REGULATIONS FOR THE DEGREES OF
MASTER OF SCIENCE (MSc) AND MASTER OF SCIENCE IN ENVIRONMENTAL MANAGEMENT (MSc[EnvMan])
For students admitted in 2021-22 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 five fields: Applied Geosciences, Food Industry: Management and Marketing, Food Safety and Toxicology, Physics 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

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(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, shall hold a Bachelor's degree in a relevant science or engineering discipline, and prior knowledge expected in basic college-level physics, mathematics, statistics, and computer programming;
(iv) in respect of the courses of study leading to the degree of Master of Science in the field of Physics, a Bachelor's degree with honours in a relevant science (e.g. physics, astronomy, earth science, mathematics) or engineering, and prior knowledge expected in university-level electromagnetism, quantum mechanics and thermodynamics, university-level linear algebra and multi-variable calculus, basic statistics, and some computer programming experience (e.g. coding in C++, Mathematica, Matlab or Python); and
(v) 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.

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.

Award of degree

Sc23 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.

Advanced standing

Sc24 In recognition of studies completed successfully before admission to the Master of Science in Environmental Management, Master of Science in the field of Applied Geosciences and Master of Science in the field of Space Science, advanced standing of up to 12 credits may be granted to a candidate with appropriate qualification and professional experiences, on production of appropriate certification, subject to the approval of the Board of the Faculty. Credits gained for advanced standing shall not be included in the calculation of the GPA but will be recorded on the transcript of the candidate. The candidate should apply before commencement of first year of study via the Department and provide all the supporting documents.

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 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.

Dissertation or Project

Sc27 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, unless otherwise permitted or required by the course coordinator(s);

(c) for the part-time curriculum (except Master of Science in the field of Applied Geosciences, Master of Science in the field of Physics 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, unless otherwise permitted or required by the course coordinator(s). The dissertation shall be submitted not later than the last Friday in May of the second year of study and the project report shall be submitted not later than the last Friday in June of the second year of study, unless otherwise permitted or required by the course coordinator(s);

(e) for the full-time curriculum of Master of Science in the field of Physics, be submitted by October 15 and the dissertation or project report shall be submitted not later than the last Friday in May of the first year of study;

(f) for the part-time curriculum of Master of Science in the field of Physics, be submitted by October 15 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.

Sc 28 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

Sc29 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.

Sc30 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.

Sc31 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

Sc32 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

Sc33 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

Sc34 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 and MSc in the field of Physics

SYLLABUSES FOR THE DEGREE OF
MASTER OF SCIENCE IN THE FIELD OF SPACE SCIENCE
(for students admitted in 2021-22 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 capstone project.

Core Courses	
SPSC7002	Introduction to space weather (6 credits)
SPSC7003	Remote sensing in space science (6 credits)
SPSC7004	Radiation detection and measurement (6 credits)
SPSC7005	Space science entrepreneurship (6 credits)
SPSC7007	Data analysis in space science (6 credits)
SPSC7015	Introduction to planetary science (6 credits)
Elective Courses*	
SPSC7006	Small satellite design (6 credits)
SPSC7011	Introduction to space plasma physics (6 credits)
SPSC7014	Big data, AI and machine learning in space science (6 credits)
SPSC7016	Overview of space astrophysics (6 credits)
STAT6016	Spatial data analysis (6 credits)
STAT7102	Advanced statistical modelling (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)

** Timetabling of courses may limit availability of some electives. The actual offering of such electives will be based on student demand.*

B. COURSE CONTENTS

Core Courses

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 covers the fundamentals of space weather, from its origins, to its effects, and forecasting.

Assessment: coursework (50%); written examination (50%)

SPSC7003 Remote sensing in space science (6 credits)

This course introduces the theory behind, and the many practical applications of remote sensing, focusing on applications of satellite-based detectors to monitor the Earth's environment. The course covers the physical principles of remote sensing, including the various spectral signatures in the different parts of the electromagnetic spectrum. Students will learn about the different sensor technologies, and how to characterize and quantify their performance.

Assessment: coursework (50%); written examination (50%)

SPSC7004 Radiation detection and measurement (6 credits)

This course provides an overview of various ways we detect radiation to make physical measurements in space science. It covers the fundamentals of radiation interactions and properties of radiation detectors, including some of the most commonly used ones in contemporary science missions.

Assessment: coursework (50%); written examination (50%)

SPSC7005 Space science entrepreneurship (6 credits)

No longer driven entirely by governmental institutions, developments in frontier space science in modern times also receive boosts from academia, corporations and entrepreneurs alike. 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 how ventures can be started for the burgeoning space industry.

Assessment: coursework (60%); final case study and presentation (40%)

SPSC7007 Data analysis in space science (6 credits)

This course introduces concepts of data analysis in space science. Techniques ranging from traditional statistical methods to recent machine learning algorithms will be introduced. Applications of these techniques in space science will be the focus in this course for students to understand how they are actually deployed in solving practical problems in space science.

Assessment: coursework (50%); written examination (50%)

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 provides a modern understanding of the properties of our Solar System and planetary systems around other stars and of the physical, chemical, and geological processes that govern their motion and properties. Special attention will be paid to how our knowledge has been enriched by recent discoveries from space missions such as Cassini and Kepler.

Assessment: coursework (50%); written examination (50%)

Elective Courses

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. Microsatellites make full use of the latest achievements in basic technologies such as modern microelectronics, micro mechanics, and advanced materials. This course covers 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: coursework (50%); written examination (50%)

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 plasma characteristics, electromagnetic waves in cold plasmas, collision theory, magnetohydrodynamics (MHD), 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: coursework (50%); written examination (50%)

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

Artificial Intelligence (AI), Machine Learning and Big Data analytics are interdependent disciplines that are increasingly influential in the real world under the broad umbrella of data science. They have found widespread applications in all branches of science and technology and 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 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. Examples in all areas will be drawn from contemporary research in 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: coursework (50%); written examination (50%)

SPSC7016 Overview of space astrophysics (6 credits)

While astrophysics from space was historically proposed to cover those parts of the electromagnetic spectrum not visible from earth such as X-rays and gamma rays, 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 30-year lifetime. This course provides 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: coursework (50%); written examination (50%)

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: coursework (50%); written examination (50%)

STAT7102 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) Linear regression models; (ii) Generalized linear models; (iii) Model selection and regularization; (iv) Kernel and local polynomial regression; selection of smoothing parameters; (v) Generalized additive models; (vi) Hidden Markov models and Bayesian networks.

Assessment: coursework (50%); written examination (50%)

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.

Pre-requisite: A good background in linear algebra, programming experience.
Mutually exclusive with: COMP7504 Pattern recognition and applications

Assessment: coursework (25%); written examination (75%)

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: coursework (30%); written examination (70%)

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: coursework (30%); written examination (70%)

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 course will cover the modulation and demodulation. 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.

Mutually exclusive with: ELEC6014 and ELEC6045

Assessment: coursework (40%); written examination (60%)

Capstone Project

SPSC7031 Space science final project (6 credits)

Students must carry out a research project in any aspect of space science under the guidance of a faculty member from the MSc in Space Science program. Students are encouraged to approach faculty members in their areas of interest as soon as possible, in order to choose an appropriate project. Students may either propose a topic of interest, participate in any existing projects of the faculty member, or else they will be assigned a project after consultation with the course coordinator. An oral presentation is required and a written report must be submitted.

Assessment: oral presentation (25%); written report (75%)