Master of Science in the field of

APPLIED GEOSCIENCES

A springboard for a robust and fruitful career

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Programme Prospectus
Programme Structure
To be eligible for the award of the MSc in the field of Applied Geosciences, a student shall complete all core courses and total credits prescribed in a selected theme.

Engineering Geology Theme (66 credits)
Core courses
GEOS7010  Geology principles and practice (6 credits), for non-geologists
GEOS7011  Advanced geology of Hong Kong (6 credits), for geologists OR
GEOS7033  Geology of Hong Kong (6 credits), for non-geologists
GEOS7012  Site investigation and engineering geological techniques (6 credits)
GEOS7015  Rock mechanics (3 credits)
GEOS7016  Soil mechanics (3 credits)
GEOS7020  Project Part I (6 credits)
GEOS7021  Geological fieldwork I (3 credits), for non-geologists OR
GEOS8021  Geological fieldwork II (3 credits), for geologists
GEOS8001  Hydrogeology (3 credits)
GEOS8002  Professional practice in applied geosciences (3 credits)
GEOS8003  Seminars on unforeseen ground conditions, geotechnical and environmental failures (3 credits)
GEOS8020  Project Part II (12 credits)
GEOS8101  Engineering geology and geotechnical design (6 credits)
GEOS8204  Basic structural mechanics and behaviour (3 credits)
GEOS8205  Mathematics I (6 credits)
GEOS8206  Mathematics II (6 credits)

Elective courses
GEOS7022  Course of directed studies (3 credits)

Core courses for students with a first degree in Geology or a related subject:
GEOS7010, 7012, 7015, 7016, 7020, 8001, 8002, 8003, 8020, 8021, 8011, 8012, 8014, 8024 – 66 credits.
GEOS7022 may be substituted for GEOS8204 if directed by the programme director.

Core courses for students whose first degree is not in Geology or a related subject:
GEOS7010, 7012, 7015, 7016, 7020, 8011, 8012, 8014, 8020, 8021, 8011, 8012 – 66 credits.

Certain other courses may be accepted as electives at the discretion of the programme director.

* For geologists
Not a core course for non-geologists and full-time students taking course GEOS7022
Graduates in Civil Engineering cannot take this course for credits.

The design of the curriculum of the Engineering Geology theme (part-time)

<table>
<thead>
<tr>
<th>Semester</th>
<th>Mechanics</th>
<th>Engineering</th>
<th>Integrated studies</th>
<th>Geology</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th</td>
<td>Rock Engineering GEOS8032</td>
<td>Dissertation project GEOS8032</td>
<td>Seminars GEOS8033</td>
<td>15</td>
</tr>
<tr>
<td>3rd</td>
<td>Geotechnical Engineering GEOS8034</td>
<td>Professional practice GEOS8032</td>
<td>Dissertations GEOS8034</td>
<td>18</td>
</tr>
<tr>
<td>2nd</td>
<td>Structure GEOS8004</td>
<td>Site Investigation GEOS8020</td>
<td>Geologial Fieldwork GEOS8022</td>
<td>15</td>
</tr>
<tr>
<td>1st</td>
<td>Rock &amp; Soil Mechanics GEOS8004, GEOS8005, GEOS8006</td>
<td>Geology of HK GEOS8010</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>18</td>
<td>24</td>
<td>12</td>
<td>68 credits (for Geologists)</td>
</tr>
</tbody>
</table>

Description of Selected Courses (Provisional)
GEOS7010  Geology principles and practice (6 credits)
Course coordinator: Dr Samuel W P Ng (taught by Dr Ng and Dr Jean Wong)
A review of fundamental concepts in geosciences, including earth and geological processes, surface processes, minerals and rocks, and geological structures and geomap interpretation. The course also introduces the rocks and geological formations of Hong Kong.
Assessment: Course work (30%) and written examination (70%)

GEOS7011  Advanced geology of Hong Kong (6 credits)
Course coordinator: Dr Jason Ali (taught by Dr Ali and Professor Rod Sewell)
This advanced course examines specialist aspects of the rocks and geological formations and structures of Hong Kong and their significance in the context of geotechnical engineering, environmental management and resource development. Topics include volcanic and granitic rocks, sedimentary and metamorphic rocks, weathering processes, superficial deposits, geology and geological aspects of landslides.
Assessment: Course work (50%) and written examination (50%)

GEOS7012  Site investigation and engineering geological techniques (6 credits)
Course coordinator: Professor Philip Chung (taught by Professor Chung, Ir Kevin Styles, Mr Mark Wallace and Ir Stuart Miller)
A professional course on the concepts and skills used in geotechnical site investigation. Topics include the design of site investigations, desk study and walkover survey, aerial photographic interpretation, soil and rock description and classification, ground investigation technology and soil and rock laboratory testing.
Assessment: Course work (30%) and written examination (70%)

Study Load
To complete the MSc curriculum students are required to pass courses amounting to 66 or 69 credits. Learning hours will amount to approximately 1,440 or 1,500 hours, including about 360 hours for the Project, and contact hours will be about 400 or 415 hours. The 2-year part-time programme of studies imposes a heavy workload on a part-time student in a full-time job — an annual MSc workload of 720 hours is approximately forty percent of the number of working hours of a full-time job. Students are expected to work year-round and teaching is conducted during Reading Weeks and in the Summer Semester.
Assessment: Course work (30%) and written examination (70%)

GEOS7015 Rock mechanics (3 credits)
Course coordinator: Dr Louis N Y Wong (taught by Dr Wong and Ir Ivan Ho)
The course introduces the basic concepts of rock mechanics used in geotechnical practice. Topics include index properties, strength and deformability of intact rock; distribution and measurement of in-situ stresses; and shear strength of discontinuities in rock masses.
Assessment: Course work (30%) and written examination (70%)

GEOS7016 Soil mechanics (3 credits)
Course coordinator: Professor Philip Chung (taught by Professor Chung and Ir Florence Ko)
An examination of the basic soil mechanics theory used in geotechnical practice. The course reviews phase relationships, soil classification, compaction, fluid flow and effective stress concepts; and provides a more detailed analysis of elasticity, shear strength and consolidation.
Assessment: Course work (30%) and written examination (70%)

GEOS7020 Project Part I (6 credits)
Course coordinator: Professor Y C Chan
The first phase of an independent self-directed study of a problem in applied geosciences. It involves literature review, data collection and data analysis. Students are required to write a project plan and give a presentation on their proposed study. Work is required on the project during the summer following the second semester.
Assessment: Course work (100%)

GEOS7021 Geological fieldwork I (3 credits)
Course coordinator and teacher: Dr PY Tam
Self-directed study in the field over a 6-month period leading to the production of maps, field sheets, narrative accounts and other geological records for assessment. The fieldwork may be undertaken in association with the excursions of the Department of Earth Sciences, the local learned societies or independently. (Marked on a pass/fail basis.)
Assessment: Course work (100%)

GEOS7022 Course of directed studies (3 credits)
Course coordinator: Professor A W Malone
Studies to assist learning in the core courses, involving some of the following activities: professional activities, field work, laboratory work, internship, class exercises, tutorials and reading.
Assessment: course work (80%) and oral examination (20%)

GEOS7024 Management (3 credits)
Course coordinator: Professor Y C Chan (taught by Dr P L Ng)
This subject provides the graduate with basic knowledge of project management practice. It will cover most of the following: engineering processes, programming and procurement strategies; contract management; construction site safety, health and environmental aspects; quality control and quality assurance.
Assessment: Course work (30%) and written examination (70%)

GEOS7033 Geology of Hong Kong (6 credits)
Course coordinator: Dr Jean Wong (taught by Dr Wong and Dr M C Cheung)
To provide an understanding of the principal components of the geology of Hong Kong and its regional setting, including the distribution and interpretation of the main rock types, age relationships; and superficial deposits; and the locations and orientations of the main regional and local structures.
Assessment: Course work (50%) and written examination (50%)
Pre-requisite: GEOS7010

GEOS8001 Hydrogeology (3 credits)
Course coordinator and teacher: Professor J Jiao
To study the role of sub-surface water in engineering and environmental applications. Topics include the hydrologic cycle, properties of aquifers controlling the transmissivity, storage and quality of groundwater, quantification of groundwater flow, the field investigation of groundwater and assessment of field parameters and applications of hydrogeology in engineering and environmental studies.
Assessment: Course work (30%) and written examination (70%)

GEOS8002 Professional practice in applied geosciences (3 credits)
Course coordinator: Professor Y C Chan (taught by Professor Chan and Mr Barry Hoy)
An examination of issues in professional practice in applied geoscience; including regulation of practice, professional ethics and law, contracts and risk management.
Assessment: Course work (30%) and written examination (70%)

GEOS8003 Seminars on unforeseen ground conditions, geotechnical and environmental failures (3 credits)
Course coordinator: Professor A W Malone
A series of student-led seminars on case histories of landslides, collapses of engineering structures, excessive ground settlement and environmental disasters. Presentations of facts and opinions are given by students based on suggested reading material.
Assessment: Course work (100%)
Pre-requisite: GEOS8002

GEOS8020 Project Part II (12 credits)
Course coordinator: Professor Y C Chan
The second phase of an independent self-directed study of a problem in applied geosciences culminating in the preparation of a dissertation of about 10,000 words. Students will be required to make a presentation of their preliminary results.
Assessment: Course work (100%)

GEOS8021 Geological fieldwork II (3 credits)
Course coordinator: Dr Jess King
Self-directed study in the field over a 6-month period leading to the production of maps, field sheets, narrative accounts and other geological records for assessment. The fieldwork may be undertaken in association with the excursions of the Department of Earth Sciences, the local learned societies or independently. (Marked on a Pass/Fail basis.)
Assessment: Course work (100%)

GEOS8101 Engineering geology and geotechnical design (6 credits)
Course Coordinator: Professor Philip Chung (taught by Professor Chung and Dr Vickie Kong)
An examination of civil engineering design methodology and the application of soil mechanics theory and empiricism in geotechnical design. Emphasis is given to soil slopes and embankments, earth pressure and retaining structures; and shallow and deep foundations.
Assessment: Course work (30%) and written examination (70%)
Pre-requisite: GEOS7016

GEOS8102 Rock engineering and geomaterials (6 credits)
Course Coordinator: Dr Louis N Y Wong (taught by Dr Wong, Ir Roy Hung and Ir Ivan Chan)
This course starts with a brief introduction to the design methodology and the systems approach in rock engineering, and is mainly focused on the collection and analysis of engineering geological data for the design of rock structures. Uses of rock mechanics input and empirical classifications in analysis and design of rock slopes, tunnel excavation and support systems, and rock foundations are demonstrated through case histories.
Assessment: Course work (30%) and written examination (70%)
Pre-requisite: GEOS7015

GEOS8104 Natural hillside landslide and hazard studies (3 credits)
Course coordinator: Mr Jonathan Hart (taught by Mr Hart and Professor R P Martin)
The contents of this course will include most of the following topics: classification of landslides; Hong Kong terminology, examples of natural terrain landslides and documentary sources of information; hillside evolution, geomorphological principles (including the evolutionary landform models of Dalrymple and Hansen) and Quaternary geology of Hong Kong; hillslope hydrology, modes of groundwater flow, runoff and infiltration, piping; hydrological and morphological conditions for initiation of shallow landslides in regolith; engineering geological and geomorphological mapping; landform processes; regolith mapping, boulder identification; landslide hazard assessment; landslide susceptibility assessment for risk quantification; design event approach; landslide mobility modelling.
Assessment: Course work (30%) and written examination (70%)

GEOS8201 Geological fieldwork III (3 credits)
Course coordinator: Dr Jess King
Self-directed study in the field over a 6-month period leading to the production of maps, field sheets, narrative accounts and other geological records for assessment. The fieldwork may be undertaken in association with the excursions of the Department of Earth Sciences, the local learned societies or independently. (Marked on a Pass/Fail basis.)
Assessment: Course work (100%)

GEOS8203 Engineering geology and geotechnical design (6 credits)
Course Coordinator: Professor Philip Chung (taught by Professor Chung and Dr Vickie Kong)
An examination of civil engineering design methodology and the application of soil mechanics theory and empiricism in geotechnical design. Emphasis is given to soil slopes and embankments, earth pressure and retaining structures; and shallow and deep foundations.
Assessment: Course work (30%) and written examination (70%)
Pre-requisite: GEOS7016

GEOS8204 Basic structural mechanics and behaviour (3 credits)
Course coordinator and teacher: Ir Philip C T Kwok
The subject will cover most of the following topics: Behaviour of structural members subjected to tension, compression, bending, shear and torsion. Buckling of compression members. Statically determinate and indeterminate structures; including the concept of redundancy of structural members. Load transfer mechanisms of structural systems including foundations and shoring systems. General behaviour and basic concepts in design of reinforced concrete members. Structural design of foundations and retaining walls.
Assessment: Course work (30%) and written examination (70%)
GEOS8205 Mathematics I (6 credits)
Course coordinator and teacher: Dr F L Tsang
This course (together with GEOS8206 Mathematics II) strives to provide a comprehensive introduction to the fundamental mathematics that all earth scientists need. Topics include the language of sets, the concept of matrices and its applications, functions, limits, first order differentiation, applications of derivatives, first order Taylor’s expansion, properties of exponential and logarithmic functions, the notation of integration, integration techniques, volume of revolution, higher order differentiation and Taylor’s expansion, Hessian test for functions of two variables, the concept of multiple integration, and volume using triple integration.
Assessment: Course work (30%) and written examination (70%)

GEOS8206 Mathematics II (6 credits)
Course coordinator and teacher: Dr F L Tsang
This course is a continuation of GEOS8205 (Mathematics I). The first part of the course aims to teach students different solution methods to first order differential equations (separable, linear, Bernoulli, exact/nonexact types), second order linear differential equations with constant coefficients using characteristic equation, method of variation of parameters, method of educated guess. The second part introduces the concept of probability and statistics, topics include counting, probability (using the language of sets), random variables (including Binomial, Poisson, Exponential, Normal), probability density/distribution functions, cumulative distribution functions, joint distributions, independence, mean, variance, covariance, moment generating functions, sampling and confidence intervals (using Normal/t- distributions).
Assessment: Course work (30%) and written examination (70%)