

**REGULATIONS FOR THE DEGREES OF
MASTER OF SCIENCE (MSc) AND MASTER OF SCIENCE IN ENVIRONMENTAL
MANAGEMENT (MSc[Env Man])**

For students admitted in 2020-2021 and thereafter

(See also General Regulations and Regulations for Taught Postgraduate Curricula)

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 Space Science.

The degree of Master of Science in Environmental Management is a postgraduate degree awarded for the satisfactory completion of a prescribed course of study in Environmental Management.

Admission requirements**Sc21**

- (a) To be eligible for admission to the courses leading to the degree of Master of Science or Master of Science in Environmental Management, a candidate
 - (i) shall comply with the General Regulations and the Regulations for Taught Postgraduate Curricula;
 - (ii) shall hold a Bachelor's degree with honours of this University; or another qualification of equivalent standard of this University or another University or comparable institution accepted for this purpose;
 - (iii) in respect of the courses of study leading to the degree of Master of Science in the field of Space Science, a Bachelor's degree in a relevant science (e.g. physics, astronomy, earth sciences) or engineering, and prior knowledge expected in basic college physics (mechanics, electricity & magnetism), college-level mathematics (e.g. calculus, linear algebra), basic statistics, and some computer programming (e.g. python, C);
 - (iv) shall satisfy the examiners in a qualifying examination if required.
 - (b) 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 demonstrates 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 to follow the course of study prescribed. It shall consist of one or more written papers or equivalent and may include a project proposal.
 - (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

- (a) To be eligible for the award of the degree of Master of Science or Master of Science in Environmental Management, a candidate
 - (i) shall comply with the General Regulations and the Regulations for Taught Postgraduate Curricula; and
 - (ii) shall complete the curriculum and satisfy the examiners in accordance with these regulations and syllabuses.
 - (b) A candidate (either full-time or part-time) who has not satisfied the examiners for the award of the degree of Master of Science in the field of Applied Geosciences but has satisfied the requirements for the award of Postgraduate Diploma in Earth Sciences (PGDES) (or is deemed to have satisfied such requirements by the Faculty Board) may be allowed to exit with a PGDES, subject to the approval of the Faculty Board. Those who are allowed to take this exit path will not be re-admitted to the degree of Master of Science in the field of Applied Geosciences.
 - (c) The Postgraduate Diploma in Earth Sciences and the Master of Science in the field of Applied Geosciences curricula are an impermissible combination. Candidates who are awarded the Postgraduate Diploma in Earth Sciences shall not be admitted to the Master of Science in the field of Applied Geosciences curriculum.
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Transfer of candidature into the Master of Science in the field of Applied Geosciences

Sc24

- (a) Subject to the approval of the Faculty Board, a candidate who has registered for the PGDES may be allowed to transfer to read the Master of Science in the field of Applied Geosciences and advanced credits of up to 45 credits may be granted. Application for the transfer must be made prior to the BoE's recommendation for conferment of the PGDES, or before August 31 of the final year of PGDES, whichever is earlier.
 - (b) A candidate who has transferred his/her candidature to the Master of Science in the field of Applied Geosciences will not be awarded the PGDES. If a candidate after transferring to the Master of Science in the field of Applied Geosciences fails to complete the Master of Science, he/she may be awarded the PGDES provided that he/she has satisfied the requirements of the PGDES.
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Period of study

Sc25 The curriculum of the Master of Science or the Master of Science in Environmental Management shall normally extend over one academic year of full-time study or two academic years of part-time study. Candidates in either degree shall not be permitted to extend their studies beyond the maximum period of registration of two academic years of full-time study or three academic years of part-time study, unless the otherwise permitted or required by the Board of the Faculty.

Completion of curriculum

Sc26 To complete the curriculum of the Master of Science or Master of Science in Environmental Management, a candidate

- (a) shall satisfy the requirements prescribed in TPG 6 of the Regulations for Taught Postgraduate Curricula;

- (b) shall follow courses of instruction and complete satisfactorily all prescribed written, practical and field work;
 - (c) shall complete and present a satisfactory dissertation or project on an approved subject or complete courses with equivalent credits as a replacement; and
 - (d) shall satisfy the examiners in all courses prescribed in the respective syllabuses.
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Advanced standing

Sc27 Advanced standing of up to 12 credits may be granted to a candidate pursuing the course of study leading to the degree of Master of Science in the field of Space Science, in recognition of studies completed successfully before admission to the curriculum, subject to the approval of the Board of the Faculty.

Dissertation or Project

Sc28 The title of the dissertation or project shall

- (a) for the full-time mode of Master of Science (except MSc in Environmental Management), 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;
- (b) for the full-time curriculum of MSc in Environmental Management, be submitted by October 30 and the dissertation or project report shall be submitted not later than the last Friday in June of the first year of study;
- (c) for the part-time curriculum (except Master of Science in the field of Applied Geosciences and MSc in Environmental Management), be submitted for approval by March 15 of the first year of study and the dissertation or project report shall be submitted not later than July 1 of the second year of study;
- (d) for the part-time curriculum of MSc in Environmental Management, be submitted by June 30 of the first academic year and the dissertation or project report shall be submitted not later than the last Friday in May of the second year of study.

Sc29 A 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 worker, which shows his/her share of the work) undertaken after registration as a candidate for either degree.

Assessments

Sc30 The assessment in any course shall consist of elements prescribed by the course teachers, and will normally comprise either written coursework alone, or coursework combined with formal examinations; in either case participation in field work or practical work may form part of the assessment.

Sc31 A candidate who has failed to satisfy the examiners

- (a) at his/her first attempt in any course 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;
- (b) at his/her first submission of dissertation or project report may be permitted to submit a new or revised dissertation or project report within a specified period;

- (c) 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.

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.

Discontinuation

Sc33 A candidate who

- (a) has failed to satisfy the examiners in more than half the number of credits of courses during any of the academic years or in any course at a repeated attempt, or
- (b) is not permitted or fails 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.

Assessment results

Sc34 On successful completion of the curriculum, candidates who have shown exceptional merit may be awarded a mark of distinction, and this mark shall be recorded in the candidates' degree diploma.

Grading systems

Sc35 Individual courses shall be graded according to one of the following grading systems as determined by the Board of Examiners:

- (a) Letter grades, their standard and the grade points for assessments as follows:

Grade	Standard	Grade Point
A+	Excellent	4.3
A		4.0
A-		3.7
B+	Good	3.3
B		3.0
B-		2.7
C+	Satisfactory	2.3
C		2.0
C-		1.7
D+	Pass	1.3
D		1.0
F	Fail	0

or

- *(b) 'Pass' or 'Fail'

Courses which are graded according to (b) above will not be included in the calculation of the GPA.

*Only applies to certain courses in MSc in the field of Applied Geosciences

**SYLLABUSES FOR THE DEGREE OF
MASTER OF SCIENCE IN THE FIELD OF SPACE SCIENCE
(for students admitted in 2020-2021 and thereafter)**

A. COURSE STRUCTURE

Each student must complete at least 60 credits of courses, split into 36 credits of core courses, 18 credits of electives, and 6 credits of a final project.

Core Courses

SPSC7001	Space flight propulsion (6 credits)
SPSC7002	Introduction to space weather (6 credits)
SPSC7003	Remote sensing (6 credits)
SPSC7004	Radiation detection and measurement (6 credits)
SPSC7005	Space science entrepreneurship (6 credits)
SPSC7006	Small satellite design (6 credits)

Elective Courses*

SPSC7011	Introduction to space plasma physics (6 credits)
SPSC7012	Climate change (6 credits)
SPSC7013	Habitable planets and the origin of life (6 credits)
SPSC7014	Big data, AI and machine learning in space science (6 credits)
SPSC7015	Introduction to planetary science (6 credits)
SPSC7016	Overview of space astrophysics (6 credits)
SPSC7017	Introduction to astrochemistry and astrobiology (6 credits)
SPSC7018	Project management for space science (6 credits)
STAT6014	Advanced statistical modelling (6 credits)
STAT6016	Spatial data analysis (6 credits)
ELEC6008	Pattern recognition and machine learning (6 credits)
ELEC6026	Digital signal processing (6 credits)
ELEC6065	Data compression (6 credits)
ELEC6100	Digital communications (6 credits)

Capstone Project

SPSC7031	Space science final project (6 credits)
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** Timetabling of courses may limit availability of some electives. The actual offering of such electives will be based on student demand.*

B. COURSE CONTENTS

SPSC7001 Space flight propulsion (6 credits)

This course covers an introduction to the basic concepts of space flight propulsion. Topics include: Mechanics of particle motions under central forces, Newton's law applied to the orbital mechanics of particles under central forces, orbital transfers, dynamics of mass-varying system, an application of kinetic principles to rocket and jet propulsion via the first-order differential equations, multi-stage design for energy efficiency, particles under velocity-dependent resistance, terminal velocity and its

application to parachute and small particulates, peak deceleration of spacecraft re-entry trajectories.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7002 Introduction to space weather (6 credits)

Our modern lifestyles rely on satellite technology which can be severely affected by the Earth's local particle environment. Much of this is due to the influence of the Sun, which emits large quantities of radiation and charged particles that interact with the Earth's magnetic field. This course will cover the fundamentals of space weather, from its origins, to its effects, and forecasting.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7003 Remote sensing (6 credits)

This course is focussed on the theory behind, and practical application of, planetary remote sensing. The course covers the use of visible, infrared, radar, and laser remote sensing data to analyse planetary surfaces. Specific applications will include compositional and morphological analyses to support geological studies, landing site characterisation, and exploration for natural resources in space.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7004 Radiation detection and measurement (6 credits)

This course will provide an overview of the various ways in which we can detect radiation to make physical measurements. The course will cover the fundamentals of radiation interactions, properties of radiation detectors, including some of the most commonly used ones (e.g. Proportional Counters, Geiger-Mueller Counters). The course will include discussions of the principles of detection and some practical applications.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7005 Space science entrepreneurship (6 credits)

Unlike the early days, space science in modern times is not driven just by governments. Businesses like SpaceX, Blue Origin, or Virgin Galactic are not only capturing people's imagination, but also proving that space provides big business opportunities. This course will cover the basics of designing, launching, and running a business, with a special emphasis on the space industry.

Assessment: 25% coursework and written assignment, 20% midterm examination, 40% final case study and presentation 15% Group discussions, attendance, and class engagements.

SPSC7006 Small satellite design (6 credits)

Small satellites (sometimes referred to as microsatellites, CubeSats, etc.) are becoming increasingly popular. Once proposed mainly for educational purposes, due to their low cost and shorter development time scales, these days many such satellites are being proposed and launched with a range of cutting-edge scientific goals. This course will cover the practical aspects of designing a small satellite, based on the principle of purchasing "off-the-shelf" components, and benefitting from "open source" solutions

to many of the technical challenges. Topics include: science instruments and payloads, satellite subsystems, ground networks, space science data and software, ground networks, launchers, and operations.

Assessment: 50% coursework, 50% project

SPSC7011 Introduction to space plasma physics (6 credits)

Most of space is filled with plasma, the fourth state of matter where freely moving charges from ionized gas interact with (and generate) electric and magnetic fields, leading to a complicated set of phenomena. This course will provide an introduction to the field, covering such topics as orbit theory, electromagnetic waves in cold plasmas, collision theory, magnetohydrodynamics, force-free magnetic-field configurations, stochastic processes, and interaction of particles and waves. The course will emphasize some of the applications of plasma physics in the fields of geophysics and astrophysics.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7012 Climate change (6 credits)

Global warming is one of the biggest challenges faced by this generation, posing potentially an existential threat to the planet: since 2001, the Earth has experienced 16 of the 17 warmest years in recorded history. The study of climate change from space has been one of the key goals of NASA going back to the 1960s. This course will cover the evidence for human-caused climate change, explaining the causes, including sources of greenhouse gas emissions. The course will explore all the various ways in which satellites are providing the necessary measurements, provide possible solutions. Topics include: Climate conditions on Earth, the greenhouse effect, satellite observations, climate modeling, future prospects for climate change mitigation.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7013 Habitable planets and the origin of life (6 credits)

The discovery of large numbers of exoplanets has provided the first solid piece of evidence that our Earth may not be as unique as our ancestors believed. The next step in humankind's quest for the search of the origin of life will involve finding planets that are close enough in their conditions to Earth to harbour life similar to our own. This course will examine the quest for life outside our planet, including the search for planets in the so-called habitable zone. The course will also cover the origin of life outside our solar system and describe the various space observations being carried out in this effort.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7014 Big data, AI and machine learning in space science (6 credits)

These areas overlap, are interdependent and increasingly influential in the real world under the broad umbrella of data science. Big data and data analytics have been widely used in different fields of physics and other sciences. They have direct application in Space and satellite technologies. This course introduces the basics of all these areas. Data analytics is the science of analyzing raw data to make conclusions, a particular challenge in the Big data era, while Machine learning (ML) is a technique enabling computers to learn without being explicitly programmed and is part of the broader concept of Artificial Intelligence (AI). Key concepts across these overlapping and interdependent fields will be

explored including practical processes, techniques and algorithms. There will be a focus on real-world examples with specific emphasis on applications in space and planetary sciences. The course will also cover some ML software packages in Python and R including basic techniques in supervised, unsupervised, and reinforcement learning. Examples in all areas will be drawn from fields such as astrophysics, particle physics and complex systems, including rare source identification from vast data, training sets, smart classification, time series, imaging and spectral analyses.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7015 Introduction to planetary science (6 credits)

We live in a golden age of planetary science, with new missions being proposed at an unprecedented rate by all the major space agencies. This course will provide an overview of planetary science, covering the major topics of the field: planetary dynamics, planetary properties, solar heating and energy transport, planetary atmospheres, planetary surfaces, planetary interiors, magnetospheres, meteorites and asteroids, comets, planet formation, and the search for extrasolar planets.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7016 Overview of space astrophysics (6 credits)

Astrophysics from space was historically proposed to cover those parts of the electromagnetic spectrum not visible from earth (e.g. X-rays, gamma rays), however, almost every part of the spectrum can benefit from space observations, removing the obstacles posed by our atmosphere. Some of the most iconic astrophysical images have been produced by the Hubble Space telescope, a relatively modest (in size) instrument which has made some stunning discoveries over the course of its almost 30-year lifetime. This course will provide an overview of past, present, and future astrophysical space missions, including their major science goals and achievements, and the technologies that made them possible.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7017 Introduction to astrochemistry and astrobiology (6 credits)

The notion that life may have originated in space has gained support in recent decades from the discovery of large numbers of complex molecules in space. How are these molecules detected? Where do they come from? Can these molecules eventually lead to the building blocks of life? This course will explore the tools, methods, and major results of astrochemistry and astrobiology, exploring in the process the origins of life in space.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

SPSC7018 Project management for space science (6 credits)

The course will cover the fundamental aspects of project management, as they apply to space projects. Topics will include: initiation of a project, performance specifications, technical aspects of a project cycle, project planning, project execution, risk assessment and mitigation, project closure. The course will introduce students to hands-on aspects of project management, including management tools.

Assessment: 80% coursework, 20% final examination

STAT6014 Advanced statistical modelling (6 credits)

This course introduces modern methods for constructing and evaluating statistical models and their implementation using popular computing software, such as R or Python. It will cover both the underlying principles of each modelling approach and the model estimation procedures. Topics from: (i) Generalized linear models; (ii) Mixed models; (iii) Kernel and local polynomial regression; (iv) Generalized additive models; (v) Hidden Markov models and Bayesian networks.

Assessment: 40% coursework, 20% midterm examination, 40% final examination

STAT6016 Spatial data analysis (6 credits)

This course covers statistical concepts and tools involved in modelling data which are correlated in space. Applications can be found in many fields including epidemiology and public health, environmental sciences and ecology, economics and others. Covered topics include: (1) Outline of three types of spatial data: point-level (geostatistical), areal (lattice), and spatial point process. (2) Model-based geostatistics: covariance functions and the variogram; spatial trends and directional effects; intrinsic models; estimation by curve fitting or by maximum likelihood; spatial prediction by least squares, by simple and ordinary kriging, by trans-Gaussian kriging. (3) Areal data models: introduction to Markov random fields; conditional, intrinsic, and simultaneous autoregressive (CAR, IAR, and SAR) models. (4) Hierarchical modelling for univariate spatial response data, including Bayesian kriging and lattice modelling. (5) Introduction to simple spatial point processes and spatio-temporal models. Real data analysis examples will be provided with dedicated R packages such as geoR.

Assessment: 50% coursework, 50% final examination

ELEC6008 Pattern recognition and machine learning (6 credits)

This course aims at providing fundamental knowledge on the principles and techniques of pattern recognition and machine learning.

Specifically, the course covers the following topics: Bayes decision theory; parametric and non-parametric methods; linear discriminant functions; unsupervised learning and clustering; feature extraction; neural networks; context-dependent classification; case studies.

Assessment: 25% coursework, 75% written examination

ELEC6026 Digital signal processing (6 credits)

This course provides an introduction to the fundamental concepts of digital signal processing (DSP) including a wide variety of topics such as discrete-time linear time invariant systems, sampling theorem, z-transform, discrete-time/discrete Fourier transform, and digital filter design. Furthermore, the course will also discuss in detail about other advanced topics in digital signal processing such as multidimensional signals and systems, random processes and applications, and adaptive signal processing.

Assessment: 20% coursework, 80% written examination

ELEC6065 Data compression (6 credits)

This course provides an introduction to the state-of-the-art compression techniques for typical media including files, digital images, videos and audios. Specifically, the course will discuss in detail about the coding and quantization techniques commonly used for images, videos and audios. Finally, the course will cover basic concept and terminologies of common image, video and audio standards.

Assessment: 20% coursework, 80% written examination

ELEC6100 Digital communications (6 credits)

This course aims at enabling the fundamental understanding of the digital communication systems. After an overview on basic probability and random processes, the module will cover different modulations and their optimal decision rules, with an emphasis on signal space representation. Then, performance analyses under additive white Gaussian noise channel and fading channel are examined. This is followed by topics on spatial diversity and channel equalization.

Assessment: 30% coursework, 70% written examination

SPSC7031 Space science final project (12 credits) (*Capstone Project*)

Students must carry out a research project in space science, under the guidance of a faculty member. Students are encouraged to approach faculty members in their areas of interest, in order to choose an appropriate project, which they will typically carry out over the course of the second semester. If students cannot choose, they will be offered a project (in consultation with the programme director), supervised by a member of our faculty. A final (oral) presentation is required and a report must be submitted.

Assessment: 25% oral presentation, 75% final report