data Step.
- CLO 5: perform conditional processing in Data Step.
- CLO 6: perform iterative processing in Data Step including the following: work with arrays in Data step; restructure SAS data sets by Data Step and PROC TRANSPOSE; subset and merge data sets by Data Step and PROC APPEND; present data in a readable way by PROC TABULATE; produce high-resolution graphics by PROC SGPLOT; HTML output by ODS; procedure SQL for structured query language.

Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in STAT1600, or already enrolled in this course.

Offer in 2016 - 2017

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<tr>
<th>Grade Descriptors (A+ to F)</th>
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<th>2nd sem</th>
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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 presentional skills.

B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply moderately effective organizational and presentional 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 presentional skills.

D: 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.

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 presentional skills are minimally effective or ineffective.
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.

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Fail
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Course Type
Lecture-based course

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Required/recommended reading and online materials
Annual Digest of Statistics (Census & Statistics Department, Hong Kong SAR, latest issue)

Course Opportunities
The course covers the major methods for studying demographic and socio-economic statistics, which provide quantitative information on the essential aspects of the lives of citizens in a territory. The course aims to provide students with 1) essential knowledge including the underlying principles of the pertinent methods and statistical indicators; and 2) skills in the statistical descriptions of a territory and their interpretation and application to planning, policy-making and commercial endeavours.

Course Contents & Topics
Population structure, fertility, mortality, migration, life tables, population projections; Social statistics on health, housing, labour, and social equity; Economic statistics on prices and GDP; Sources, theory and methods of official statistics; Examples would be especially drawn from Hong Kong, and Mainland China.

Course Learning Outcomes
On successful completion of this course, students should be able to:
CLO 1 describe and interpret major official & other publicly disseminated socio-economic statistics of a territory
CLO 2 further appraise and analyse the socio-economic well-being of a territory with particular reference to Hong Kong and mainland China
CLO 3 predict a future situation by assimilating and deriving from appropriate statistics
CLO 4 critically assess statistics reporting

Pre-requisites and Impermissible combinations (Level 2 or above in HKDSE Mathematics or Level 2 or above in HKDSE Mathematics Extended Module 1 or 2 or equivalent); and Pass or already enrolled in BIOL2102, ECON1280, STAT1601, STAT1602, STAT2601, STAT1603, STAT2901

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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<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>65</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Department of Statistics & Actuarial Science
567
Course Website: moodle.hku.hk

### STAT2901 Probability and statistics: foundations of actuarial science (6 credits)

**Offering Department:** Statistics & Actuarial Science  
**Course Objectives:** The purpose of this course is to develop knowledge of the fundamental tools in probability and statistics for quantitatively assessing risk. Applications of these tools to actuarial science problems will be emphasized. Students will have a thorough command of probability topics and the supporting calculations.

**Course 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

**Pre-requisites (and Co-requisites and Impermissible combinations):**
- 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, STAT2601, STAT1603

**Offer in 2016 - 2017**  
**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.

**Course Type:** Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
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**Assessment Methods and Weighting**

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<tr>
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**Required/recommended reading and online materials**

- M. A. Bean: Probability: The Science of Uncertainty with Applications to Investments, Insurance, and Engineering (Brooks/Cole, Thomas Learning)

**Course Website:** moodle.hku.hk

### STAT2902 Financial mathematics (6 credits)

**Offering Department:** 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...
Course Learning Outcomes

On successful completion of this course, students should be able to:

CLO 1 understand the fundamental concepts of financial mathematics
CLO 2 learn standard actuarial notations for a variety of annuities
CLO 3 do simple discounted cashflow analysis using basic annuities
CLO 4 learn the operations of some commonly-encountered financial instruments such as bonds, mortgages, short sales, and so on
CLO 5 quote interest in various modes and determine interest rate based on a series of financial transactions
CLO 6 deal with Exam FM of the Society of Actuaries

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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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 2016 - 2017

Y 2nd sem Offer in 2017 - 2018 : Y Examination May

Grade Descriptors (A+ to F)

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Course Type

Lecture-based course

Course Teaching & Learning Activities

Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework (assignments, tutorials, and class test(s)) 25 CLO 1,2,3,4,5,6
Examination One 3-hour written examination 75 CLO 1,2,3,4,5,6

Required/recommended reading and online materials


Course Website

moodle.hku.hk
**Course Type**
Lecture-based course

**Course Teaching & Learning Activities**

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**Required/recommended reading and online materials**


**Course Website**
moodle.hku.hk

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**Offering Department**
Statistics & Actuarial Science

**Course Co-ordinator**
Prof S M S Lee, Statistics & Actuarial Science

**Teachers Involved**
Prof S M S Lee, Statistics & Actuarial Science

**Course Objectives**
This course covers the advanced theory of point estimation, interval estimation and hypothesis testing. Using a mathematically-oriented approach, the course provides a solid and rigorous treatment of inferential problems, statistical methodologies and the underlying concepts and theory. It is suitable in particular for students intending to further their studies or to develop a career in statistical research.

1. Paradigms of inference: frequentist, Bayesian, Fisherian.
2. Decision theory: loss function; risk; decision rule; admissibility; minimaxity; unbiasedness; Bayes' rule.
3. Estimation theory: exponential families; likelihood; sufficiency; minimal sufficiency; ancillarity; completeness; UMVU estimators; information inequality; large-sample theory of maximum likelihood estimation.
4. Hypothesis testing: uniformly most powerful test; monotone likelihood ratio; unbiasedness; UMP unbiased test; maximal invariants; most powerful invariant test; large-sample theory of likelihood ratio.

**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**
moodle.hku.hk

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**Course Learning Outcomes**
On successful completion of this course, students should be able to:

**CLO 1**: Form a panoramic view of classical developments in mathematical statistics

**CLO 2**: Gain thorough insight into the essentials of statistical inference

**CLO 3**: Build a solid foundation for future research studies in statistics and related areas

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in STAT2602 or STAT3902

**Offer in 2016 - 2017**
Y 1st sem  Offer in 2017 - 2018 : Y

**Assessment**
Examination
Dec

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**Department of Statistics & Actuarial Science**
<table>
<thead>
<tr>
<th>STAT3603</th>
<th>Probability modelling (6 credits)</th>
<th>Academic Year</th>
<th>2016</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>Dr J K Woo, Statistics &amp; Actuarial Science (<a href="mailto:jkwoo@hku.hk">jkwoo@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr J K Woo, Statistics &amp; Actuarial Science</td>
<td></td>
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</tr>
<tr>
<td>Course Objectives</td>
<td>This is an introductory course in probability modelling. A range of important topics in stochastic processes will be discussed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Introduction to probability theory, conditional probability and expectation, Markov chains, random walk models, classification of states in a Markov chain, calculation of limiting probabilities and mean time spent in transient states, Poisson process, distribution of inter-arrival time and waiting time, conditional distribution of the arrival time, Brownian Motion, hitting time and maximum variable, geometric Brownian motion, the Black-Scholes option pricing formula, Gaussian bridge, and stationary processes. Birth-and-death process, branching process and renewal process may also be covered (if time permits).</td>
<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 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</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>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.</td>
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<tr>
<td>Offer in 2016 - 2017</td>
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<td>Course Type</td>
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<td>Course Teaching &amp; Learning Activities</td>
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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
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<tr>
<td>Required/recommended reading and online materials</td>
<td>S. M. Ross: Introduction to Probability Models (9th edition)</td>
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<td>Course Website</td>
<td>moodle.hku.hk</td>
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<table>
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<tr>
<th>STAT3604</th>
<th>Design and analysis of experiments (6 credits)</th>
<th>Academic Year</th>
<th>2016</th>
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<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
<td>Quota</td>
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<tr>
<td>Course Co-ordinator</td>
<td>Dr G Li, Statistics &amp; Actuarial Science (<a href="mailto:gdli@hku.hk">gdli@hku.hk</a>)</td>
<td></td>
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<tr>
<td>Teachers Involved</td>
<td>Dr G Li, Statistics &amp; Actuarial Science</td>
<td></td>
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<tr>
<td>Course Objectives</td>
<td>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.</td>
<td></td>
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</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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.</td>
<td></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 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</td>
<td></td>
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<tr>
<td>Pre-requisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass in STAT2602 or STAT3611 or STAT3902</td>
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C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

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Course Type Lecture-based course

Course Teaching & Learning Activities

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Required/recommended reading and online materials

P. W. M. John: Statistical Design and Analysis of Experiments (Macmillan, 1971)

Course Website moodle.hku.hk

STAT3605 Quality control and management (6 credits) Academic Year 2016

Offering Department Statistics & Actuarial Science

Quota ---

Course Co-ordinator

Dr E A L Li, Statistics & Actuarial Science (ericli11@hku.hk)

Teachers Involved

Dr E A L Li, Statistics & Actuarial Science

Course Objectives

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.

Course Contents & Topics


Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 appreciate the practicality of statistical concepts and methods in general
- CLO 2 understand how certain specific statistical methods can benefit various production situations
- CLO 3 know the traditional and modern systems of quality management

Pre-requisites

Pass in BIOL2102 or (ECON120) and any University level 2 course) or (STAT1601 and any University level 2 course) or STAT2602 or (STAT1603 and any University level 2 course) or STAT3902

Offer in 2016 - 2017 Y

Grade Descriptors (A+ to F)

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</table>

Required/recommended reading and online materials

### STAT3606 Business logistics (6 credits)

**Academic Year:** 2016

**Offering Department:** Statistics & Actuarial Science

**Course Co-ordinator:** Ms O T K Choi, Statistics & Actuarial Science (ochoi@saas.hku.hk)

**Teachers Involved:**
- Ms O T K Choi, Statistics & Actuarial Science
- Ms O T K Choi, Statistics & Actuarial Science

**Course Objectives:**
Modern business corporations are increasingly using logistics as a management tool, for example, in capital budgeting problems, production planning, scheduling, transportation and queuing problems. This course addresses the business applications of logistics.

**Course Contents & Topics:**
In this course, students will apply the analytical skills with aid of computer techniques in solving the business logistic problems. Topics include optimization techniques applied in allocation of resources, financial planning, transportation, assignment, inventory control and queuing problems.

**Course Learning Outcomes:**
On successful completion of this course, students should be able to:
- CLO 1 solve linear programming with Graphical approach, Simplex method and hands-on Excel Solving function
- CLO 2 set-up and solve network flow problems using least-cost approach, MODI method and Vogel's approximation.
- CLO 3 understand decision theory and its applications
- CLO 4 evaluate the cost and effectiveness of service systems

**Pre-requisites (and Co-requisites and Impermissible combinations):**
- Pass in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1601 and any University level 2 course) or (STAT1602 and any University level 2 course) or STAT2601 or (STAT1603 and any University level 2 course) or STAT2901; and
- Not for students who have passed MATH3901, or have already enrolled in this course.

**Offer in 2016 - 2017:**
- Y 1st sem Offer in 2017 - 2018: Y
- Examination Dec

**Grade Descriptors (A+ to F):**
- A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type:** Lecture-based course

**Course Teaching & Learning Activities:**

<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>
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<tr>
<td>Reading / Self study</td>
<td></td>
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</tbody>
</table>

**Assessment Methods and Weighting:**

<table>
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<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework, tutorials and a test</td>
<td>25</td>
<td>CLO 1,2,3,4</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials:**

- F.S. Hillier and G. J. Lieberman: An Introduction to Operations Research

**Course Website:** moodle.hku.hk

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### STAT3607 Statistics in clinical medicine and bio-medical research (6 credits)

**Academic Year:** 2016

**Offering Department:** Statistics & Actuarial Science

**Course Co-ordinator:** Prof G Yin, Statistics & Actuarial Science (gyin@hku.hk)

**Teachers Involved:**
- Prof G Yin, Statistics & Actuarial Science

**Course Objectives:**
In clinical research, medical data are often observed which motivates the application of statistical methodology to the clinical observational and decision-making process. Also, statistical problems often arise from clinical trial designs. It involves phase I, II, III and IV clinical trial designs, both Bayesian and frequentist approaches, sample size and power calculation. No knowledge in biology or medicine is assumed; the course provides the necessary biomedical background when the statistical problems are introduced.

**Course Contents & Topics:**
The contents of the course include contingency tables, regression models, survival analysis, categorical data analysis, Bayesian designs, dose-finding methods, sample size and power calculation, phase I, II and III trial designs, hypothesis testing, adaptive designs.

**Course Learning Outcomes:**
On successful completion of this course, students should be able to:
- CLO 1 understand the basic concepts in medical statistics
- CLO 2 design clinical trials and compute sample sizes
- CLO 3 conduct statistical inference and apply regression models
- CLO 4 solve medical problems by using various statistical tests

**Pre-requisites (and Co-requisites):**
Pass in STAT2602 or STAT3902

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573 Department of Statistics & Actuarial Science
### Offer in 2016 - 2017

<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
<th>Y 2nd sem</th>
<th>Offer in 2017 - 2018 : Y</th>
<th>Examination</th>
<th>May</th>
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<tbody>
<tr>
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<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
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### Course Type
- **Lecture-based course**

### Assessment Methods and Weighting

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<td><strong>Examination</strong></td>
<td>One 2-hour written examination</td>
<td>75</td>
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</table>

### Required/recommended reading and online materials


### Course Website
- Additional Course Information
  - moodle.hku.hk

### STAT3608
- **Statistical genetics (6 credits)**
- **Academic Year**: 2016

### Offering Department
- Statistics & Actuarial Science

### Course Co-ordinator
- Prof T W K Fung, Statistics & Actuarial Science (wingfung@hku.hk)

### Teachers Involved
- Prof T W K Fung, Statistics & Actuarial Science

### 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 (Co-requisites and Impermissible combinations)
- Pass in STAT2602 or STAT3902

### Offer in 2016 - 2017

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Lecture-based course

**Course Teaching & Learning Activities**

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<td>Examination</td>
<td>One 2-hour written examination</td>
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**Required/recommended reading and online materials**


**Course Website**
moodle.hku.hk

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**STAT3609**

The statistics of investment risk (6 credits)  

**Offering Department**
Statistics & Actuarial Science

**Course Co-ordinator**
Dr. K P W. Wat, Statistics & Actuarial Science (watkp@hku.hk)

**Course Objectives**
Most investments involve some risk. The decision to invest or not is usually made against a background of uncertainty. Whilst prediction of the future is difficult, there are statistical modelling techniques which provide a rational framework for investment decisions, particularly those relating to stock markets and the markets for interest rates, commodities and currencies. Building upon research, both in Hong Kong and abroad, this course presents the prevailing statistical theories for prices and price-change in these vital markets.

**Course Contents & Topics**
Concept of market efficiency, mean-variance portfolio theory, capital asset pricing model, arbitrage pricing theory, portfolio performance and management, behavioural finance.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:

1. **CLO 1** measure risk and return of portfolios
2. **CLO 2** apply different approaches in constructing optimal investment portfolios
3. **CLO 3** explain and apply asset pricing models and evaluate investment performance
4. **CLO 4** explain the concepts of market efficiency and apply appropriate testing procedures to assess different forms of market efficiency

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in STAT2602, or already enrolled in this course, or Pass in (STAT1603 and any University level 2 course) or STAT3611 or STAT3614; and Not for students who have passed in FINA2320, or have already enrolled in this course; and Not for BSc(Academic Science) students

**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 Type**
Lecture-based course

**Assessment Methods and Weighting**

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<td>Assignments</td>
<td>Coursework (assignments, tutorials, and a class test)</td>
<td>30</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>70</td>
<td>CLO 1,2,3,4</td>
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</table>

**Required/recommended reading and online materials**


**Course Website**
moodle.hku.hk

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**STAT3610**

Risk management and insurance (6 credits)  

**Academic Year**
2016
### STAT3611 Computer-aided data analysis (6 credits)

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Quota</th>
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</thead>
<tbody>
<tr>
<td>Statistics &amp; Actuarial Science</td>
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</tbody>
</table>

#### Course Co-ordinator
Dr F Lam, Statistics & Actuarial Science

#### Teachers Involved
Dr K Y Wu, Statistics & Actuarial Science

#### Course Objectives
A wide range of statistical analyses and methods are presented using data sets from social sciences research and scientific studies. Measuring uncertainty, describing patterns of variability and the inter-relationship between several variables are essential aspects of scientific investigations that require good understanding of statistics. This computer-oriented but non-mathematical course develops the important concepts and methods of statistics. The course makes extensive use of computers through the user friendly statistical software JMP. No knowledge of a programming language is required.

#### Course Contents & Topics
Data exploration, formulation of testable hypotheses, the evaluation of evidence and forecasting on the basis of past experience.

#### Course Learning Outcomes
On successful completion of this course, students should be able to:
- CLO 1 summarize and describe the quantitative and qualitative data using some simple statistical measures
- CLO 2 describe the patterns of variability and the inter-relationship between several continuous or discrete variables
- CLO 3 carry out simple statistical analyses based on some real life data, formulate testable hypotheses, make appropriate statistical inferences and make interpretations on the findings

#### Pre-requisites (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 STAT2601 or (STAT1602 and any University level 2 course) or STAT2901, (Not available to Actuarial Science students)

#### Course Type
Lecture-based course

#### Course Teaching & Learning Activities
<table>
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<tr>
<th>Activities</th>
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<td>Assignments</td>
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<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>
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</table>

#### Required/recommended reading and online materials

#### Course Website
moodle.hku.hk

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### STAT3616

#### Course Co-ordinator
Dr E W L Wong, Statistics & Actuarial Science

#### Teachers Involved
Dr R W L Wong, Statistics & Actuarial Science

#### Course Objectives
To provide knowledge on basic risk and its management, as well as basic financial planning though insurance products, to students. To allow students to understand the statistical, financial and legal principles underlying the techniques for managing the insurable risks faced by organisations and individuals. By aiming at students who have minimal background in quantitative methods, it involves very minimal quantitative calculations and is not available to students majoring in Actuarial Science.

#### 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 2016 - 2017
<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>May</td>
</tr>
</tbody>
</table>

#### Grade Descriptors
A to F

#### Assessment Methods
- Tutorials 12
- Examination One 2-hour written examination 75

#### Course Website
rwong@hku.hk

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### Department of Statistics & Actuarial Science
## STAT3612 Data mining (6 credits)

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### Course Type
Lecture-based course

### Course Teaching & Learning Activities
- **Activities**
  - Lectures: 36
  - Tutorials: 12
  - Reading / Self study: 100

### Assessment Methods and Weighting

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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
<td>CLO 1,2,3</td>
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### Required/recommended reading and online materials
- R. Hooke: How to tell the liars from the Statisticians (Marcel Dekker)
- J. G. Peatman: Introduction to Applied Statistics (Harper)

### Course Website
moodle.hku.hk

### Additional Course Information
CogSc or CompSc students having taken STAT1301 should obtain approval from the dept.

Other reference:
- J. T. McClave & F. H. Dietrich II: Statistics (Maxwell Macmillan, 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)

### Data mining (6 credits)

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### Course Co-ordinator
Dr G C S Lui, Statistics & Actuarial Science (csglui@hku.hk)

### Teachers Involved
Dr G C S Lui, Statistics & Actuarial Science, Dr A J Zhang, Statistics & Actuarial Science

### Course Objectives
With an explosion in information technology in the past decade, vast amounts of data appear in a variety of fields such as finance, customer relations management and medicine. The challenge of understanding these data arises with the aim of creating new knowledge and finding new relationships among data attributes has led to the innovative usage of statistical methodologies and development of new ones. In this process, a new area called data mining is spawned. This course provides a comprehensive and practical coverage of essential data mining concepts and statistical models for data mining.

### Course Contents & Topics
- Data pre-processing, classification and regression trees, credit scoring, kNN classifier, cluster analysis and neural networks.

### Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1 implement data mining process summarized in the acronym SEMMA which stands for sampling, exploring, modifying, modeling, and assessing data
  - CLO 2 understand and apply a wide range of data mining techniques, and recognize their characteristics, strengths and weaknesses
  - CLO 3 be proficient with the leading data mining software—SAS Enterprise Miner
  - CLO 4 identify and use appropriate data mining techniques for a data mining project, taking into account both the nature of the data to be mined and the goals of the user of the discovered knowledge
  - CLO 5 evaluate the quality of discovered knowledge, taking into account the requirements of the data mining task being solved and the goals of the user

### Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT2602 or (STAT1603 and any University level 2 course) or STAT3902

### Co-requisites: STAT3600

### Offer in 2016 - 2017
Y 1st sem 2nd sem Offer in 2017 - 2018: Y Examination No Exam
Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Course Type
Lecture-based course

Course Teaching & Learning Activities
<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
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<tbody>
<tr>
<td>Lectures</td>
<td></td>
<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>
<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>30</td>
<td>CLO 1,2,3,5</td>
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<tr>
<td>Project reports</td>
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<tr>
<td>Test</td>
<td></td>
<td>40</td>
<td>CLO 2,3</td>
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</table>

Required/recommended reading and online materials
Tan, P. N., Steinback, M. and Kumar, V.: Introduction to Data Mining (Addison Wesley, 2014, 3rd edition)
J. Han & M. Kamber: Data Mining: Concepts and Techniques (Morgan Kaufmann, 2011, 3rd edition)
Larose, D. T.: Discovering Knowledge in Data: An Introduction to Data Mining (Wiley, 2005)

Lecture-based course

Course Teaching & Learning Activities
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments, a class text and a group project)</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
Lattin J., Carroll J.D. and Green P.E.: Analysing multivariate data (Thomson)
Course Website: moodle.hku.hk

### STAT3614 Business forecasting (6 credits)

**Offering Department:** Statistics & Actuarial Science  
**Quota:** ---

**Course Co-ordinator:** Dr R W L Wong, Statistics & Actuarial Science (rwong@hku.hk)

**Teachers Involved:** Dr R W L Wong, Statistics & Actuarial Science

**Course Objectives:**
In daily business operations, forecasts are routinely required on different aspects of the economy, the market and individual companies. Numerous statistical techniques have been developed in the past decades to provide forecasts for the business decision-maker. This course considers a wide range of such techniques that have proven useful to practitioners. The course will involve the use of computer software, EXCEL, in the teaching process.

**Course Contents & Topics:**
Review of basic statistical concepts; autocorrelation analysis; evaluation and combination of forecasts; moving averages and smoothing methods; simple linear regression; multiple regression; growth curves; time series regression; the handling of seasonal cycles; decomposition methods.

**Course Learning Outcomes:**
On successful completion of this course, students should be able to:
- CLO 1 understand data patterns and choose a suitable forecasting technique
- CLO 2 understand forecasting methods: moving averages and smoothing methods, decomposition and winner’s methods, simple and multiple linear regression
- CLO 3 develop hands-on skills of analyzing business data with computer software, EXCEL, and its add-ins functions

**Pre-requisites (and Co-requisites and Impermissible combinations):**
Passes in BIOL2102 or (ECON1280 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1602 and any University level 2 course) or (STAT1603 and any University level 2 course); and Not for students who have passed or already enrolled in any of these courses: STAT2601, STAT2901, STAT3907, STAT4601, ECON2280.

**Offer in 2016 - 2017:** N  
**Grade Descriptors (A+ to F):**

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<tr>
<th>Grade</th>
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<tbody>
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<td>Promote thorough mastery at an advanced level of extensive knowledge and skills required for attaining 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 thorough mastery at an advanced level of extensive knowledge and skills required for attaining the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
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<tr>
<td>C</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. 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>D</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>E</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>
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<tr>
<td>F</td>
<td>Demonstrate limited 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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<td>Lectures</td>
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<td>CLO 1</td>
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<td>Tutorials</td>
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<td></td>
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<td></td>
<td>CLO 1</td>
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<tr>
<td>Assignments</td>
<td>(assignments, tutorials, and a class test)</td>
<td>40</td>
<td>CLO 1</td>
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<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
<td>CLO 1, 2, 3</td>
</tr>
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</table>

**Required/recommended reading and online materials:**

**Course Website:** moodle.hku.hk

**Additional Course Information:** Also available to CompSc students having taken STAT1301. Students should obtain approval from the course coordinator before choosing this course.

### STAT3615 Practical mathematics for investment (6 credits)

**Offering Department:** Statistics & Actuarial Science  
**Quota:** ---

**Course Co-ordinator:** Dr E C K Cheung, Statistics & Actuarial Science (eckc@hku.hk)

**Teachers Involved:** Dr E C K Cheung, Statistics & Actuarial Science

**Course Objectives:**
The main focus of this course is built on the concepts on financial mathematics. Practical applications of these course concepts are also considered.

**Course Contents & Topics:**
This course covers: simple and compound interest; annuities certain; discounted cash flow analysis; amortization schedules and sinking funds; yield rates; bonds and related securities; practical applications such as real estate mortgage, short sales and term structure of interest rates.

**Course Learning Outcomes:**
On successful completion of this course, students should be able to:
- CLO 1 solve practical problems relating to annuities certain, simple and compound interest
- CLO 2 carry out discounted cash flow analysis
- CLO 3 apply amortization schedules and sinking funds to the practical problems such as real estate mortgage

**Pre-requisites (and Co-requisites and Impermissible combinations):**
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 2016 - 2017:** Y  
**Grade Descriptors (A+ to F):**

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<tr>
<td>A</td>
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<td>B</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining 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>C</td>
<td>Demonstrate considerable 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>D</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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<tr>
<td>E</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>
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<tr>
<td>F</td>
<td>Demonstrate limited 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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**Assessment Methods:**

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<tbody>
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<td>Lectures</td>
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<td></td>
<td>CLO 1</td>
</tr>
<tr>
<td>Tutorials</td>
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<td>CLO 1, 2, 3</td>
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<tr>
<td>Reading / Self study</td>
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<td>CLO 1</td>
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<tr>
<td>Assignments</td>
<td>(assignments, tutorials, and a class test)</td>
<td>40</td>
<td>CLO 1</td>
</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
<td>CLO 1, 2, 3</td>
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</table>

**Additional Course Information:** Students should obtain approval from the course coordinator before choosing this course.
### STAT3617 Sample survey methods (6 credits)

**Academic Year**: 2016

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<th>Course Type</th>
<th>Lecture-based course</th>
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<td>Lectures</td>
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<td>36</td>
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<td>Tutorials</td>
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<td>Methods</td>
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<tr>
<td>Assignments</td>
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<tr>
<td>Coursework</td>
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<td>(assignments, tutorials, and a class test)</td>
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<td>Examination</td>
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<td>One 3-hour written examination</td>
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<td>Reading and study</td>
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<td>Online materials</td>
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<th>Course Website</th>
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<tr>
<th>Teachers Involved</th>
<th>Statistics &amp; Actuarial Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>Dr G C S Lui, Statistics &amp; Actuarial Science (<a href="mailto:csglui@hku.hk">csglui@hku.hk</a>)</td>
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<th>Pre-requisites (and Co-requisites and Impermissible combinations)</th>
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<thead>
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<th>Course Contents &amp; Topics</th>
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<tr>
<td>Overview of SAS underlying parts. Macroprogramming. Advanced programming techniques including data simulation, advanced data look-up techniques, modifying transaction datasets and controlling I/O processing and memory.</td>
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<td>On successful completion of this course, students should be able to:</td>
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<td>CLO 1 Understand the system of SAS and basic programming</td>
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<td>CLO 3 Use the output dataset without printing to OUTPUT windows for piping idea in automation</td>
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<td>CLO 4 Use SAS MACRO to develop customized and automated applications</td>
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<th>Grade Descriptors (A+ to F)</th>
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<tr>
<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>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>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>
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<tr>
<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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<tr>
<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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<tr>
<th>Assessment</th>
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<tbody>
<tr>
<td>Examination</td>
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### STAT3616 Advanced SAS programming (6 credits)

**Academic Year**: 2016

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<td>50</td>
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<td></td>
</tr>
<tr>
<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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading and study</td>
<td></td>
</tr>
<tr>
<td>Online materials</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Course Website</th>
<th>moode.hku.hk</th>
</tr>
</thead>
</table>

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580
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 2016 - 2017
Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Pre-requisites and Co-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Pass in STAT3615; and Pass or already enrolled in BIOL2102, or (ECON1280 and any University level 2 course), or (STAT1601 and any University level 2 course), or STAT2601, or (STAT1603 and any University level 2 course), or STAT2901.</td>
</tr>
</tbody>
</table>

Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Tutorials</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>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>Coursework (assigments, 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
Not for students who have passed in FINA2322, or have already enrolled in this course; and
Not for BSc(Actuarial Science) students.

Offer in 2016 - 2017

Grade Descriptors (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of 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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Course Type Lecture-based course

Assessment Methods and Weighting

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<td>Assignments Coursework (assignments, tutorials, and a class test)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Examination One 2-hour written examination</td>
<td>25</td>
<td>CLO 1, 3</td>
<td></td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website

moodle.hku.hk
**STAT3621**  
**Data visualization (6 credits)**

**Offering Department**  
Statistics & Actuarial Science

**Course Co-ordinator**  
Dr S K C Cheung, Statistics & Actuarial Science (simonkc@hku.hk)

**Teachers Involved**  
Dr S K C Cheung, 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 modeling selection, perform model diagnostics, formulate testable hypotheses, make appropriate statistical inferences, make interpretations on the findings and report writing

**Pre-requisites (and Co-requisites and Impermissible combinations)**
Pass in STAT3600 or STAT3907  
(Students are strongly recommended to take STAT2603 prior to taking this course.)

**Offer in 2016 - 2017**  
Y 2nd sem  
Offer in 2017 - 2018: Y

**Grade Descriptors (A+ to F)**

<table>
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<th>Grade Descriptors</th>
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<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>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>50</td>
<td>CLO 1.2.3.4</td>
</tr>
<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
<td>50</td>
<td>CLO 1.2.3.4</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>50</td>
<td>CLO 1.2.3.4</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>50</td>
<td>CLO 1.2.3.4</td>
</tr>
<tr>
<td>Fail</td>
<td>Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.</td>
<td>50</td>
<td>CLO 1.2.3.4</td>
</tr>
</tbody>
</table>

**Course Type**  
Lecture-based course

**Assessment Methods and Weighting**

<table>
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<tr>
<th>Methods</th>
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</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>Coursework (assignments and a class test)</td>
<td>50</td>
<td>CLO 1.2.3.4</td>
</tr>
<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>50</td>
<td>CLO 1.2.3.4</td>
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</tbody>
</table>

**Required/recommended reading and online materials**

**Course Website**
moodle.hku.hk

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Pre-requisites (and Co-requisites and Impermissible combinations)

Pass in STAT2602 or STAT3902

Offer in 2016 - 2017

Y 1st sem Offer in 2017 - 2018 : Y Examination Dec

Grade Descriptors (A+ to F)

A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.

B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Description

Course Type Lecture-based course

Course Teaching & Learning Activities

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<tr>
<th>Activities</th>
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<th>No. of Hours</th>
</tr>
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<tbody>
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<td>Lectures</td>
<td></td>
<td>36</td>
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<tr>
<td>Tutorials</td>
<td></td>
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<tr>
<td>Reading / Self study</td>
<td></td>
<td>100</td>
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Assessment Methods and Weighting

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</thead>
<tbody>
<tr>
<td>Presentation</td>
<td>oral presentation and in-class discussion</td>
<td>40</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
<tr>
<td>Project reports</td>
<td>written report</td>
<td>60</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website moodle.hku.hk

STAT3799 Directed studies in statistics (6 credits)

Offering Department Statistics & Actuarial Science

Course Co-ordinator Prof S M S Lee, Statistics & Actuarial Science (smslee@hku.hk)

Teachers Involved Various teachers as the assessors of oral presentations and written reports, Statistics & Actuarial Science

Course Objectives To enhance students' knowledge of a particular topic and students' self-directed learning and critical thinking skills.

Course Contents & Topics The student undertakes a self-managed study on a topic in statistics under the supervision of a staff member. The topic is preferably one not sufficiently covered in the regular curriculum. The directed study can be a critical review or a synthesis of published work on the subject, or a laboratory or field study that would enhance students' understanding of the subject. The project may not require an element of originality.

Course Learning Outcomes On successful completion of this course, students should be able to:

CLO 1 gain first-hand experience in solving a research or applied problem in statistics or related areas
CLO 2 develop skills in important technical tools, including the use of computer software or programs, for typical statistical research and data analyses
CLO 3 write succinct reports on the findings of a research study
CLO 4 make concise oral presentation of the findings of a research study

Pre-requisites (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; 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.

Offer in 2016 - 2017

Y 1st sem 2nd sem Offer in 2017 - 2018 : Y Examination No Exam

Grade Descriptors (A+ to F)

A Demonstrate thorough grasp of the subject. Show strong analytical and critical abilities and logical thinking, with evidence of original thought. Insightful use and critical analysis / evaluation of information drawn from a full range of high quality sources and to quote/reference aptly. Critical use of data and results to draw appropriate and insightful conclusions. Apply highly effective organizational and presentational skills. (Work of A+ should show considerable additional work beyond that is required in wider areas relevant to the topic.)

B Demonstrate substantial grasp of the subject. Evidence of analytical and critical abilities and logical thinking. Critical use of relevant information from sources, showing ability to make meaningful comparisons between different secondary interpretations and to quote/reference aptly. Correct use of data of results to draw appropriate conclusions. Apply effective organizational and presentational skills.

C Demonstrate general but incomplete grasp of the subject. Evidence of some analytical and critical abilities and logical thinking. Use of relevant information from sources, showing ability to make comparisons between different interpretations and to quote/reference aptly. Mostly correct but some erroneous use of data and results to draw appropriate conclusions. Apply moderately effective organizational and presentational skills.

D Demonstrate partial but limited grasp, with retention of some relevant information, of the subject. Evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Demonstrate use and reference of several sources, but mainly through summary rather than analysis and comparison. Limited ability to use data and results to draw appropriate conclusions. Apply limited or barely effective organizational and presentational skills.

Fail Demonstrate evidence of little or no grasp of the knowledge and understanding of the subject. Evidence of little or lack of analytical and critical abilities, logical and coherent thinking. Limited use of secondary sources and no critical comparison of them. Misuse of data and results and/or unable to draw appropriate conclusions. Organization and presentational skills are minimally effective or ineffective.

Course Type Project-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading / Self study</td>
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<td>120</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Methods</td>
<td>Details</td>
</tr>
<tr>
<td>----------------------------------</td>
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</tr>
<tr>
<td>Oral presentation</td>
<td>oral presentation &amp; in-class discussion</td>
<td>40</td>
</tr>
<tr>
<td>Research report</td>
<td>written report</td>
<td>60</td>
</tr>
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</table>

| Course Website | moodle.hku.hk |

### STAT3901

**Life contingencies (6 credits)**

**Academic Year**: 2016

**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**: 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; benefit premiums.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- 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 (and Co-requisites and Impermissible combinations)**: (Pass in STAT2602 and STAT3615) or (Pass in STAT2902 and (Pass in STAT3902 or already enrolled in this course)) or (Pass in STAT2602 and STAT3702)

**Offer in 2016 - 2017**: Y 1st sem Offer in 2017 - 2018 : 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 most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Type**: Lecture-based course

**Course Teaching & Learning Activities**

- **Activities**
  - Lectures: 36
  - Tutorials: 12
  - Reading / Self study: 100

**Assessment Methods and Weighting**

<table>
<thead>
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<tbody>
<tr>
<td>Assignments</td>
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<td>25</td>
<td>CLO 1,2,3,4,5</td>
</tr>
<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**


**Course Website**: moodle.hku.hk

### STAT3902

**Statistical models (6 credits)**

**Academic Year**: 2016

**Offering Department**: Statistics & Actuarial Science

**Course Co-ordinator**: Dr J F Xu, Statistics & Actuarial Science (xujf@hku.hk)

**Teachers Involved**: Dr J F Xu, Statistics & Actuarial Science

**Course Objectives**: 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.

**Course Contents & Topics**: Distribution and density of function of random variables; Order statistics, central limit theorem, Maximum likelihood estimator (MLE), moment estimator, Bayesian estimator, properties of estimators, limiting properties of MLE; Confidence interval estimations for normal mean, the difference of two normal means, normal variance, the ratio of two normal variances, and large-sample confidence intervals; Power function, Neyman-Pearson Lemma, likelihood ratio test, and goodness of fit test.

**Course Learning Outcomes**: On successful completion of this course, students should be able to:

- CLO 1
# STAT3903 Stochastic models (6 credits)

**Offering Department**: Statistics & Actuarial Science  
**Quota**: --

**Course Co-ordinator**: Y K Chung, Statistics & Actuarial Science (yukchung@hku.hk)

**Teachers Involved**: Y K Chung, Statistics & Actuarial Science

**Course Objectives**: This is an introductory course in probability modelling. A range of important topics in stochastic processes will be discussed.

**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, Gaussian bridge, and stationary processes. Birth-and-death process, branching process and renewal processes.

**Examination**: One 3-hour written examination 75%  
**Assignments**: Coursework (assignments, tutorials, and a class test) 25%

**Course Website**: moodle.hku.hk

## Pre-requisites and Co-requisites

- **Pre-requisites (and Co-requisites and Impermissible combinations)**: Pass in STAT2601; and Not for students who have passed in STAT2602, or already enrolled in this course; and For BSc(Actuarial Science) students only.

## Grade Descriptors

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</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>
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<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
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<td>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>F</td>
<td>Fail</td>
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</tbody>
</table>

## Assessment Methods

<table>
<thead>
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<tr>
<td>Examination</td>
<td>75</td>
<td>CLO 1, 2, 3, 4</td>
</tr>
</tbody>
</table>

## Required/recommended reading and online materials


## 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

## Course Type

Lecture-based course
### STAT3904 Corporate finance for actuarial science (6 credits)

**Offering Department**: Statistics & Actuarial Science  
**Teachers Involved**: Dr J K Woo, Statistics & Actuarial Science (jkwoo@hku.hk)

#### Course Objectives
On successful completion of this course, students should be able to:

- CLO 1 understand the factors to be considered by a company when deciding on its capital structure and dividend policy, and also the impact of financial leverage and long/short term financing policies on capital structure.
- CLO 2 calculate the value of bonds and stocks.
- CLO 3 understand the mean-variance portfolio theory.
- CLO 4 understand the factors to be considered by a company when determining on its capital structure and dividend policy, and also the impact of financial leverage and long/short term financing policies on capital structure.

#### 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; present value and net present value, financial instruments and dividends derivatives market, no-arbitrage pricing theory, binomial model and Black-Scholes option pricing formula. The main part of the course will focus on some important topics of corporate finance including: capital structure and dividend policy, financial leverage and firm value, market efficiency, risk and return, investment decision using Markowitz mean variance analysis, CAPM, long term financing, measures and performance assessment of financial performance using various measures.

#### Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1 understand the factors to be considered by a company when deciding on its capital structure and dividend policy, and also the impact of financial leverage and long/short term financing policies on capital structure.
- CLO 2 calculate the value of bonds and stocks.
- CLO 3 assess financial performance using various measures.
- CLO 4 understand the mean-variance portfolio theory.

#### Pre-requisites (and Co-requisites and Impermissible combinations)

<table>
<thead>
<tr>
<th>Course</th>
<th>Code</th>
<th>Offer in 2016 - 2017</th>
<th>Grade Descriptors</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture-based course</td>
<td>Statistics &amp; Actuarial Science</td>
<td>Quota</td>
<td>2016</td>
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<tr>
<td>Activities</td>
<td>Details</td>
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<tr>
<td>Tutorials</td>
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<td></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>Coursework (assignments, tutorials, and a class test)</td>
<td>25</td>
<td>CLO 1,2,3</td>
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<tr>
<td>Examination</td>
<td>One 3-hour written examination</td>
<td>75</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

#### Required/recommended reading and online materials

#### Course Website
moodle.hku.hk
Course Learning Outcomes

CLO 1 define and recognize the definitions of terms commonly used in derivatives markets
CLO 2 evaluate the payoff and profit of basic derivative contracts, including forwards, futures, options, and swaps
CLO 3 explain how derivative securities can be used as tools to manage financial risk

Pre-requisites
Pass in STAT2902; and Not for students who have passed in STAT3618, or have already enrolled in this course; and Not for students who have passed in FINA2322, or have already enrolled in this course; and For BSc(Actuarial Science) students only.

Offer in 2016 - 2017
Y 1st sem Offer in 2017 - 2018 : Y Examination Dec

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type Lecture-based course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 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 2-hour written examination 75 CLO 1,2,3

Required/recommended reading and online materials

Course Website moodle.hku.hk

STAT3906 Risk theory I (6 credits) Academic Year 2016

Offering Department Statistics & Actuarial Science Quota ---

Course Co-ordinator Dr K C Cheung, Statistics & Actuarial Science (kccg@hku.hk)

Teachers involved Dr K C Cheung, Statistics & Actuarial Science

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, ruin probability, etc.

Course Contents & Topics

Severity models; frequency models; collective risk models; coverage modifications; ruin theory; risk measures; simulation.

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
CLO 4 apply simulation methods within the context of actuarial models

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 2016 - 2017
Y 2nd sem Offer in 2017 - 2018 : Y Examination May

Grade Descriptors (A+ to F)
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
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Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type Lecture-based course

Course Teaching & Learning Activities

Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Assessment Methods and Weighting

Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments 25 CLO 1,2,3,4
## STAT3907

**Linear models and forecasting (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 G Li, Statistics &amp; Actuarial Science (<a href="mailto:gdli@hku.hk">gdli@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr G Li, Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>Course Website</td>
<td>moodle.hku.hk</td>
</tr>
</tbody>
</table>

### Course Objectives

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**: fit a generalized linear model to the real data
- **CLO 4**: identify and fit a suitable AR, MA or ARMA model to real data
- **CLO 5**: perform residual analysis
- **CLO 6**: do forecasting with these fitted models

### Course Contents & Topics

- **Regression and multiple linear regression; predicting; generalised linear model; time series models including autoregressive, moving average, autoregressive-moving average and integrated models; forecasting.**

### teachers Involved

- Dr K C Cheung, Statistics & Actuarial Science

### Course Website

- moodle.hku.hk

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### STAT3908

**Credibility theory and loss distributions (6 credits)**

<table>
<thead>
<tr>
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<tr>
<td>Course Co-ordinator</td>
<td>Dr K C Cheung, Statistics &amp; Actuarial Science (<a href="mailto:kccog@hku.hk">kccog@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr K C Cheung, Statistics &amp; Actuarial Science</td>
</tr>
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</table>

### Course Objectives

Credibility is an example of a statistical estimate. The idea of credibility is very useful in premium calculation. Insurance loss varies according to the business nature, what distribution should be used to fit a particular loss is both of theoretical interest and practical importance. This course covers important actuarial and statistical methods.

### Course Contents & Topics

- Limited fluctuation approach; Buhlman's approach; Bayesian approach; empirical Bayes parameter estimations; construction and selection of parametric models; properties and estimation of failure time and loss distributions; determination of the acceptability of a fitted model; comparison of fitted models; simulation of both discrete and continuous random variables.

### Course Learning Outcomes

On successful completion of this course, students should be able to:

- **CLO 1**: apply limited fluctuation (classical) credibility including criteria for both full and partial credibility
- **CLO 2**: perform Bayesian analysis using both discrete and continuous models
- **CLO 3**: apply Buhlmann and Buhlmann-Straub models and understand the relationship of these to the Bayesian model
- **CLO 4**: apply conjugate priors in Bayesian analysis and in particular the Poisson-gamma model
- **CLO 5**: apply empirical Bayesian methods in the nonparametric and semiparametric cases

---

### Prerequisites

- 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
- For BSc(Actuarial Science) students only.

### 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 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 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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### Assessment Methods

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<th>Assessment Methods to CLO Mapping</th>
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<tbody>
<tr>
<td>Examination</td>
<td>One 3-hour written examination 75 CLO 1,2,4,5,6</td>
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<tr>
<td>Assignments Coursework</td>
<td>(assignments, tutorials, and a class test) 25 CLO 1,2,3,4,5,6</td>
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<tr>
<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
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### References

### Pre-requisites
- Pass in STAT2602 or STAT3902 or STAT3906

### Course Teaching & Learning Activities

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<tr>
<td>Examination</td>
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<td>75</td>
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</table>

### Required/recommended reading and online materials

### Course Website
- moodle.hku.hk

### STAT3909 Advanced life contingencies (6 credits)

<table>
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<tr>
<th>Academic Year</th>
<th>Quota</th>
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<tbody>
<tr>
<td>2016</td>
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</tr>
</tbody>
</table>

#### Course Co-ordinator
- H L Yang, Statistics & Actuarial Science (hlyang@hku.hk)

#### Teachers Involved
- Prof H L Yang, Statistics & Actuarial Science

#### Course Objectives
- The objective of the course is to prepare students for the Non-traditional Life Insurance parts of the Models for Life Contingencies (MLC) course of the Society of Actuaries. Emphasis will be placed on applications of more advanced theories of life contingencies.

#### Course Contents & Topics
- This course is a continuation of the materials covered in STAT3901. We shall discuss the following topics: Loss-at-issue random variable, Benefit premium, Future loss random variable, Benefit reserves, Cash flow projection, Present value of cash flows, Expenses and asset shares.

#### Course Learning Outcomes
- On successful completion of this course, students should be able to:
  - CLO 1 calculate benefit reserves for life insurances and annuities
  - CLO 2 incorporate expenses in gross premium and calculate policy value based on the gross premium for life insurances and annuities
  - CLO 3 understand multiple decrement models and calculate the life insurances and annuities in models with multi decrements
  - CLO 4 understand the multiple state model and the Kolmogorov forward equations
  - CLO 5 understand multiple life models and calculate the life insurances and annuities in multi-life models
  - CLO 6 understand the interest risk and calculate the life insurances and annuities when the interest rate is not a constant, and understand profit testing

#### Pre-requisites (and Co-requisites and Impermissible combinations)
- Pass in STAT3901, or already enrolled in this course; and For BSc(Actuarial Science) students only.

<table>
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<th>Grade Descriptors (A to F)</th>
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<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 presentation skills.</td>
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<tr>
<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. Organizational and presentation skills are minimally effective or ineffective.</td>
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#### Course Type
- Lecture-based course

#### Course Teaching & Learning Activities

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<td>Tutorials</td>
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<tr>
<td>Reading / Self study</td>
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</tbody>
</table>
### STAT3910 - Financial Economics I

**Offering Department:** Statistics & Actuarial Science  
**Course Co-ordinator:** Prof H L Yang, Statistics & Actuarial Science  
**Teachers Involved:** Prof H L Yang, Statistics & Actuarial Science  
**Course Objectives:**

- On successful completion of this course, students should be able to:
  - Understand basic probability theory, including probability space, random variable, conditional probability, conditional expectation and discrete time martingale.
  - Understand the Black-Scholes formula and its assumptions, the option Greeks, option elasticity, and implied volatility.
  - Understand the hedging strategies and portfolio, market-maker risk, self-financing portfolio.
  - Understand exotic options.

**Pre-requisites:**
- Pass in STAT2602 or STAT3902; and
- Not for students who have passed in STAT3618, or have already enrolled in this course.

**Course Contents & Topics:**
- Option market; European and American options; conditional expectation and discrete-time martingale, discrete-time option-pricing theory; binomial model and its Greeks; true probabilities vs. risk-neutral probabilities; estimating volatility; the Black-Scholes formula; implied volatility; Greeks again; market-making and hedging; exotic options.

**Course Type:** Lecture-based course

**Assessments:**
- Assignments: Coursework (assignments, tutorials, and a class test) - 25%
- Examination: One 3-hour written examination - 75%

**Course Website:** moodle.hku.hk

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### STAT3911 - Financial Economics II

**Offering Department:** Statistics & Actuarial Science  
**Course Co-ordinator:** Prof H L Yang, Statistics & Actuarial Science  
**Teachers Involved:** Prof H L Yang, Statistics & Actuarial Science  
**Course Objectives:**

- This course is a basic course on the derivative market. The course covers discrete-time models, volatility estimation, and Black-Scholes formula and its variations. The course also includes some basic risk management ideas and methods. This course and STAT3911 will cover all the concepts, principles and techniques needed for SoA Exam MFE.

**Course Contents & Topics:**
- 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:
  - Understand Brownian motion and its properties.

**Course Website:** moodle.hku.hk
Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
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<td>Assignments</td>
<td>Workpackage (assignments, tutorials, and a class test)</td>
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<td>CLO 1, 2, 3, 4, 5</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</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials

- Steven Shreve: Stochastic Calculus for Finance II Continuous-Time Models (2008)

Course Website
moodle.hku.hk

Course Type
Lectures-based course

Course Teaching & Learning Activities

<table>
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</thead>
<tbody>
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<td>Lectures</td>
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</table>

Assessment Methods

- One 3-hour written examination: 75%

Required/recommended reading and online materials

- Steven Shreve: Stochastic Calculus for Finance II Continuous-Time Models (2008)

Course Website
moodle.hku.hk

Pre-requisites (and Co-requisites and Impermissible combinations)
Pass in STAT3603 or STAT3903 or STAT3910 or STAT3906 or STAT3910

Grade Descriptors
A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining 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.

Pre-requisites
Pass in STAT3609; and
Pass in STAT3910, or already enrolled in this course; and
For BSc(Actuarial Science) students only.

Offer in 2016 - 2017
Y 2nd sem

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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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.
STAT3952 Investment and asset management (6 credits) Academic Year 2016
Offering Department Statistics & Actuarial Science Quota ---
Course Co-ordinator TBC, Statistics & Actuarial Science
Teachers Involved TBC, Statistics & Actuarial Science
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.
Pre-requisites 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.
Grade Descriptors (A+ to F) A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
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C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
Course Type Lecture-based course
Assessment Methods and Weighting Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping
Assignments Coursework (assignments, tutorials, and a class test) 25 CLO 1,2,3,4,5,6
Examination One 3-hour written examination 75 CLO 1,2,3,4,5,6
Course Website moodle.hku.hk
Department of Statistics & Actuarial Science
### STAT3953  
**Fundamentals of actuarial practice (6 credits)**  
**Academic Year:** 2016  
**Quota:** ---  
**Offering Department:** Statistics & Actuarial Science  
**Course Co-ordinator:** Dr L F K Ng, Statistics & Actuarial Science (flouings@hku.hk)  
**Teachers Involved:** Dr L F K Ng, Statistics & Actuarial Science  
**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 & 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  
- **CLO 4:** Explain actuarial practices as applied directly on behalf of financial security system providers or as a consultant to those providers  
- **CLO 5:** Apply actuarial skills in nontraditional and emerging areas of practice  
- **CLO 6:** Provide context for the specific mathematical and technical skills developed in the basic actuarial courses  
**Course Co-ordinator:** Prof W K Li, Statistics & Actuarial Science  
**Quota:** ---  
**Offer in 2016 - 2017:** Y 1st sem Offer in 2017 - 2018 : 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.  
- **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. Organizational and presentational skills are minimally effective or ineffective.  
**Course Type:** Lecture-based course  
**Course Teaching & Learning Activities:**  
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<th>No. of Hours</th>
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<td>Project work</td>
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<tr>
<td>Reading / Self study</td>
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**Assessment Methods and Weighting:**  
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<td>Project reports</td>
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<td>Test</td>
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**Required/recommended reading and online materials:**  
- Klugman, S.: Understanding Actuarial Practice (Society of Actuaries, 2012)  
**Course Website:** moodle.hku.hk

### STAT3954  
**Current topics in actuarial science (6 credits)**  
**Academic Year:** 2016  
**Quota:** ---  
**Offering Department:** Statistics & Actuarial Science  
**Course Co-ordinator:** Prof W K Li, Statistics & Actuarial Science (hrntlwk@hku.hk)  
**Teachers Involved:** TBC, Statistics & Actuarial Science  
**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:**
## Course Descriptors (A+ to F)

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 regression model

CLO 4 extend the Cox's model to a multivariate setup to accommodate multivariate survival survival data

### Assessment Methods and Weighting

<table>
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<tr>
<th>Assessment Methods and Weighting</th>
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<td>Coursework (assignments, practical project &amp; class test(s))</td>
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### Course Website

moodle.hku.hk

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### Offering Department

Statistics & Actuarial Science

### Teachers Involved

Dr J F Xu, Statistics & Actuarial Science (xujf@hku.hk)

### Course Objectives

This course is concerned with how models which predict the survival pattern of humans or other entities are established. This exercise is sometimes referred to as survival-model construction.

### Course Contents & Topics

The nature and properties of parametric and nonparametric survival models will be studied. Topics to be covered include: the introduction of some important basic quantities like the hazard function and survival function; some commonly used parametric survival models; concepts of censoring and/or truncation; parametric estimation of the survival distribution by maximum likelihood estimation method; nonparametric estimation of the survival functions from possibly censored samples by means of the Kaplan-Meier estimator, the Nelson-Aalen estimator; and the kernel density estimator or the Ramirez-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 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.

CLO 2 demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. 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 to most familiar situations. 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 to solve problems. Apply limited or barely 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 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.

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.
STAT3956 Pension funds and pension mathematics (6 credits) Academic Year 2016
Offering Department Statistics & Actuarial Science
Course Co-ordinator Prof G Ma, Statistics & Actuarial Science (gma328@hku.hk)
Teachers Involved Prof G Ma, Statistics & Actuarial Science
Course Objectives This course covers the basics of pension plan design and pension fund management, as well as the fundamentals of pension plan valuations using different actuarial cost methods. The students will be introduced to the application of actuarial valuation techniques to the funding and accounting of pension plans.
Course Contents & Topics The following topics will be covered: Fundamentals of private pension plans; pricing and valuation of pension obligations; actuarial cost methods and their effects on cost patterns; selection of actuarial assumptions; principles of asset and liability management.
Course Learning Outcomes On successful completion of this course, students should be able to:
CLO 1 calculate the pension benefits in accordance with the provisions of a pension plan
CLO 2 calculate the normal cost and actuarial liabilities using different actuarial cost methods
CLO 3 perform gain and loss analyses for pension valuations
CLO 4 select appropriate assumptions and methods for funding or accounting purposes
CLO 5 interpret the valuation results presented in actuarial valuation reports
CLO 6 understand the principles of asset and liability modeling as related to pension plans
Pre-requisites (and Co-requisites and Impermissible combinations) Pass in STAT3909
Offer in 2016 - 2017 Grade Descriptors (A+ to F)
Y 1st sem Offer in 2017 - 2018 : Y Examination Dec
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 presenational skills are minimally effective or ineffective.
Required/recommended reading and online materials
ACTEX Publications
2001 Supplement to Actuarial Cost Methods-A Review, ACTEX Publications
Course Website moodle.hku.hk

STAT4601 Time-series analysis (6 credits) Academic Year 2016
Required/recommended reading and online materials
Techniques for Censored and Truncated Data (Springer, 1999)
Verlag, New York, 2005, 2nd ed.)
Klein, J. P. and Moeschberger, M. L.: Survival Analysis: Techniques for Censored and Truncated Data (Springer
1999)
Course Website moodle.hku.hk
### STAT4602 Multivariate data analysis (6 credits)

**Offering Department**
Statistics & Actuarial Science

**Course Co-ordinator**
Prof W.K. Fung, Statistics & Actuarial Science (wingfung@hku.hk)

**Teachers Involved**
Prof W.K. Fung, Statistics & Actuarial Science

**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; and
Not for students who have passed in STAT3614, or have already enrolled in this course; and
Not for students who have passed in STAT3907, or have already enrolled in this course.

**Offer in 2016 - 2017**
Y 1st sem Offer in 2017 - 2018: Y

**Examination Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping**
- Examination One 2-hour written examination 60 CLO 1, 2, 3, 4, 5, 6, 7
- Assignments Coursework (assignments, tutorials, and a class test) 40 CLO 1, 2, 3, 4, 5, 6, 7

**Grade Descriptors (A+ to F)**
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- F: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Website**
moodle.hku.hk

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### Department of Statistics & Actuarial Science

**Offering Department**
Statistics & Actuarial Science

**Course Co-ordinator**
Dr G L Li, Statistics & Actuarial Science (gdli@hku.hk)

**Teachers Involved**
Dr 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 modes; model identification; estimation and diagnostic checking; seasonal models and forecasting methods for time series.

**Course Learning Outcomes**
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 STAT3907, or have already enrolled in this course.

**Offer in 2016 - 2017**
Y 1st sem Offer in 2017 - 2018: Y

**Examination Methods Details Weighting in final course grade (%) Assessment Methods to CLO Mapping**
- Examination One 2-hour written examination 60 CLO 1, 2, 3, 4, 5, 6, 7
- Assignments Coursework (assignments, tutorials, and a class test) 40 CLO 1, 2, 3, 4, 5, 6, 7

**Grade Descriptors (A+ to F)**
- A: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- F: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

**Course Website**
moodle.hku.hk

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### Department of Statistics & Actuarial Science

**Offering Department**
Statistics & Actuarial Science

**Course Co-ordinator**
Prof T W K Fung, Statistics & Actuarial Science (wingfung@hku.hk)

**Teachers Involved**
Prof T W K Fung, Statistics & Actuarial Science

**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
**Pre-requisites (and Co-requisites and Impermissible combinations)**

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<td>Y 2nd sem Offer in 2017 - 2018 : Y</td>
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<td>May</td>
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<td>Demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
<td></td>
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<tr>
<td>C</td>
<td>Demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Demonstrates general but complete 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>
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<tr>
<td>Fail</td>
<td>Demonstrates partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.</td>
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**Course Type**

Lecture-based course

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<th>Activities</th>
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<th>No. of Hours</th>
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<td>Reading / Self study</td>
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<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
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<td>Assignments</td>
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<td>Coursework (assignments, tutorials, and a class test)</td>
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<td>CLO 1,2,3,4,5</td>
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<td>Examination</td>
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<td>CLO 1,2,3,4,5</td>
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**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**
moodle.hku.hk

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**STAT4603**

Current topics in risk management (6 credits)

<table>
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<th>Offering Department</th>
<th>Statistics &amp; Actuarial Science</th>
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<tr>
<td>Course Co-ordinator</td>
<td>Dr K P Wat, Statistics &amp; Actuarial Science (<a href="mailto:watkp@hku.hk">watkp@hku.hk</a>)</td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr K P Wat, Statistics &amp; Actuarial Science</td>
</tr>
</tbody>
</table>

**Course Objectives**

This course is to broaden the students knowledge of risk management by considering current topics in risk management. These topics will build on the theory and methods covered in the core courses. The topics offered each year depend on staff availability.

**Course Contents & Topics**

Liquidity risk; BASEL III and beyond; Operational risk; Model risk; 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 STAT4601

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<td>Examination</td>
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<td>Demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.</td>
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<td>B</td>
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**Course Type**

Lecture-based course

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<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Reading / Self study</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment Methods and Weighting</th>
<th>Methods</th>
<th>Details</th>
<th>Weighting in final course grade (%)</th>
<th>Assessment Methods to CLO Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td></td>
<td></td>
<td>50</td>
<td>CLO 1,2,3</td>
</tr>
</tbody>
</table>

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**Assessment Methods Details**

- **Assignments**: 50% (CLO 1,2,3)
- **Examination**: 50% (CLO 1,2,3,4,5)

**Assessment Grade Descriptors**

- **A**: Demonstrates thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**: Demonstrates substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**: Demonstrates general but complete 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.
- **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.

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**Reading / Self study**: 100%

**Tutorials**: 12 hours

**Lectures**: 36 hours

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**Examination One 3-hour written examination**: 50% (CLO 1,2,3,4,5)

**Organization and presentational skills** are minimally effective or ineffective.
Course Type
Lecture-based course

Course Teaching & Learning Activities

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></td>
<td>36</td>
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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>
<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>40</td>
<td>CLO 1,2,3,4</td>
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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials


Course Website
moodle.hku.hk

Additional Course Information
This course is previously called STAT2320 as the prerequisite changed to STAT3303.

STAT4606
Risk management and Basel Accords in banking and finance (6 credits)

Offering Department
Statistics & Actuarial Science

Course Co-ordinator
Mr P K Y Pang, Statistics & Actuarial Science (the_pang@yahoo.com)

Teachers Involved
Mr P K Y Pang, Statistics & Actuarial Science

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 2016 - 2017: Y
Offer in 2017 - 2018: Y

Grade Descriptors (A+ to 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.
- 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.
- 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 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.
- 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.

Assessment Methods

<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>Examination</td>
<td>One 2-hour written examination</td>
<td>60</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

Course Website
moodle.hku.hk

Academic Year
2016

STAT4607
Credit risk analysis (6 credits)

Academic Year
2016
## Course Objectives

For a commercial bank, credit risk has always been the most significant. It is the risk of default on debt, swap, or other 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 approach; Credit derivatives.

## Course Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand the Basel requirements for credit risk
- CLO 2 estimate credit scores using the logit model
- CLO 3 understand and estimate default probabilities using various approaches such as Moody's, the KMV and the mortality method
- CLO 4 understand the concept of credit value-at-risk and the CreditMetrics approach
- CLO 5 estimate default correlations
- CLO 6 assess rating systems

## Course Teaching & Learning Activities

- Lectures: 36 hours
- Tutorials: 12 hours
- Reading / Self study: 100 hours

## Assessment Methods

- Coursework (assignments, tutorials, and class test(s)): 40%
- One 2-hour written examination: 60%

## 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 high level of organization 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

moodle.hku.hk

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### STAT4608

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Statistics &amp; Actuarial Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>Dr Z Zhang, Statistics &amp; Actuarial Science (<a href="mailto:zhangz08@hku.hk">zhangz08@hku.hk</a>)</td>
</tr>
<tr>
<td>Courses Co-ordinator</td>
<td>Dr Z Zhang, Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>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.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>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</td>
</tr>
<tr>
<td>Course Type</td>
<td>Lecture-based course</td>
</tr>
<tr>
<td>Course Teaching &amp; Learning Activities</td>
<td>Lectures: 36 hours, Tutorials: 12 hours</td>
</tr>
<tr>
<td>Assessment Methods and Weighting</td>
<td>Coursework: 60%, Examination: 40%</td>
</tr>
<tr>
<td>Course Website</td>
<td>moodle.hku.hk</td>
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</tbody>
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### STAT3910

<table>
<thead>
<tr>
<th>Offering Department</th>
<th>Statistics &amp; Actuarial Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Involved</td>
<td>Dr K P Wat, Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>Courses Co-ordinator</td>
<td>Dr K P Wat, Statistics &amp; Actuarial Science</td>
</tr>
<tr>
<td>Course Objectives</td>
<td>For a commercial bank, credit risk has always been the most significant. It is the risk of default on debt, swap, 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.</td>
</tr>
<tr>
<td>Course Contents &amp; Topics</td>
<td>Probabilities of default, recovery rates and loss given default; Default and credit migration; credit scoring and internal rating models; Credit portfolio models such as CreditMetrics, CreditPortfolioView, KMV and actuarial approach; Credit derivatives.</td>
</tr>
<tr>
<td>Course Learning Outcomes</td>
<td>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, the KMV and the mortality method CLO 4 understand the concept of credit value-at-risk and the CreditMetrics approach CLO 5 estimate default correlations CLO 6 assess rating systems</td>
</tr>
<tr>
<td>Prerequisites (and Co-requisites and Impermissible combinations)</td>
<td>Pass or already enrolled in STAT3618 or STAT3905 or STAT3910 or (FINA2322 and any University level 3 course)</td>
</tr>
<tr>
<td>Offer in 2016 - 2017</td>
<td>2nd sem</td>
</tr>
<tr>
<td>Examination</td>
<td>Examination</td>
</tr>
<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 high level of organization 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.</td>
</tr>
<tr>
<td>Assessment Methods</td>
<td>Coursework: 60%, Examination: 40%</td>
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<tr>
<td>Course Website</td>
<td>moodle.hku.hk</td>
</tr>
</tbody>
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### Department of Statistics & Actuarial Science

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### Course: STAT4609 Big Data Analytics (6 credits)

#### Pre-requisites and Co-requisites
- Pass in STAT3907 and STAT3910; or
- Pass in STAT4601 and FINA2320 or STAT3609

#### Offer in 2016 - 2017
- **Y** 2nd sem
- Offer in 2017 - 2018: **Y**

#### Grade Descriptors (A+ to F)
- **A**: Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- **B**: Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- **C**: Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- **D**: Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- **Fail**: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

#### Course Type
Lecture-based course

#### Course Teaching & Learning Activities
- **Activities**
  - **Details**: 
  - **No. of Hours**
    - Lectures: 36
    - Tutorials: 12
    - Reading / Self study: 100

#### Assessment Methods and Weighting
- **Methods**
  - **Details**
  - **Weighting in final course grade (%)**
  - **Assessment Methods to CLO Mapping**

<table>
<thead>
<tr>
<th>Course Contents &amp; Topics</th>
<th>Course Learning Outcomes</th>
</tr>
</thead>
</table>
| Web analytics, data analytics, sentiment analysis, link analysis, social network analysis, recommender systems (collaborative filtering), and parallel computing for big data analytics. | 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.

#### Offer in 2016 - 2017
- **Y** 2nd sem
- Offer in 2017 - 2018: **Y**

#### Assessment
- **Examination**: May
- **No Exam**

#### Course Website
moodle.hku.hk

#### Required/recommended reading and online materials
STAT4710  Capstone experience for statistics undergraduates (6 credits)

Offering Department: Statistics & Actuarial Science
Course Co-ordinator: Prof W K Li, Statistics & Actuarial Science
Course Website: moodle.hku.hk

Course Objectives
This project-based course aims to provide students with capstone experience to formulate and investigate real life problems in the area of statistics, risk management, finance, climate, social science, medicine and scientific research by integrating and applying the statistical theories and quantitative techniques learnt in their junior university years.

Course Contents & Topics
No formal teaching. Students are expected to devote 120-140 hours working on this project. Students will work in groups of four or five under the supervision of a teacher. Students are required to give a presentation on their work two to three weeks before the end of the semester, and submit their final report at the end of the semester.

It aims to help the students to establish a good and solid foundation of life-long learning skills, and to enable students to equip with hands-on experience in solving real life problems starting from identification of the key variable(s) of interest, literature search, model formulation, data analysis or simulation, technical report writing and presentation of the results. Students will need to find an interesting topic of their own, conduct literature search regarding the most recent research related to the problem, make suggestions to improve the current situations or even solve the problem identified in their project.

Course Learning Outcomes
On successful completion of this course, students should be able to:

- CLO 1: formulate a problem using statistical or risk management ideas for a particular issue we are facing with and determine ways in which statistics/risk management can be used to solve the problems or to make predictions.
- CLO 2: integrate theory and practice, and to understand limitations of their current knowledge.
- CLO 3: work in a team and to collaborate with people with different background.
- CLO 4: express ideas effectively in both written and oral forms.
- CLO 5: develop further logical, critical thinking, creativity, technical report writing, communication and consultation skills.
- CLO 6: advocate to others the appreciation of statistics/risk management as to its relevance to our daily life.

Pre-requisites (and Co-requisites and Impermissible combinations)
Students are expected to have satisfactorily completed at least 24 credits of advanced level disciplinary core/elective courses in the Decision Analytics/Risk Management/Statistics Majors. Students who are interested in taking the course should submit their applications to the Department.

This capstone course is only for students majoring in Decision Analytics/Risk Management/Statistics, and is mutually exclusive with STAT3799, STAT4766 and STAT4799.

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

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.
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D:  Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
Fail: Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

Course Type: Project-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>Text</td>
<td>oral presentation, progress and attendance</td>
<td>45</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Research report</td>
<td>written report</td>
<td>55</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
</tbody>
</table>

Required/recommended reading and online materials
No specific list of textbooks and references. Students are encouraged to obtain information via various channels (main library, e-journals, internet, and discussions with classmates and teachers, etc.).

Course Website: moodle.hku.hk

STAT4711  Capstone experience for actuarial science undergraduates (6 credits)

Offering Department: Statistics & Actuarial Science
Course Website: moodle.hku.hk
Department of 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
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 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 STAT4785.

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

**Offer in 2016 - 2017**
- Y 1st sem 2nd sem Offer in 2017 - 2018 : Y

**Grade Descriptors**
(A+ to F)
- A Demonstrate thorough mastery at an advanced level of extensive knowledge and skills required for attaining all the course learning outcomes. Show strong analytical and critical abilities and logical thinking, with evidence of original thought, and ability to apply knowledge to a wide range of complex, familiar and unfamiliar situations. Apply highly effective organizational and presentational skills.
- B Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.
- C Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.
- D Demonstrate partial but limited command of knowledge and skills required for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.
- Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

### Course Type
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>Tutorials, group work/project, reading/self-study</td>
<td>120</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>oral presentation, progress and attendance</td>
<td>45</td>
<td>CLO 1,2,3,4,5,6</td>
</tr>
<tr>
<td>Research report</td>
<td>written report</td>
<td>55</td>
<td>CLO 1,2,3,4,5</td>
</tr>
</tbody>
</table>

### Course Website
moodle.hku.hk

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### STAT4766
Statistics internship (6 credits)

**Offering Department**
Statistics & Actuarial Science

**Teachers Involved**
Various teachers as the assessors of oral presentations and written reports, Statistics & Actuarial Science

**Course Objectives**
This course is offered to students majoring in Decision Analytics/Risk Management/Statistics who take on a minimum of 160 hours of internship work related to his major disciplines. It provides students with first-hand experience in the applications of academic knowledge in a real-life work environment.

**Course Contents & Topics**
Upon completion of the internship, each student is required to submit a written report and to give a presentation on his/her internship experience. The report should emphasize important working/educational experiences encountered by the student during his/her internship. In many situations, this would mean a report of the project(s) that the student has been involved in during his/her internship.

**Course Learning Outcomes**
On successful completion of this course, students should be able to:
- CLO 1 gain first-hand work experience in an industry related to decision analytics, risk management or statistics
- CLO 2 apply knowledge in decision analytics, risk management or statistics to solve practical problems in the work place
- CLO 3 understand contexts for specific quantitative skills developed in basic decision analytics, risk management or statistics courses
- CLO 4 communicate specialist knowledge in decision analytics, risk management or statistics to non-experts in a work environment
Course Type: Internship
Offering Department: Statistics & Actuarial Science
Course Co-ordinator: Dr L F K Ng, Statistics & Actuarial Science (floung@hku.hk)

Course Description:
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. The capstone course is only for BSc(Actuarial Science) students of Decision Analytics/Risk Management/Statistics Majors. It is mutually exclusive with STAT4710.

Pre-requisites and Co-requisites:
Pass in at least 24 credits of advanced level disciplinary core/elective courses in the Decision Analytics/Risk Management/Statistics Majors.

Grade Descriptors (Pass/Fail):
- **Pass**: Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of "Distinction".
- **Fail**: Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.

Course Availability:
- **Offer in 2016 - 2017**: Y
- **Y 1st sem 2nd sem Summer Offer in 2017 - 2018**: Y
- **Examination**: No Exam

Course Teaching & Learning Activities:
- **Activities**: 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
- **Details**: oral presentation and in-class discussion
- **Weighting in final course grade (%)**: 40
- **Assessment Methods to CLO Mapping**: CLO 1,2,3,4
- **Methods**: Written report
- **Details**: written report
- **Weighting in final course grade (%)**: 60
- **Assessment Methods to CLO Mapping**: CLO 1,2,3,4

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.**

**STAT4767 Actuarial science internship (6 credits)**

**Offering Department**: Statistics & Actuarial Science

**Course Co-ordinator**: Dr L F K Ng, Statistics & Actuarial Science (floung@hku.hk)

**Course Description**:
This course is offered to actuarial science students who take on an 6-month full time or similar internships. The internship work it is expected that students are to work at least 160 hours (or the equivalent of 4 weeks full-time) and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of "Distinction".

**Course Learning Outcomes**:
On successful completion of this course, students should be able to:
- **CLO 1**: gain practical experiences during internship
- **CLO 2**: describe basic actuarial practices learned during the internship
- **CLO 3**: explain how actuarial theories learned in University can be applied in practice
- **CLO 4**: provide context for specific technical skills developed in basic actuarial courses

**Pre-requisites (and Co-requisites and Impermissible combinations)**:
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.

**Offer in 2016 - 2017**: Y 1st sem 2nd sem Y

**Grade Descriptors (Pass/Fail)**:
- **Pass**: Able to apply knowledge to solve problems in the workplace. Successfully handles and carries out the work required in the job or assigned by supervisor(s). Establishes effective collaboration and communication with supervisor(s), colleagues, and clients in the job. Successfully fulfills the requirements set out in the Course Description regarding working hours, written and oral report, and evaluation by supervisor(s), etc. Students demonstrating excellent performance in the above would be awarded a grade of "Distinction".
- **Fail**: Very limited or no ability to solve problems in the workplace. Fails to handle or carry out the work required in the job or assigned by supervisor(s). Fails to establish effective collaboration or communication with supervisor(s), other colleagues, or clients in the job. Fails to satisfy the requirements set out in the Course Description regarding working hours, written and oral report, or evaluation by supervisor(s), etc.

**Course Type**: Internship

**Course Teaching & Learning Activities**:
- **Activities**: it is expected that students are to work at least 6 months or 120 working days
- **No. of Hours**: 960

**Assessment Methods and Weighting**:
- **Methods**: Oral presentation
- **Details**: oral presentation and in-class discussion
- **Weighting in final course grade (%)**: 40
- **Assessment Methods to CLO Mapping**: CLO 1,2,3,4
- **Methods**: Written report
- **Details**: written report
- **Weighting in final course grade (%)**: 60
- **Assessment Methods to CLO Mapping**: CLO 1,2,3,4

**Course Website**: 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)  Academic Year 2016

Offering Department  Statistics & Actuarial Science  Quota 50

Course Co-ordinator  Prof S M S Lee, Statistics & Actuarial Science (smslee@hku.hk)

Teachers Involved  Various teachers as the assessors of oral presentations and written reports, Statistics & Actuarial Science

Course Objectives  Each year a few projects suitable for Actuarial Science students will be offered to provide students with practical experience in approaching a real problem, in report writing and in oral presentation.

Course Contents & Topics  These projects, under the supervision of individual staff members, involve the applications of statistics and/or probability in a wide range of problems of practical and/or academic interests.

Course Learning Outcomes  On successful completion of this course, students should be able to:

- CLO 1: formulate meaningful research problems
- CLO 2: learn and apply advanced techniques in probability and/or statistics to solve real life problems
- CLO 3: summarize and present research findings in a professional manner

Pre-requisites (and Co-requisites and Impermissible combinations)  Pass in at least 24 credits of advanced level disciplinary core/elective courses in BSc(Actuarial Science) programme including STAT3902 and STAT3907; and Pass or already enrolled in at least one of the following courses: STAT3616, STAT3911, STAT4601, STAT4602; 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.


Grade Descriptors  (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Assessment Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A demonstration of thorough grasp of the subject. 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>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>B</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>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>C</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>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>D</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>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>F</td>
<td>F demonstrate 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.</td>
<td>CLO 1.2.3</td>
</tr>
</tbody>
</table>

Course Type  Project-based course

Course Teaching & Learning Activities  
- Activities: Reading / Self study
- Details: No of Hours: 120

Assessment Methods and Weighting  
- Methods: Oral presentation, oral presentation & in-class discussion, written report
- Details: Weighting in final course grade (%): 40, 60
- Assessment Methods to CLO Mapping: CLO 1.2.3, CLO 1.2.3

Course Website  moodle.hku.hk

Additional Course Information  Approval is subject to past academic performance.

STAT4799 Statistics project (12 credits)  Academic Year 2016

Offering Department  Statistics & Actuarial Science  Quota 30

Course Co-ordinator  Prof S M S Lee, Statistics & Actuarial Science (smslee@hku.hk)

Teachers Involved  Various teachers as the assessors of oral presentations and written reports, Statistics & Actuarial Science

Course Objectives  Each year a few projects suitable for students majoring in Decision Analytics/Statistics/Risk Management 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 STAT3600; and Pass or already enrolled in at least one of the following courses: STAT3616, 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.

Offer in 2016 - 2017  Y Year long Offer in 2017 - 2018: Y

Grade Descriptors  (A+ to F)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Assessment Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</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.</td>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>B</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>
<td>CLO 1.2.3</td>
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<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>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>D</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>
<td>CLO 1.2.3</td>
</tr>
<tr>
<td>F</td>
<td>F demonstrate 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.</td>
<td>CLO 1.2.3</td>
</tr>
</tbody>
</table>
This course is an advanced course in risk theory which extends various topics discussed in STAT3906. It discusses utility theory, discrete ruin model; compound Poisson risk model; ruin probability; reinsurance; adjustment coefficient; Lundbergs inequality; Tijms approximation; non-homogeneous birth process; contamination model; mixed Poisson process; inflation model; IBNR (Incurred But Not Reported) claims; mixed Erlang distributions; stop-loss moments; equilibrium distributions.

On successful completion of this course, students should be able to:

- CLO 1 understand utility theory including some commonly used utility functions, Jensen’s inequality, risk aversion and utility maximization
- CLO 2 define discrete and continuous ruin models
- CLO 3 calculate the adjustment coefficient, Lundbergs inequality and Tijms approximation in ruin theory
- CLO 4 understand the effect of reinsurance and change of parameters on ruin probability
- CLO 5 understand non-homogeneous birth process and its applications as contagion models for claim frequencies
- CLO 6 understand mixed Poisson process and its applications including the inflation model and the IBNR model
- CLO 7 derive the relationship between stop-loss moments and equilibrium distributions

### 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>written report</td>
<td>60</td>
<td>CLO 1,2,3</td>
</tr>
<tr>
<td>Oral presentation</td>
<td>oral presentation &amp; in-class discussion</td>
<td>40</td>
<td>CLO 1,2,4</td>
</tr>
</tbody>
</table>

### Assessment

- Examination: One 3-hour written examination (75%)
- Assignments (coursework, assignments, tutorials, and a class test) (25%)
- Pre-requisites: Pass in STAT3906

### Course Objectives

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 Contents & Topics

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 Learning Outcomes

On successful completion of this course, students should be able to:

- CLO 1 understand utility theory including some commonly used utility functions, Jensen’s inequality, risk aversion and utility maximization
- CLO 2 define discrete and continuous ruin models
- CLO 3 calculate the adjustment coefficient, Lundbergs inequality and Tijms approximation in ruin theory
- CLO 4 understand the effect of reinsurance and change of parameters on ruin probability
- CLO 5 understand non-homogeneous birth process and its applications as contagion models for claim frequencies
- CLO 6 understand mixed Poisson process and its applications including the inflation model and the IBNR model
- CLO 7 derive the relationship between stop-loss moments and equilibrium distributions

## Required/Recommended reading and online materials

**Course Website**: moodle.hku.hk

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**STAT4902**  
**Selected topics in actuarial science (6 credits)**  
**Academic Year**: 2016

**Offering Department**: Statistics & Actuarial Science

**Course Co-ordinator**: TBC, Statistics & Actuarial Science

**Teachers Involved**: Dr L F K Ng, Statistics & Actuarial Science

**Course Objectives**: This course is an advanced course in actuarial science which discusses selected topics which potential graduate students will find useful. It focuses on tools that are in the frontier of actuarial science with examples on applications.

**Course Contents & Topics**: The contents will be chosen from the following topics: Coherent risk measures; Premium calculation principles; Copulas; Extreme value theory; Stochastic dominance; Ordering of risks; Renewal equations with insurance applications; Reliability problems; Generalized linear models; Comonotonicity; Measures of dependency; Phase-type distributions; Applications to enterprise risk analysis; Other topics as determined by the instructor.

**Course Learning Outcomes**:

- **On successful completion of this course, students should be able to:**
  - CLO 1 understand the mathematical tools useful for further research and applications
  - CLO 2 apply the tools to solve potentially unseen problems

**Pre-requisites (and Co-requisites and Inpermissible combinations)**: Pass in STAT3906

**Offer in 2016 - 2017**: N  
**Offer in 2017 - 2018**: 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.

**Course Type**: Lecture-based course

**Course Teaching & Learning Activities**:

- **Activities**: Lectures, Tutorials, Reading / Self study
- **Details**: 36, 12, 100
- **No. of Hours**: 36, 12, 100

**Assessment Methods and Weighting**:

- **Methods**: Assignments, Coursework (assignments, tutorials and class test(s)), Examination
- **Details**: 40, 60
- **Weighting in final course grade (%)**: 40, 60
- **Assessment Methods to CLO Mapping**: CLO 1,2, CLO 1,2

**Required/recommended reading and online materials**:


**Course Website**: moodle.hku.hk

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**STAT4903**  
**Actuarial techniques for general insurance (6 credits)**  
**Academic Year**: 2016

**Offering Department**: Statistics & Actuarial Science

**Course Co-ordinator**: Dr L F K Ng, Statistics & Actuarial Science

**Teachers Involved**: Dr L F K Ng, Statistics & Actuarial Science

**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 underlying expense provisions
   - Pure premium methods
   - Loss Ratio methods

**Course Website**: moodle.hku.hk
- 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. Concurrent topics
   Applications using predictive modeling in General Insurance
   - e.g. predictive modeling, Enterprise Risk Management, etc

On successful completion of this course, students should be able to:

CLO 1 understand the feature and underlying risk of general insurance products
CLO 2 calculate the premium rate for basic general insurance products
CLO 3 estimate the claims liabilities for general insurance products

Pass in STAT3906

Examination
One 3-hour written examination 75
CLO 2,3
Examination

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 2,3

Course Type Lecture-based course

Assessment Methods and Weighting

Activities Details No. of Hours
Lectures 36
Tutorials 12
Reading / Self study 100

Required/recommended reading and online materials

Course Website moodle.hku.hk

Additional 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
- Feldtburn, 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

Additional Course Information

Department of Statistics & Actuarial Science
On successful completion of this course, students should be able to:

CLO 1 comprehend 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 (and Co-requisites and Impermissible combinations)
Pass in STAT3600 or STAT3907

Course Type Lecture-based course

Offer in 2016 - 2017 Y 1st sem Offer in 2017 - 2018 : 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 for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Course Learning Outcomes

Outcomes
Course Learning Outcomes

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
moodle.hku.hk

Examination Grade Descriptors
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

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 Type Lecture-based course

Offering Department Statistics & Actuarial Science
Quota ---

Offer in 2016 - 2017 Y 1st sem Offer in 2017 - 2018 : 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 for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Course Learning Outcomes

Outcomes
Course Learning Outcomes

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, 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
moodle.hku.hk

Examination Grade Descriptors
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.

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 for attaining some of the course learning outcomes. Show evidence of some coherent and logical thinking, but with limited analytical and critical abilities. Show limited ability to apply knowledge to solve problems. Apply limited or barely effective organizational and presentational skills.

Course Learning Outcomes

Outcomes
Course Learning Outcomes

Course Teaching & Learning Activities
Activities Details No. of Hours
Lectures 36
Tutorials 12
tutorials, and a class test)
Examination One 2-hour written examination 75 CLO 1,2,3,4

Required/recommended reading and online materials

Course Website
moodle.hku.hk

Examination Grade Descriptors
Fail Demonstrate little or no evidence of command of knowledge and skills required for attaining the course learning outcomes. Lack of analytical and critical abilities, logical and coherent thinking. Show very little or no ability to apply knowledge to solve problems. Organization and presentational skills are minimally effective or ineffective.
<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 (assignments, tutorials, and a class test)</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
<td></td>
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<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>50</td>
<td>CLO 1,2,3,4</td>
<td></td>
</tr>
</tbody>
</table>


| Course Website | moodle.hku.hk |

<table>
<thead>
<tr>
<th>STAT7611</th>
<th>Computational statistics (6 credits)</th>
<th>Academic Year</th>
<th>2016</th>
</tr>
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<tbody>
<tr>
<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Prof G Yin, Statistics &amp; Actuarial Science (<a href="mailto:gyin@hku.hk">gyin@hku.hk</a>)</td>
<td></td>
<td></td>
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<tr>
<td>Teachers Involved</td>
<td>Prof G Yin, Statistics &amp; Actuarial Science</td>
<td></td>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>Course Contents &amp; Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contents include: Numerical optimization and integration, EM algorithm and its variants, Simulation and Monte Carlo integration, Importance sampling and variance reduction techniques, Markov chain Monte Carlo methods, and Bootstrap methods.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Learning Outcomes</th>
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</thead>
<tbody>
<tr>
<td>On successful completion of this course, students should be able to:</td>
</tr>
<tr>
<td>CLO 1 understand the importance of the technique for generating random variables in Bayesian statistics, Monte Carlo integration and bootstrapping methods</td>
</tr>
<tr>
<td>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</td>
</tr>
<tr>
<td>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</td>
</tr>
<tr>
<td>CLO 4 apply EM-type algorithms to find the posterior mode and apply Markov chain Monte Carlo methods to generate posterior samples</td>
</tr>
<tr>
<td>CLO 5 apply Bootstrap methods to obtain estimated standard errors of estimators and confidence intervals of parameters for both parametric and non-parametric cases</td>
</tr>
</tbody>
</table>

| Pre-requisites (and Co-requisites and Impermissible combinations) | Pass in STAT3600 or STAT3907 |

<table>
<thead>
<tr>
<th>Offer in 2016 - 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y 1st sem Offer in 2017 - 2018 : Y</td>
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<table>
<thead>
<tr>
<th>Grade Descriptors (A+ to F)</th>
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<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
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<tr>
<td>D</td>
</tr>
<tr>
<td>Fail</td>
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<table>
<thead>
<tr>
<th>Course Type</th>
<th>Lecture-based course</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Course Teaching &amp; Learning Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities</td>
</tr>
<tr>
<td>Lectures</td>
</tr>
<tr>
<td>Tutorials</td>
</tr>
<tr>
<td>Reading / Self study</td>
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</table>

<table>
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<tr>
<th>Assessment Methods and Weighting</th>
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<tbody>
<tr>
<td>Methods</td>
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<tr>
<td>Assignments</td>
</tr>
<tr>
<td>Examination</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required/recommended reading and online materials</th>
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</thead>
</table>

| Course Website | moodle.hku.hk |

<table>
<thead>
<tr>
<th>STAT7614</th>
<th>Advanced statistical modelling (6 credits)</th>
<th>Academic Year</th>
<th>2016</th>
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</thead>
<tbody>
<tr>
<td>Offering Department</td>
<td>Statistics &amp; Actuarial Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Co-ordinator</td>
<td>Dr Y K Chung, Statistics &amp; Actuarial Science (<a href="mailto:yukchung@hku.hk">yukchung@hku.hk</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachers Involved</td>
<td>Dr Y K Chung, Statistics &amp; Actuarial Science</td>
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</table>

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<tr>
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<tbody>
<tr>
<td>It will cover both the underlying principles of each modelling approach and the statistical properties of the model estimation procedures. Topics from: (i) Generalized linear models; (ii) Random effects and mixed models; (iii) Nonparametric and semi-parametric methods: kernel and local polynomial regression; selection of smoothing methods.</td>
</tr>
</tbody>
</table>
**Course Learning Outcomes**

On successful completion of this course, students should be able to:
- CLO 1: understand the definition and basic characteristics of each statistical model
- CLO 2: identify for a given set of data the most suitable statistical model and tools to use
- CLO 3: develop skills of building a scoring model for various management and prediction, problems involving a binary response; employing the powerful tool of kernel density estimation using SAS or R for real data mining problems; and analysing data with SAS procedures PROC LOGISTIC, PROC GENMOD, PROC GLM, PROC UNIVARIATE (option KERNEL) or equivalent R Packages

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in STAT3600 or STAT3907

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Offer</th>
<th>Y</th>
<th>2nd sem</th>
<th>Offer in 2017 - 2018</th>
<th>Y</th>
<th>Examination</th>
<th>May</th>
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<tr>
<td>Grade Descriptors (A+ to F)</td>
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</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>
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<tr>
<td>B</td>
<td>Demonstrate substantial command of a broad range of knowledge and skills required for attaining at least most of the course learning outcomes. Show evidence of analytical and critical abilities and logical thinking, and ability to apply knowledge to familiar and some unfamiliar situations. Apply effective organizational and presentational skills.</td>
<td></td>
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<tr>
<td>C</td>
<td>Demonstrate general but incomplete command of knowledge and skills required for attaining most of the course learning outcomes. Show evidence of some analytical and critical abilities and logical thinking, and ability to apply knowledge to most familiar situations. Apply moderately effective organizational and presentational skills.</td>
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<td>D</td>
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<td>E</td>
<td>Fail</td>
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**Course Type**

Lecture-based course

**Course Teaching & Learning Activities**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Details</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td></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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<td>100</td>
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**Assessment Methods and Weighting**

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<tr>
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<td>CLO 1,2,3</td>
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<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**

1. Recommend Reading : R.H. Myers et al., 2010: Generalized Linear Models (2nd ed.), Wiley

**Course Website**

moodle.hku.hk

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### Course STAT7615

**Offering Department**

Statistics & Actuarial Science

**Teachers Involved**

Prof W K Li, Statistics & Actuarial Science (hmlwk@hku.hk)

**Course Objectives**

This course covers statistical methods and models of importance to risk management and finance and links finance theory to market practice via statistical modeling and decision making. Emphases will be put on empirical analyses to address the discrepancy between finance theory and market data.

**Course Contents & Topics**

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; Stochastic interest rate models; Extreme value theory for risk management.

**Course Learning Outcomes**

On successful completion of this course, students should be able to:
- CLO 1: apply Monte Carlo methods to determine the value of options and other derivative securities
- CLO 2: predict volatility of a set of securities using appropriate models
- CLO 3: estimate the value-at-risk under extreme value theory

**Pre-requisites (and Co-requisites and Impermissible combinations)**

Pass in STAT4608

**Offer in 2016 - 2017**

<table>
<thead>
<tr>
<th>Offer</th>
<th>Y</th>
<th>2nd sem</th>
<th>Offer in 2017 - 2018</th>
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**Course Type**

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<td>Coursework (assignments, tutorials, and a class test)</td>
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</tr>
<tr>
<td>Examination</td>
<td>One 2-hour written examination</td>
<td>75</td>
</tr>
</tbody>
</table>

**Required/recommended reading and online materials**
- Danielsson Jon: Financial Risk Forecasting (Willy 2011)

**Course Website**
moodle.hku.hk
REGULATIONS FOR THE DEGREE OF
BACHELOR OF SCIENCE
(BSc)

These regulations apply to students admitted under the 4-year ‘2012 curriculum’ to the BSc degree curriculum in the academic year 2012-2013 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 in an approved institution of higher education elsewhere in accordance with UG2 of the Regulations for First Degree Curricula. Credits granted for advanced standing will be recorded on the transcript of the candidate but shall not be included in the calculation of the GPA.

Assessment

Sc7

(a) Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any combination of continuous assessment of coursework, written examinations and/or any other assessable activities. Only passed courses will earn credits.

(b) Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate’s absence from any examination. Any supplementary examination shall be part of that academic year’s examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(c) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(d) Candidates are required to make up for failed courses in the following manner: repeating the failed course by undergoing instruction and satisfying the assessment, or for elective courses, taking another course in lieu and satisfying the assessment requirements.

(e) There shall be no appeal against the results of examinations and all other forms of assessment.

Award of BSc Degree

Sc8 To be eligible for the award of the BSc degree, candidates shall have:

(a) satisfied the requirements in UG5 of the Regulations for First Degree Curricula;

(b) passed not fewer than 240 credits, comprising 96 credits of the required courses as prescribed in the major programme of the BSc degree curriculum.

Honours classification

Sc9 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

See also General Regulations, pp. xx to xx

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.

1 These regulations are applicable to candidates admitted from 2016-17 onwards to the first year of first degree curricula under the 4-year ‘2012 curriculum’, the 2-year curriculum in respect of the BSc(IM), the 5-year curriculum in respect of the BA&BE(LangEd), BEd&BSc, BEd&BSocSc, BSc(Sp&HearSc), and BNurs, and the 6-year curriculum in respect of the BChinMed, BDS and MBBS. Reference in these regulations to the powers of the Boards of Faculties shall be applicable to Senate Boards of Studies which administer first degree curricula.

(For the Regulations for First Degree Curricula applicable to cohorts admitted in 2012-13 and 2013-14 under the 4-year ‘2012 curriculum’ can be found in the Calendar for 2013-14, and in the Calendar for 2014-15 for the cohorts admitted in 2014-15 and 2015-16.)
to fulfill the curriculum requirements as specified in the syllabuses of the degree curriculum.

‘Elective course’ or ‘Elective’ means any course offered within the same or another curriculum, other than compulsory courses in the candidate’s degree curriculum, that can be taken by the candidate in order to complete the credit requirements of the degree curriculum.

‘Capstone experience’ refers to one or more courses within the major programme or professional core which are approved by the Board of the Faculty for the purpose of integrating knowledge and skills acquired, and which are prescribed in the syllabuses of the degree curriculum.

‘Syllabus’ means courses taught by departments, centres, and schools, offered under a degree curriculum.

‘Prerequisite’ means a course or a group of courses which candidates must have completed successfully or a requirement which candidates must have fulfilled before being permitted to take the course in question.

‘Corequisite’ means a course which candidates must take in conjunction with the course in question.

‘Credits’ or ‘credit-units’ means the value assigned to each course to indicate its study load relative to the total study load under a degree curriculum. The study load refers to the hours of student learning activities and experiences, both within and outside the classroom, and includes contact hours and time spent on assessment tasks and examinations. Candidates who satisfactorily complete courses with a credit value earn the credits assigned to these courses.

‘Grade Points’ are standardized measurements of candidates’ academic achievement in courses taken to satisfy the requirements of the degree curriculum and are expressed as a scale prescribed in these regulations.

‘Grade Point Average’ is a numerical measure of a candidate’s academic achievement over a specified period of time. Each course attempted (including each failed course) is assigned a numerical value, with all courses carrying equal weighting. This numerical value is the product of grade points earned for the course and the credit value of that course. The ‘Grade Point Average’ is the sum of these numerical values divided by the total number of credits attempted:

\[ GPA = \frac{\sum_i \text{Course Grade Point} \times \text{Course Credit Value}}{\sum_i \text{Course Credit Value}} \]

(where ‘i’ stands for all passed and failed courses taken by the student over a specified period)

‘Semester Grade Point Average’ or ‘Semester GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given semester.

‘Year Grade Point Average’ or ‘Year GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) during a given academic year.

‘Cumulative Grade Point Average’ or ‘Cumulative GPA’ is the GPA in respect of courses attempted by a candidate (including failed courses) at the time of calculation.

‘Assessment’ refers to judgment about the quality and extent to which a student has achieved the stated learning objectives or learning outcomes. It includes all types of assessment activities which allow for such a judgment to be made. For the purpose of interpreting the relevant provisions of the Ordinance and the Statutes and where appropriate, reference to ‘examination’ or ‘examinations’ in the Ordinance and the Statutes shall include and cover all forms of ‘assessment’ and its related processes.

A ‘transcript’ refers to a transcript of the record of study of a candidate, issued by the Registry of the University.
UG 2 Advanced standing:

Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum. Candidates who are awarded Advanced Standing will not be granted any further credit transfer for those studies for which Advanced Standing has been granted. The amount of credits to be granted for advanced standing shall be determined by the Board of the Faculty, in accordance with the following principles:

(a) at least half the number of credits of the degree curriculum normally required for award of the degree shall be accumulated through study at this University or from transfer of credits for courses completed at other institutions in accordance with Regulation UG 4(d); and

(b) in accordance with Statute III.5 and notwithstanding the granting of advanced and/or transfer credits, a minimum of two semesters of study at this University shall be required before a candidate is considered for the award of a first degree, other than a degree in medicine or surgery, and a minimum of four semesters of study at this University shall be required before a candidate is considered for a first degree in medicine or surgery.

Credits granted for advanced standing shall not normally be included in the calculation of the GPA unless permitted by the Board of the Faculty but will be recorded on the transcript of the candidate.

UG 3 Period of study:

The period of study of the curriculum shall be specified in the regulations governing the degree. To be eligible for award of the degree, a candidate shall fulfill all curriculum requirements within the maximum period of registration, unless otherwise permitted or required by the Board of the Faculty.

UG 4 Progression in curriculum:

(a) Candidates shall normally be required to take not fewer than 24 credits nor more than 30 credits in any one semester (except the summer semester) unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of outstanding credits required to complete the curriculum requirements is fewer than 24 credits.

(b) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. With the special permission of the Board of the Faculty, candidates may exceed the annual study load of 72 credits in a given academic year provided that the total number of credits taken does not exceed the maximum curriculum study load for the normative period of study specified in the curriculum regulations, save as provided for under UG4(c).

(c) Where candidates are required to make up for failed credits, the Board of the Faculty may give permission for candidates to exceed the annual study load of 72 credits provided that the total number of credits taken does not exceed the maximum curriculum study load for the maximum period of registration specified in the curriculum regulations.

(d) Candidates may, with the approval of the Board of the Faculty, transfer credits for courses completed at other institutions at any time during their candidature. The number of transferred credits may be recorded in the transcript of the candidate, but the results of courses completed at other institutions shall not be included in the calculation of the GPA. The number of credits to be transferred shall not exceed half of the total
credits normally required under the degree curricula of the candidates during their candidature at the University.

(c) Unless otherwise permitted by the Board of the Faculty, candidates shall be recommended for discontinuation of their studies if they have:

(i) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters, or
(ii) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester), or
(iii) exceeded the maximum period of registration specified in the regulations of the degree.

UG 5 Requirements for graduation:

To be eligible for admission to the degree, candidates shall fulfill the following requirements in addition to the requirements prescribed in the regulations and syllabuses governing the degree curriculum within the maximum period of registration:

(a) successful completion of 12 credits in English language enhancement, including 6 credits in Core University English\(^2\) and 6 credits in an English in the Discipline course\(^3\);
(b) successful completion of 6 credits in Chinese language enhancement\(^4\);
(c) successful completion of 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry\(^5\) with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits; and
(d) successful completion of a capstone experience as specified in the syllabuses of the degree curriculum.

UG 6 Exemption:

Candidates may be exempted, with or without special conditions attached, from any of the requirements in UG 5 by the Senate in exceptional circumstances. Candidates who are so exempted must replace the number of exempted credits with courses of the same credit value.

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\(^2\) Candidates who have achieved Level 5** in English Language in the Hong Kong Diploma of Secondary Education Examination, or equivalent, may at the discretion of the Faculty be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

\(^3\) (a) To satisfy the English in the Discipline (ED) requirement, candidates who have passed the ED course for a Major but subsequently change that Major are required to pass the ED course for the new Major, or either of the double Majors finally declared upon graduation irrespective of whether the second Major is offered within or outside of the candidates’ home Faculty.

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

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

\(^4\) Candidates who have not studied Chinese language during their secondary education may be exempted from this requirement and should take an elective course in lieu, see Regulation UG6.

\(^5\) Candidates registered for double degree studies are required to successfully complete 24 credits of courses in the Common Core Curriculum, selecting one course from each Area of Inquiry, within the curriculum of the first degree, as appropriate.
UG 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:

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<th>Grade</th>
<th>Standard</th>
<th>Grade Point</th>
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<td>A+</td>
<td>Excellent</td>
<td>4.3</td>
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<td>A</td>
<td>Good</td>
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<td>A-</td>
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<td>B+</td>
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6 UG 8 is not applicable to the respective Professional Core of the BDS and MBBS curricula.
(b) Special permission may be given by Senate for courses in individual curricula to be graded as ‘Pass’, ‘Fail’ or ‘Distinction’. Such courses will not be included in the calculation of the GPA.

UG 9 Honours classifications:

(a) Honours classifications shall be awarded in five divisions\(^7\): First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the degree in accordance with the following Cumulative GPA scores, with all courses taken (including failed courses) carrying equal weighting:

<table>
<thead>
<tr>
<th>Class of honours</th>
<th>CGPA range</th>
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<tbody>
<tr>
<td>First Class Honours</td>
<td>3.60 – 4.30</td>
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<td>Second Class Honours</td>
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<td>Division One</td>
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<td>Division Two</td>
<td>2.40 – 2.99</td>
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<td>Third Class Honours</td>
<td>1.70 – 2.39</td>
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<td>Pass</td>
<td>1.00 – 1.69</td>
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(b) Honours classification may not be determined solely on the basis of a candidate’s Cumulative GPA and the Board of Examiners for the degree may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Cumulative GPA falls below the range stipulated in UG9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on Faculty noticeboards.

\(^7\) UG 9 is not applicable to the BChinMed, BDS and MBBS curricula.
Teaching Weeks
# Teaching Weeks 2016-2017 for Undergraduate and Taught Postgraduate Students

### FIRST SEMESTER: SEP 1 - DEC 23, 2016

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#### Reading/ Field Trip Week: Oct 17 - 22, 2016

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### SECOND SEMESTER: JAN 16 - MAY 27, 2017

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### OPTIONAL SUMMER SEMESTER

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### Notes:

- First Semester: 11 Mondays, 12 Tuesdays, Wednesdays and Thursdays, 11 Fridays and Saturdays
- Second Semester: 12 Mondays and Tuesdays, 13 Wednesdays, 12 Thursdays, 11.5 Fridays, and 12 Saturdays

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**General Holiday**

**Reading/ Field Trip Week**

**University Holiday (Full Day)**

**Revision Period**

**University Holiday (afternoon only)**

**Class Suspension Period for the Lunar New Year**

**Assessment Period**

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### Useful contacts and websites

<table>
<thead>
<tr>
<th><strong>Faculty of Science</strong></th>
<th>Office Location</th>
<th>Tel</th>
<th>Fax</th>
<th>Email</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ground Floor,</td>
<td>3917 2683</td>
<td>2858 4620</td>
<td><a href="mailto:science@hku.hk">science@hku.hk</a></td>
<td><a href="http://www.scifac.hku.hk">http://www.scifac.hku.hk</a></td>
</tr>
<tr>
<td></td>
<td>Chong Yuet Ming Physics Building</td>
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*(Please visit [http://www.scifac.hku.hk](http://www.scifac.hku.hk) for the latest updates of BSc courses, timetables, notices and forms)*

<table>
<thead>
<tr>
<th><strong>Departments/School</strong></th>
<th>Website</th>
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<tbody>
<tr>
<td>Biological Sciences</td>
<td><a href="http://www.biosch.hku.hk">http://www.biosch.hku.hk</a></td>
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<tr>
<td>Biomedical Sciences</td>
<td><a href="http://www.sbms.hku.hk">http://www.sbms.hku.hk</a></td>
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<td>Chemistry</td>
<td><a href="http://www.chemistry.hku.hk">http://www.chemistry.hku.hk</a></td>
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<tr>
<td>Earth Sciences</td>
<td><a href="http://www.earthsciences.hku.hk">http://www.earthsciences.hku.hk</a></td>
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<tr>
<th><strong>Academic Advising Office</strong></th>
<th>Tel</th>
<th>Website</th>
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<tbody>
<tr>
<td></td>
<td>2219 4686</td>
<td><a href="http://aao.hku.hk">http://aao.hku.hk</a></td>
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<tr>
<th><strong>Academic Services Office</strong></th>
<th>Office Location</th>
<th>Tel</th>
<th>Fax</th>
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<tbody>
<tr>
<td></td>
<td>G04, Run Run Shaw Building</td>
<td>2859 2433</td>
<td>2540 1405</td>
<td><a href="mailto:asoffice@hku.hk">asoffice@hku.hk</a></td>
<td><a href="http://www.ase.hku.hk">http://www.ase.hku.hk</a></td>
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<tr>
<th><strong>Common Core courses</strong></th>
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<th><strong>HKU Worldwide Undergraduate Exchange Programme</strong></th>
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<td><a href="http://www.als.hku.hk/admission/exchange">http://www.als.hku.hk/admission/exchange</a></td>
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<tr>
<th><strong>Centre of Development and Resources for Students (CEDARS)</strong></th>
<th>Tel</th>
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<tr>
<td></td>
<td>2859 2305</td>
<td><a href="http://cedars.hku.hk">http://cedars.hku.hk</a></td>
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<tr>
<th><strong>University Health Service</strong></th>
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<tr>
<td></td>
<td>2859 2501 (General enquiries)</td>
<td><a href="http://www.uhs.hku.hk">http://www.uhs.hku.hk</a></td>
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<td>2549 4686 (Medical appointments only)</td>
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<td><a href="http://www.hku.hk/plagiarism">http://www.hku.hk/plagiarism</a></td>
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