

## **REGULATIONS FOR THE DEGREE OF MASTER OF SCIENCE (MSc)**

*These regulations apply to students admitted in the academic year 2009-2010 and thereafter.*

*(See also General Regulations)*

Any publication based on work approved for a higher degree should contain a reference to the effect that the work was submitted to the University of Hong Kong for the award of the degree.

The degree of Master of Science is a postgraduate degree awarded for the satisfactory completion of a prescribed course of study in one of the following four fields: Applied Geosciences, Food Industry: Management and Marketing, Food Safety and Toxicology, and Materials Science.

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### **Admission requirements**

**Sc20** To be eligible for admission to the courses leading to the degree of Master of Science, a candidate

- (a) shall comply with the General Regulations; and
  - (b) shall hold (i) a Bachelor's degree with honours of this University; or  
(ii) another qualification of equivalent standard of this University or another University or comparable institution accepted for this purpose.
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**Sc21** A candidate who does not hold a Bachelor's degree with honours of this University or another qualification of equivalent standard may in exceptional circumstances be permitted to register if the candidate can demonstrate adequate preparation for studies at this level and satisfies the examiners in a qualifying examination.

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### **Qualifying examination**

**Sc22**

- (a) A qualifying examination may be set to test the candidate's academic ability or his/her ability to follow the courses of study prescribed. It shall consist of one or more written papers or their equivalent and may include a project report.
  - (b) A candidate who is required to satisfy the examiners in a qualifying examination shall not be permitted to register until he/she has satisfied the examiners in the examination.
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### **Award of degree**

**Sc23** To be eligible for the award of the degree of Master of Science, a candidate

- (a) shall comply with the General Regulations; and
  - (b) shall complete the curriculum and satisfy the examiners in accordance with the regulations set out below.
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### **Length of curriculum**

**Sc24** The curriculum of the part-time programme shall extend over not less than two academic years of part-time study and of the full-time programme over not less than one academic year. Candidates shall not be permitted to complete the curriculum in more than 3 academic years, except with the approval of the Faculty Board.

## Completion of curriculum

- Sc25** To complete the curriculum, a candidate
- (a) shall follow courses of instruction and complete satisfactorily all prescribed written, practical and field work;
  - (b) shall complete and present a satisfactory dissertation or project on a subject within the candidate's approved field of study or complete courses with equivalent units as a replacement; and
  - (c) shall satisfy the examiners in all prescribed written papers and in any prescribed oral or practical examination.
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## Title of dissertation or project

**Sc26** The title of the dissertation or project shall, for the part-time programme, be submitted for approval by March 15 of the first year of study in which the teaching programme ends and the dissertation or project report shall be submitted not later than April 15 of the second year of study. The title of the dissertation or project shall, for the full-time programme, be submitted for approval by October 15 and the dissertation or project report shall be submitted not later than August 15 in the subsequent year. The candidate shall submit a statement that the dissertation or project represents his/her own work (or in the case of co-joint work, a statement countersigned by his/her co-worker, which shows his/her share of the work) undertaken after registration as a candidate for the degree.

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## Examinations

**Sc27** An assessment of the candidate's coursework during his/her studies, including completion of written assignments and participation in field work or laboratory work, as the case may be, is taken into account in determining the candidate's result in each course.

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**Sc28** A candidate who has failed to satisfy the examiners at his/her first attempt in courses totalling not more than half of the number of credits of courses in the examination held during any of the academic years of study may be permitted to present himself/herself for re-examination in the course or courses at a specified subsequent examination, with or without repeating any part of the curriculum.

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**Sc29** A candidate who is re-examined in any course shall not be eligible for the award of more than a pass grade in that paper.

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**Sc30** A candidate who has failed to present a satisfactory dissertation or project report may be permitted to submit a new or revised dissertation or project report within a specified period.

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**Sc31** A candidate who has failed to satisfy the examiners in any prescribed fieldwork or practical work may be permitted to present himself/herself for re-examination in fieldwork or practical work within a specified period.

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**Sc32** Failure to take the examination as scheduled, normally results in automatic course failure. A candidate who is unable because of illness to be present at any examination of a course, may apply for permission to be present at some other time. Any such application shall be made on the form prescribed within two weeks of the examination.

**Sc33** A candidate who

- (a) has failed to satisfy the examiners in more than half the number of credits of courses in any to be examined during any of the academic years, or in any course at a repeated attempt; or
  - (b) is not permitted to submit a new or revised dissertation or project report; or
  - (c) has failed to satisfy the examiners in their dissertation or project report at a second attempt;
- may be recommended for discontinuation of studies.
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### **Examination results**

**Sc34** At the conclusion of the examination, a pass list shall be published. A candidate who has shown exceptional merit at the whole examination may be awarded a mark of distinction, and this mark shall be recorded in the candidate's degree diploma.

## SYLLABUSES FOR THE DEGREE OF MASTER OF SCIENCE IN THE FIELD OF APPLIED GEOSCIENCES<sup>1</sup>

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### A. COURSE STRUCTURE

To be eligible for the award of the MSc in the field of Applied Geosciences a student shall complete all core courses prescribed in a selected theme, and elective courses totaling 66 credits.

### SIX THEME OPTIONS

#### **ENGINEERING GEOLOGY THEME**

##### Core Courses

GEOS7010/GEOS7023	* Geology Principles and Practice (6 credits)/Geology for Geotourism (6 credits)
GEOS7011	Advanced Geology of Hong Kong (6 credits)
GEOS7012	Site Investigation and Engineering Geological Techniques (6 credits)
GEOS7015	Rock Mechanics (3 credits)
GEOS7016	Soil Mechanics (3 credits)
GEOS7020	Project I (3 credits)
GEOS7021	Geological Fieldwork I (3 credits)
GEOS8001	Hydrogeology (3 credits)
GEOS8002	Professional Practice in Applied Geosciences (3 credits)
GEOS8003	Seminars on Unforeseen Ground Conditions, Geotechnical and Environmental Failures (3 credits)
GEOS8005	Field Testing and Instrumentation in Engineering Geology 3 credits)
GEOS8020	Project II (9 credits)
GEOS8101	Engineering Geology and Geotechnical Design (6 credits)
GEOS8102	Rock Engineering and Geomaterials (6 credits)

\* Graduates in Earth Sciences cannot take this as a core course. They can take another 6 credits from elective course(s) in its place.

#### **ENGINEERING GEOLOGY WITH HKIE APPROVED COURSES THEME**

##### Core Courses

GEOS7012	Site Investigation and Engineering Geological Techniques (6 credits)
GEOS7015	Rock Mechanics (3 credits)
GEOS7016	Soil Mechanics (3 credits)
GEOS7020	Project I (3 credits)
GEOS7024	Management (3 credits)
GEOS8001	Hydrogeology (3 credits)
GEOS8002	Professional Practice in Applied Geosciences (3 credits)
GEOS8003	Seminars on Unforeseen Ground Conditions, Geotechnical and Environmental Failures (3 credits)
GEOS8005	Field Testing and Instrumentation in Engineering Geology (3 credits)
GEOS8020	Project II (9 credits)
GEOS8101	Engineering Geology and Geotechnical Design (6 credits)
GEOS8102	Rock Engineering and Geomaterials (6 credits)
GEOS8204	Basic Structural Mechanics and Behaviour (3 credits)
GEOS8205	Mathematics I (6 credits)
GEOS8206	Mathematics II (6 credits)

#### **ENVIRONMENTAL GEOLOGY THEME**

##### Core Courses

GEOS7004	Earth Science and Environmental Management (3 credits)
GEOS7010/GEOS7023	* Geology Principles and Practice (6 credits)/Geology for Geotourism (6 credits)
GEOS7011	Advanced Geology of Hong Kong (6 credits)

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<sup>1</sup> For students admitted in 2009-2010 or thereafter.

GEOS7012	Site Investigation and Engineering Geological Techniques (6 credits)
GEOS7020	Project I (3 credits)
GEOS7021	Geological Fieldwork I (3 credits)
GEOS8002	Professional Practice in Applied Geosciences (3 credits)
GEOS8003	Seminars on Unforeseen Ground Conditions, Geotechnical and Environmental Failures (3 credits)
GEOS8020	Project II (9 credits)
GEOS8201	Applied Geochemistry (3 credits)

\* Graduates in Earth Sciences cannot take this as a core course. They can take another 6 credits from elective course(s) in its place.

#### ***GEOSCIENCES WITH SUSTAINABLE DEVELOPMENT THEME***

##### Core Courses

GEOS7004	Earth Science and Environmental Management (3 credits)
GEOS7010/GEOS7023	* Geology Principles and Practice (6 credits)/Geology for Geotourism (6 credits)
GEOS7011	Advanced Geology of Hong Kong (6 credits)
GEOS7012	Site Investigation and Engineering Geological Techniques (6 credits)
GEOS7020	Project I (3 credits)
GEOS7021	Geological Fieldwork I (3 credits)
GEOS8002	Professional Practice in Applied Geosciences (3 credits)
GEOS8003	Seminars on Unforeseen Ground Conditions, Geotechnical and Environmental Failures (3 credits)
GEOS8020	Project II (9 credits)
ENVM7013	Principles of Sustainable Development (3 credits)
ENVM7016	Environmental Policy (3 credits)
ENVM7017	Environmental law in Hong Kong (3 credits)

\* Graduates in Earth Sciences cannot take this as a core course. They can take another 6 credits from elective course(s) in its place.

#### ***CLIMATE AND EARTH SCIENCES STUDIES THEME***

##### Core Courses

GEOS7010/GEOS7023	* Geology Principles and Practice (6 credits)/Geology for Geotourism (6 credits)
GEOS7011	Advanced Geology of Hong Kong (6 credits)
GEOS7020	Project I (3 credits)
GEOS7021	Geological Fieldwork I (3 credits)
GEOS8002	Professional Practice in Applied Geosciences (3 credits)
GEOS8003	Seminars on Unforeseen Ground Conditions, Geotechnical and Environmental Failures (3 credits)
GEOS8020	Project II (9 credits)
GEOS8027	Global Climate (6 credits)
GEOS8208	Climate Change and the Environment (6 credits)
GEOS8209	Climate Change and Society (6 credits)

\* Graduates in Earth Sciences cannot take this as a core course. They can take another 6 credits from elective course(s) in its place.

#### ***GENERAL APPLIED GEOSCIENCES THEME***

##### Core Courses

GEOS7004	Earth Science and Environmental Management (3 credits)
GEOS7010/GEOS7023	* Geology Principles and Practice (6 credits)/Geology for Geotourism (6 credits)
GEOS7011	Advanced Geology of Hong Kong (6 credits)
GEOS7012	Site Investigation and Engineering Geological Techniques (6 credits)
GEOS7020	Project I (3 credits)
GEOS7021	Geological Fieldwork I (3 credits)
GEOS8002	Professional Practice in Applied Geosciences (3 credits)
GEOS8003	Seminars on Unforeseen Ground Conditions, Geotechnical and Environmental Failures (3 credits)
GEOS8020	Project II (9 credits)

\* Graduates in Earth Sciences cannot take this as a core course. They can take another 6 credits from elective course(s) in its place.

**Core and Elective Courses for the Six Themes**

GEOS7004	Earth Science and Environmental Management (3 credits)
GEOS7010	Geology Principles and Practice (6 credits)
GEOS7011	Advanced Geology of Hong Kong (6 credits)
GEOS7012	Site Investigation and Engineering Geological Techniques (6 credits)
GEOS7015	Rock Mechanics (3 credits)
GEOS7016	Soil Mechanics (3 credits)
GEOS7020	Project I (3 credits)
GEOS7021	Geological Fieldwork I (3 credits)
GEOS7022	Course of Directed Studies (3 credits)
GEOS7023	Geology for Geotourism (6 credits)
GEOS7024	Management (3 credits)
GEOS7025	Geological Fieldwork for Geotourism (6 credits)
GEOS7027	Earth Systems (6 credits)
GEOS7028	Foundation Course in Earth Sciences (6 credits)
GEOS7029	Earth's climate past and future (3 credits)
GEOS7030	Earth, environment and society (6 credits)
GEOS7031	Earth through time (6 credits)
GEOS7032	Introduction to atmosphere and oceans (3 credits)
GEOS8001	Hydrogeology (3 credits)
GEOS8002	Professional Practice in Applied Geosciences (3 credits)
GEOS8003	Seminars on Unforeseen Ground Conditions, Geotechnical and Environmental Failures (3 credits)
GEOS8005	Field Testing and Instrumentation in Engineering Geology (3 credits)
GEOS8020	Project II (9 credits)
GEOS8021	Geological Fieldwork II (3 credits)
GEOS8101	Engineering Geology and Geotechnical Design (6 credits)
GEOS8102	Rock Engineering and Geomaterials (6 credits)
GEOS8103	Applied Geosciences for the Developing World (3 credits)
GEOS8104	Natural Terrain Landslide Studies (3 credits)
GEOS8201	Applied Geochemistry (3 credits)
GEOS8203	Geohazards (3 credits)
GEOS8204	Basic Structural Mechanics and Behaviour (3 credits)
GEOS8205	Mathematics I (6 credits)
GEOS8206	Mathematics II (6 credits)
GEOS8207	Global Climate (6 credits)
GEOS8208	Climate Change and the Environment (6 credits)
GEOS8209	Climate Change and Society (6 credits)
GEOS8213	Global Tectonics (6 credits)
GEOS8216	Physical Oceanography (6 credits)
GEOS8217	Introduction to Climatology (3 credits)
GEOS8218	Meteorology (6 credits)
GEOS8219	Igneous and metamorphic petrology (6 credits)
GEOS8220	Mineralogy and geochemistry (6 credits)
GEOG7220	Environmental Mapping and Risk Assessment (3 credits)
EASC2201	Hydrogeology (6 credits)
EASC6004	Geology of Asia-Pacific and Hong Kong (6 credits)
EASC6005	Special Topics in Applied Geosciences (6 credits)
ENVM7012	Environmental Economics and Analysis (3 credits)
ENVM7013	Principles of Sustainable Development (3 credits)
ENVM7016	Environmental policy (3 credits)
ENVM7017	Environmental law in Hong Kong (3 credits)
ENVM8006	Environmental Impact Assessment (3 credits)
ENVM8011	Environmental Auditing and Reporting (3 credits)
ENVM8012	Environmental Risk Assessment (3 credits)

Certain courses not included in the list above may be accepted as alternative electives at the discretion of the programme director. Timetabling of courses may limit availability of some elective courses.

Students following the one year full-time programme will generally follow the same curriculum (66 credits) as the part-time programme, the course GEOS7022 Course of Directed Studies (3 credits) must be taken within the 66 credits.

**B. COURSE CONTENTS (Provisional)****GEOS7004 Earth Science and Environmental Management (3 credits)**

The course examines major issues of earth science of relevance to environmental management. Case studies relevant to coastal cities will be presented. Topics include chemical composition of earth materials, geochemical surveys for pollution monitoring, geology and human health, environmental change in the Quaternary Period, fluvial and coastal processes and management, environmental impact of mining and dredging, geological aspects of land use planning, water resource management and waste disposal.

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**GEOS7010 Geology Principles and Practice (6 credits)**

A review of fundamental concepts in geoscience, including earth and geological processes, surface processes, minerals and rocks, geological structures and geological map interpretation. The course also introduces the rocks and geological formations of Hong Kong.

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**GEOS7011 Advanced Geology of Hong Kong (6 credits)**

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.

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**GEOS7012 Site Investigation and Engineering Geological Techniques (6 credits)**

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.

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**GEOS7015 Rock Mechanics (3 credits)**

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.

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**GEOS7016 Soil Mechanics (3 credits)**

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.

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**GEOS7020 Project I (3 credits)**

The first phase of an independent study of a problem in applied geosciences. It involves literature review, data collection and data analysis. Students are required to write an inception report and give a presentation on their proposed study. Work is required on the project during the summer following the second semester. Professional geologists are expected to undertake a field mapping task as part of their project.

**GEOS7021 Geological Fieldwork I (3 credits)**

Self-directed study in the field over a 12-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.)

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**GEOS7022 Course of Directed Studies (3 credits)**

Full-time students will take a course of Directed Studies that will be decided individually by the course directors. The course will include field work, laboratory work, class exercises, tutorials and reading in support of the core courses of the programme.

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**GEOS7023 Geology for Geotourism (6 credits)**

This will be a joint course with GEOS7010 Geology Principles and Practice (6 credits).

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**GEOS7024 Management (3 credits)**

This subject will cover most of the following. Engineering processes, programming and procurement strategies: project framework, common methods for obtaining investigation, design and construction services, project programming. Contract management: Engineer's and contractor's site organisation, common forms of contract, specifications, methods of measurement, quantities and cost estimation, variations and claims, approaches to dispute resolution. Construction site safety, health and environmental aspects: Relevant regulations, environmental impacts of works and mitigation strategies. Quality control and quality assurance.

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**GEOS7025 Geological Fieldwork for Geotourism (6 credits)**

This will be a joint course with GEOS7021 and GEOS8021 Geological Fieldwork I and II (6 credits).

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**GEOS7027 Earth Systems (6 credits)**

To provide an appreciation of the Earth System and the interfaces between its component parts, in order that students might appreciate how informed decisions can be made on the future exploitation and preservation of the planet. To provide a forum for discussion of global issues facing earth scientists.

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**GEOS7028 Foundation Course in Earth Sciences (6 credits)**

The course, intended for students taking their first course in earth science, provides a basic overview of the earth's structure, material and internal and external processes.

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**GEOS7029 Earth's climate past and future (3 credits)**

An introduction to the study of climate change in the geological record. We look at research methods used in paleoclimatic and paeoenvironmental reconstruction and discuss how such information can be used to model possible climate trends, such as global warming.



**GEOS7030 Earth, environment and society (6 credits)**

An introduction to global environment and issues and how the environment affects the well-being of a society. The course will cover natural and anthropogenic causes of environmental changes, climate change, biochemical cycles, fossil fuel and alternative energies, air water & solid wastes and issues in land use planning.

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**GEOS7031 Earth through time (6 credits)**

The course aims to introduce the concepts of geological time and uniformitarianism. It will provide an understanding of the fossil record and the integration of earth systems and plate tectonics. Students will gain an appreciation of our place in the Universe and an understanding of the evolution of Earth and of life on Earth through time.

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**GEOS7032 Introduction to atmosphere and oceans (3 credits)**

The course will introduce the physical structure of the oceans and the atmosphere and explain their interaction and its significance for surface meteorology and global climate change. The role of humans on global systems will be identified and discussed.

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**GEOS8001 Hydrogeology (3 credits)**

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.

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**GEOS8002 Professional Practice in Applied Geosciences (3 credits)**

An examination of issues in professional practice in applied geoscience, including regulation of practice, professional ethics and law, contracts, and risk, and safety management.

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**GEOS8003 Seminars on Unforeseen Ground Conditions, Geotechnical and Environmental Failures (3 credits)**

A series of student-led seminars on case histories of landslides, collapses of engineering structures, excessive settlement and environmental disasters. Presentations of facts and opinions are given by students based on suggested reading material. Some of the seminars are facilitated by experts who were involved in the case.

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**GEOS8005 Field Testing and Instrumentation in Engineering Geology (3 credits)**

The course introduces several commonly used geophysical methods and in-situ testing techniques, including penetration tests, seismic cones, land geophysical surveys such as seismic refraction, microgravity, magnetic and conductivity surveys, ground penetrating radar, electrical imaging and downhole geophysical logging, and marine geophysics such as seismic and side-scan sonar surveys.

**GEOS8020 Project II (9 credits)**

The second phase of an independent study of a problem in applied geosciences culminating in the preparation of a project report of about 8000 words. Students will be required to make a presentation of their preliminary results.

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**GEOS8021 Geological Fieldwork II (3 credits)**

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 pass/fail basis.)

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**GEOS8101 Engineering Geology and Geotechnical Design (6 credits)**

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, marine reclamations, earth pressure and retaining structures and piled foundations.

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**GEOS8102 Rock Engineering and Geomaterials (6 credits)**

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 analyses 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.

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**GEOS8103 Applied Geoscience for the Developing World (3 credits)**

Selected topics of relevance in developing countries of Asia, including geotechnics for irrigation systems, low-cost roads in high mountains, road building materials, low-cost geo-fabrics, aseismic construction.

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**GEOS8104 Natural Terrain Landslide Studies (3 credits)**

Classification of landslides. Hong Kong terminology, examples of natural terrain landslides and documentary sources of information. Hillslope evolution - geomorphological principles and Quaternary geology of Hong Kong. Hillslope hydrology – modes of groundwater flow, runoff and infiltration, piping; hydrological & morphological conditions for initiation of shallow landslides in regolith. Rainfall and landsliding. Engineering geological / geomorphological mapping: landform processes, regolith mapping, boulder identification, landslide hazard assessment. Landslide susceptibility assessment for risk quantification. Design event approach. Landslide mobility modelling.

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**GEOS8201 Applied Geochemistry (3 credits)**

Principles and hands-on experience of analytical techniques including nebulization ICP-MS, XRF and XRD; Basics of Environmental Geochemistry, Chemical Weathering, Clay Mineralogy, and Aqueous Geochemistry; Applications of Geochemistry to environmental problems; Case Studies, with an emphasis on Hong Kong.

**GEOS8203 Geohazards (3 credits)**

A review of the science relating to various natural hazards (flooding, landslides, seismic, volcanic) and the approaches to safety management.

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**GEOS8204 Basic Structural Mechanics and Behaviour (3 credits)**

The subject will cover most of the following:

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.

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**GEOS8205 Mathematics I (6 credits)**

This course will cover the following topics: elementary and advanced calculus, matrix and vector algebra.

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**GEOS8206 Mathematics II (6 credits)**

This course will cover the following topics: ordinary and partial differential equations, introduction to probability and statistics.

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**GEOS8207 Global Climate (6 credits)**

Processes in the oceans and atmosphere. Heating the system, development of ocean currents, winds, clouds, and resources. Effects of coupling, climate change, pollution. Atmospheric structure and composition, Global ocean and atmospheric circulation patterns, El Niño-La Niña and case studies of ocean-atmosphere feedbacks, formation of winds, storms and ocean currents.

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**GEOS8208 Climate Change and the Environment (6 credits)**

The Quaternary Period comprises the last 2.6 million years of Earth history, an interval dominated by climate fluctuations and the waxing and waning of large northern hemisphere ice sheets. This course will cover the many types of evidence used to reconstruct ocean and atmospheric conditions through the Quaternary.

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**GEOS8209 Climate Change and Society (6 credits)**

This course will explore the role of humans in global change and the environmental responses to such changes. It will also take a look at human evolution and migration from a paleoenvironmental perspective.

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**GEOS8213 Global Tectonics (6 credits)**

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.

**GEOS8216 Physical Oceanography (6 credits)**

To investigate oceans and their dynamics and the processes, which have shaped them. Ocean composition and movement, waves, tides, beaches, interactions with the atmosphere and human exploitation of the non-living resources, and to demonstrate how various physical elements of the marine environment interrelate to help form the complex system we know as the world's oceans.

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**GEOS8217 Introduction to Climatology (3 credits)**

The course provides a basic overview of the earth's global weather system, processes that control the temporal and spatial variations in earth's climate. Students are expected to be able to identify major aspects of climatology and approaches to climatological study, explain the factors and physical processes controlling climate system, read synoptic charts and explain reasons for particular climatic conditions, understand the factors at work to modify micro-climates, especially of Hong Kong, and appraise the complexity of climate-related issues and the difficulty in discerning natural and human-induced global climatic changes.

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**GEOS8218 Meteorology (6 credits)**

The course is a survey of the earth's atmospheric structure and its behaviour, instrumental observation, application of remote sensing to meteorological studies, weather elements and weather systems.

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**GEOS8219 Igneous and metamorphic petrology (6 credits)**

The course provides a comprehensive treatment of the principles and techniques used in the study of igneous and metamorphic rocks and rock-forming processes. It covers petrogenesis, magmas and magmatic differentiation, igneous petrography, intrusive and extrusive rock suites, metamorphic processes & reactions and metamorphic facies and metamorphic petrography.

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**GEOS8220 Mineralogy and geochemistry (6 credits)**

The course provides students with an appreciation of mineralogical principles as a basis for understanding the petrography of igneous, sedimentary and metamorphic rocks. Its contents include the properties of minerals in hand specimen and thin section, the optical properties of minerals and the polarizing microscope and the characteristics of the major rock-forming minerals.

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**GEOG7220 Environmental Mapping and Risk Assessment (3 credits)**

The integration of digital terrain modelling with spatial and statistical analysis makes GIS a powerful tool for environmental mapping and risk assessment. Landslide, for example, has been a widespread phenomenon in Hong Kong that hampers development into hilly regions prone to frequent landslide occurrences. The ability to map areas that are more risky than others is therefore important in hazard mitigation as well as land development planning.

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**EASC2201 Hydrogeology (6 credits)**

The hydrological cycle, properties of aquifers, groundwater flow, groundwater as a chemical agent, groundwater geology, groundwater and environmental management, groundwater as a resource, groundwater as a geotechnical and environmental problem.

**EASC6004 Geology of Asia-Pacific and Hong Kong (6 credits)**

This course aims to provide an overview of the regional geology and tectonic evolution of East-SE Asia including keys aspects of Hong Kong's geology.

Topics include: Tools used in unraveling plate tectonic development of the region; assembly of China; origin of the Chinese blocks (Rodinia versus Gondwana models); SE China in the Cretaceous and Cenozoic; Hong Kong's igneous rocks; sedimentary rocks; deep and shallow structure; active tectonic systems of the western Pacific-SE Asia; India-Asia collision; Tibet; Taiwan.

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**EASC6005 Special Topics in Applied Geosciences (6 credits)**

This course aims to provide in depth knowledge of selected special topics in applied geosciences, including engineering and environmental geology, hydrogeology, engineering geophysics and Quaternary geology.

Directed studies in a focused field of research recommended by the research group/supervisor, and writing of review reports and critiques.

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**ENVM7012 Environmental Economics and Analysis (3 credits)**

The aim of this course is to equip students with the ability to undertake an economic analysis of the environment. It will examine the environment in the context of the market mechanism and policies for improving environmental performance. There will be an emphasis on market failure and strategies for internalizing the external costs of environmental damage. A good deal of attention will be paid to cost-benefit analysis and methodologies for the valuation of the environment. There will also be a consideration of alternative policy instruments from an economic perspective. The aim is also to examine means of managing resources in a way that is both economically and environmentally efficient.

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**ENVM7013 Principles of Sustainable Development (3 credits)**

This course examines the emergence of the sustainable development paradigm and its role in guiding the design of environmental policy. The concept of sustainable development is discussed in its historical context while alternative formulations and interpretations are reviewed. The relationships between sustainable development and other emerging bodies of theory and practice, such as ecological modernization, are also examined. The course reviews how policies for enhanced sustainability can be develop and implemented at the urban, regional and international levels. These issues will be demonstrated in the context of Hong Kong, China and countries elsewhere in the world.

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**ENVM7016 Environmental Policy (3 credits)**

This course focuses on processes of environmental policy making: how policy agendas emerge and evolve, the drivers and barriers influencing policy development, institutional structures for environmental policy making, stakeholder engagement, and the implementation of environmental policy. Theories of policy making are explored in relation to the environment and sustainable development. Environmental policy making systems and outcomes are reviewed through local and international case studies.

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**ENVM7017 Environmental law in Hong Kong (3 credits)**

This course will focus on the statutory interpretation of the four principal Ordinances and subsidiary legislation dealing with pollution in Hong Kong; namely the Water Pollution Control Ordinance, the Air Pollution Control Ordinance, the Noise Control Ordinance and the Waste Disposal Ordinance. Some

consideration will also be given to the Dumping at Sea Ordinance, the Radiation Ordinance, the Merchant Shipping (Prevention and Control of Pollution) Ordinance, the Environmental Impact Assessment Ordinance, the Ozone Layer Protection Ordinance and international conventions effecting the law. Students will study the nature of environmental offences, including the requirement for proving “*mens rea*” (intent) in order for certain offences to be successfully prosecuted. Students will also be introduced to the principles of judge made law (the Common Law) and will learn to read and interpret relevant case law in order to better understand the current sentencing policies towards environmental offenders, both locally and in other Common Law jurisdictions.

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#### **ENVM8006 Environmental Impact Assessment (3 credits)**

Environmental impact assessment (EIA) is one of the most important contemporary instruments of environmental management. Used widely around the world to identify the impacts of development projects as well as strategic plans and policies, EIA plays a key role in many regulatory systems for the environment. This course reviews the development of different approaches to EIA, basic analytical principles, administrative systems for EIA, assessments at the project and strategic levels (SIA), and case study applications in Hong Kong.

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#### **ENVM8011 Environmental Auditing and Reporting (3 credits)**

This course is dedicated to the construction of an integrated environmental management system (EMS). The course will consider the design of the system, its implementation and issues of continuous improvement. Environmental auditing will be dealt with in the context of the systems-based approach and will examine audit methodology, measurement and quality assurance. The approach will be extended to the auditing of supply chains (particularly in China). Emphasis will be placed on practical approaches to improving environmental performance over time. Methods and techniques of reporting on systems and auditing will include both environmental reports as well as social and sustainable development reporting.

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#### **ENVM8012 Environmental Risk Assessment (3 credits)**

Environmental risk assessments (ERAs) are a tool to determine the likelihood that contaminant releases, either past, current, or future, pose an unacceptable risk to human health or the environment. Currently, ERAs are required under various regulations in many developed countries so as to support decision-makers in risk characterization or the selection of cost-effective remedial cleanup. This course will introduce the theory and practice of human and ecological risk assessments. Students completing the course will gain a sound knowledge of the concepts and principles of ERAs, management and communication as applied in practice; understand the basic risk assessment tools (i.e. prospective, retrospective and tiered approaches) to environmental risk management; be able to select and apply the simpler tools to tackle risk issues; and appreciate the interpretations of risk and its role in environmental policy formulation and decision making.

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## **SYLLABUSES FOR THE DEGREE OF MASTER OF SCIENCE IN THE FIELD OF FOOD INDUSTRY: MANAGEMENT AND MARKETING**

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### **A. COURSE STRUCTURE (Provisional)**

All courses in this programme are compulsory. A candidate shall be examined shortly after the completion of each course.

The list of courses, and their contents set out thereafter, may be changed from time to time.

**First Year**

FOOD7001	Quality assurance and management (6 credits)
FOOD7002	GMP and environmental management (6 credits)
FOOD7003	Food quality preservation and evaluation (6 credits)
FOOD7004	HACCP and food laws (6 credits)
FOOD7005	R&D and export market strategies (9 credits)

**Second Year**

FOOD8006	Marketing management (6 credits)
FOOD8007	Financial control (6 credits)
FOOD8008	Organisational behaviour (6 credits)
FOOD8009	Project (15 credits)

Total: 66 credits

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**B. COURSE CONTENTS (Provisional)****FOOD7001 Quality assurance and management (6 credits)**

An overview on quality management will be presented. Case studies will be used to generate in-depth discussion on relevant topics.

The management of food laboratories will also be described, with a review of the modes of infectious disease transmission followed by discussion on microbial and other contaminants of relevance to South East Asia. Standard assays as well as newer methods will be covered. Guidelines of the Department of Health on acceptable limits and routine inspection procedures will be discussed.

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**FOOD7002 GMP and environmental management (6 credits)**

Good manufacturing practice has a significant impact on the daily operation of a food processing facility. Quality products and a safe work place are important components of a good company. This course will focus on issues arising from GMP and aspects of the physical design of a food processing facility which impact the safety of workers and products. There will be emphases on the sources of contamination, sanitation techniques for production site and personnel, pest control, and contingency plan for the production line. Quality assurance and HACCP will be discussed as well.

Proper handling of waste is closely related to the issue of food safety and in a broader context it has an eventual impact on the environment. This course will cover waste treatment and disposal, environmental impact assessment, operational procedures to implement ISO 14000, and laws and regulations on pollution control enforced by the Hong Kong Environmental Protection Department.

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**FOOD7003 Food quality preservation and evaluation (6 credits)**

The effects of processing and packaging on the physical and chemical characteristics of food products will be discussed. Emphasis will be placed on the freezing technology of marine products and frozen dim sums. Analytical methods for sensitive nutrients and techniques to preserve the characteristic aroma and taste of a product in processing modification will be reviewed. Issues related to nutrient enrichment and fortification will be discussed.

Sensory evaluation as an important component of food product development and marketing will be covered. Various evaluation methods and analytical techniques will be discussed in a case study setting.

**FOOD7004 HACCP and food laws (6 credits)**

As a core quality management tool in the food industry, the relevance, impact and use of HACCP in manufacturing and catering will be discussed. Topics covered will include the integration of HACCP and ISO 9000 as well as the practical implementation of HACCP using Asian case studies.

The course will provide student with a proper perspective on local, Chinese and international food laws and regulations. Familiarisation with international agencies such as the Codex Alimentarius Commission. Issues related to food inspection, food additives, and contaminants as well as the concept of and procedural details in attaining ISO registration will be discussed.

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**FOOD7005 R&D and export market strategies (9 credits)**

The role of research from the management perspective, the R & D process and the impact of technological innovation on the development of new products will be discussed.

Cultural aspects will be emphasized as an important consideration in developing new market frontiers. The strengths and weaknesses of major “Chinese food” manufacturers will be analyzed. Areas of potentials will be identified and explored.

Basic concepts of intellectual property rights will also be described in this course: copyright, trademarks, trade secrets, patents. Patent strategy for research-intensive technology companies. Practical aspects and international considerations in filing for patent protection.

The application of information technology in food manufacturing and catering will be discussed.

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**FOOD8006 Marketing management (6 credits)**

The course is designed to provide an understanding of the role of marketing in the business organization and its contribution to business success. Students will be taught in an applications oriented framework to become familiar with the various marketing concepts, marketing programs and planning and control of marketing strategies. On completion of the course students will be able to analyze customer requirements, the competitive environment and to formulate effective marketing program. Perspectives of local food manufacturers will be introduced through special seminars.

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**FOOD8007 Financial control (6 credits)**

The course aims to equip non-accounting professionals with the skills required to analyse and interpret the major financial reports prepared by businesses. The focus of the course is on providing a user perspective of the financial statements rather than on specific preparation concepts. In addition, the course addresses principles of basic financial management and explains the need for internal control procedures. Particular emphasis is given to developing an understanding of the balance sheet, profit and loss statement, and cash flow statement. The relationship between the statements will be explained and illustrated in detail. A framework for making business decisions by analysing a set of financial statements using simple techniques will also be developed.

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**FOOD8008 Organisational behaviour (6 credits)**

The course aims to equip students with a better understanding of the complex array of behaviours in organisational life. It will analyse the determinants of human behaviour in an organisation at the individual, group and organisational levels. Topics covered will include motivation, performance management, group dynamics, leadership, organisational culture, management of conflict, management ethics, and the management of change.



**FOOD8009 Project (15 credits)**

This is an individual or group research project to be carried out under the supervision of one or more faculty members. Students may propose their own topics and approach potential supervisors, or they may consider those suggested by the faculty members. The proposed project title must be submitted for approval by June 30 of the first year of their study. The candidate shall make a formal presentation on the subject of his project during the final semester of the teaching programme. The deadline for submission of the project report is April 30.

**SYLLABUS FOR THE DEGREE OF  
MASTER OF SCIENCE IN THE FIELD OF  
FOOD SAFETY AND TOXICOLOGY**

All courses in this programme are compulsory. A candidate shall be examined shortly after the completion of each course.

**A. Course Structure**

<b>Year 1 (36 credits)</b>		
FSTX7001	Principles of toxicology I	(9 credits)
FSTX7002	Principles of toxicology II	(9 credits)
FSTX7003	Toxicity tests and hazards evaluation methods	(9 credits)
FSTX7004	Regulatory toxicology: exposure estimate, risk assessment and management	(9 credits)
<b>Year 2 (33 credits)</b>		
FSTX8005	Chemical and microbial hazards in food	(9 credits)
FSTX8006	Food safety management	(9 credits)
FSTX8007	Project	(15 credits)

**B. Course Content (Provisional)****FSTX7001 Principles of toxicology I (9 credits)**

This module introduces students to the general principles and practice of toxicology. The major focus of the course is on basic principles, mechanisms and common methods underpinning the science of toxicology. Selected target organ systems (e.g. respiratory, nervous and immune systems) are studied with respect to understanding how representative chemicals damage and impair their ability to function. Students will develop a fundamental understanding of how chemicals may exert toxic effects and gain insight into the importance of organ-specific toxicity.

**FSTX7002 Principles of toxicology II (9 credits)**

This module continues to introduce students to the general principles and practice of toxicology. The course continues to focus on basic principles, mechanisms and common methods underpinning the science of toxicology. Selected toxicants are studied with respect to their source of exposure and mechanisms of effects. Selected disease processes (e.g., mutagenesis, carcinogenesis, reproductive toxicity, teratogenesis and developmental toxicity) are studied with respect to understanding their basic pathways and common mechanisms. Selected fields are presented to give students insight into the applications of toxicology and its relationship with other fields.

**FSTX7003 Toxicity tests and hazards evaluation methods (9 credits)**

This module will provide students with the current state-of-the-art methodology employed to investigate the effect of chemical and microbial toxins and environmental pollutants on living systems. Topics include: animal tests for acute toxicity, short-term and long-term toxicity, for mutagenicity, genotoxicity and carcinogenicity, for reproductive toxicity, teratogenicity, developmental toxicity and delayed neurotoxicity. Major focus is on the basic principles underpinning each test method including the test rationale, protocol design, limitations and data interpretation. Students will also be introduced to the basic concepts of toxicological evaluation and criteria for setting guidance values for dietary and non-dietary exposure to chemicals. The role of biochemical, metabolic and toxicokinetic studies in toxicological evaluation is also considered.

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**FSTX7004 Regulatory toxicology: exposure estimate, risk assessment and management (9 credits)**

In order to fully appreciate risks that arise from human exposure to chemicals in our living environment, it is essential to quantify levels of chemical contamination in environmental media and foods, and estimate total chemical exposure from dietary and non-dietary sources. This module will provide students with intensive training to develop the necessary practical skills to measure and model the extent to which human populations come into contact with toxic agents in the environment and foods, to conduct qualitative and quantitative risk assessments, to set safe levels of chemical exposure in foods (based on local food consumption patterns), and to implement effective risk management in protecting human health and the environment. The roles of international food safety authorities such as WHO, FAO, Codex Alimentarius Commission, JECFA, IARC and OECD will be described. Introduction to local and international food laws will be provided.

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**FSTX8005 Chemical and Microbial Hazards in Food (9 credits)**

This module will introduce students to the chemical and microbial hazards in food and their effects on human health. Special reference is made to heavy metals, pesticides, food additives, persistent organic pollutants and natural food contaminants of current public concern. An emphasis will also be placed on developing the understanding of the actual impact of food and waterborne pathogens, their epidemiology and factors contributing to the increase in their incidence. Determination of exposure pathways and linking food hazards to human health is the primary focus. Topics include: contamination monitoring, quantification of exposure at the individual level, interactive effects of exposure to multiple risk factors, perceptions of risk and integration of laboratory science with population-based studies.

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**FSTX8006 Food safety management (9 credits)**

An overview of quality assurance and management in the food industry will be presented. Case studies will be used to generate in-depth discussion on relevant topics. Guidelines of the HKSAR's Department of Health on acceptable limits and routine inspection procedures will be discussed. As a core quality management tool in the food industry, the relevance, impact and use of HACCP in manufacturing and catering will be discussed. Topics covered will include the integration of HACCP and ISO 14000 as well as the practical implementation of HACCP using Asian case studies.

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**FSTX8007 Project (15 credits)**

All students are required to undertake to attend training (up to maximum 6 months) in one of the following areas:

- Academic institutions, to carry out basic research project using the most advanced techniques in molecular biology, analytical chemistry and biomedical sciences.

- Food, chemical and pharmaceutical industries, to overlook industry procedures on ensuring that the emerging/newly developed food and chemical products meet regulatory standards and requirements and are safe for consumers; their potential health implications, and
- Government agencies, to gain knowledge on the procedures implemented by the local/national authorities in formulating science-based policies, laws and regulations to ensure the safe production and use of food and chemicals.

The candidate shall make a formal presentation on the subject of his training during the final semester of the teaching programme.