This course will provide an introduction to spatial processes and Bayesian kriging of point-level data. The course will cover the fundamental principles of each modelling approach and focus on both the underlying principles of each modelling approach and the major results of astrochemistry and astrobiology, exploring in detail the processes of the origin of life in space.

**Course Description**

This course is designed for students with a strong background in science and a basic understanding of mathematics. It covers the fundamental concepts of astrochemistry and astrobiology, including the origin of life in space, the history of the Earth and the Moon, the solar system, and the potential for extraterrestrial life.

**Assessment**

The course assessment will be based on a written examination at the end of the course. The exam will cover the material presented in the lectures and the readings.

**Course Content**

1. **Overview of Astrochemistry and Astrobiology**
   - Origins of life in space
   - The history of the Earth and Moon
   - The solar system
   - Potential for extraterrestrial life

2. **The Origin of Life**
   - Chemical evolution of the solar system
   - The formation of the terrestrial planet
   - The evolution of the terrestrial planet
   - The origin of life on Earth

3. **The Origin of Life on Other Planets**
   - The search for extraterrestrial life
   - Terrestrial habitability and the potential for life on other planets
   - The search for extraterrestrial life

4. **The Importance of Astrochemistry to the Origin of Life**
   - The role of astrochemistry in the origin of life
   - The importance of astrochemistry to the origin of life

5. **The Importance of Astrochemistry to the Origin of Life**
   - The role of astrochemistry in the origin of life
   - The importance of astrochemistry to the origin of life

6. **The Importance of Astrochemistry to the Origin of Life**
   - The role of astrochemistry in the origin of life
   - The importance of astrochemistry to the origin of life

**Course Requirements**

- **Prerequisites:** A good background in science and mathematics
- **Assessment:** Written examination

**Course Schedule**

- **Lectures:** Monday, Wednesday, Friday at 10:00 AM
- **Laboratory:** Thursday at 1:00 PM

**Course Materials**

- **Textbook:** Astrochemistry and Astrobiology
- **Readings:** Selected articles and papers

**Course Coordinator**

Dr. Pablo Saz Parkinson

**Instructor**

Dr. Shawn Wright

**Assistant Instructor**

Dr. Joseph Michalski

**Contact**

Email: pablo.sazparkinson@hku.hk

Website: http://www.lsr.hku.hk
The Department of Physics is offering an exciting new Taught Postgraduate Master of Science in the field of Space Science. Modern Space Science is a highly multi-disciplinary field that encompasses a broad range of sub-disciplines, from astrophysics, to space engineering, electronics, remote sensing, and space exploration. China has recently been investing heavily in Space Science, launching 39 satellites in 2018 alone, over twice as many as in 2017 and more than any other country in the world. Given its status as a global megatrends, its strong presence, and its location in the "Greater Bay Area" (GBA), Hong Kong is ideally placed to capitalize on the growth of China in the area of space science and technology.

Programme Highlights

- English as the medium of instruction
- Either 1 year full-time (6-7 semesters/time) or 2 years part-time
- Offered by the Department of Physics, with contributions from the School of Earth and Environmental Sciences, the Department of Statistics and Actuarial Science and the Department of Computer Science
- Key partners: Nanjing University (NJU, China), Zhejiang University (ZJU, China), National Astronomical Observatories of China, Shanghai Academy of Space Science and Technology
- Highly multi-disciplinary discipline, covering broad areas of space plasma physics, planetary science, space science and technology
- Strengthens Chinese Space Science Programme
- Elite guest lecturers
- Internship opportunities in top science companies in the Mainland and globally
- Professional employment opportunities, in public and private sectors
- Scholarships available

Programme Curriculum

Our MSc programme is composed of 50 credits of courses. Students must enroll in 2 courses of type "Core" compulsory courses, offered in the first semester. Students may then choose to enroll in 6 credits of type "Elective" courses, offered in the second semester. The remaining 6 credits must be a "Core" elective course (SPSC7006 - Propulsion). Students are encouraged to approach the programme in a flexible and self-motivated way, their studies can be further amplified by undertaking the course of the second semester in the first semester. Students may then choose to enroll in 6 credits of type "Elective" courses, offered in the first semester. The remaining 6 credits must be a "Core" elective course (SPSC7006 - Propulsion). Students are encouraged to approach the programme in a flexible and self-motivated way, their studies can be further amplified by undertaking the course of the second semester in the first semester.

Core Courses (18 credits)
- SPSC7001 Space flight propulsion and control (6 credits)
- SPSC7016 Introduction to space weather (6 credits)
- SPSC7017 Introduction to space plasma physics (6 credits)
- SPSC7018 Introduction to planetary science (6 credits)
- SPSC7021 Theoretical and applied navigation and measurement (6 credits)
- SPSC7022 Space science and technology (6 credits)

Elective Courses (18 credits)
- SPSC7012 Climate change (6 credits)
- SPSC7013 Habitability planets and the origin of life (6 credits)
- SPSC7014 Big data, AI and machine learning in space science (6 credits)
- SPSC7015 Atmospheric physics (6 credits)
- SPSC7016 Overview of space astrophysics (6 credits)
- SPSC7017 Introduction to astrophysics (6 credits)
- SPSC7018 Project management for space science (6 credits)
- SPSC7019 Big data, AI and machine learning in space science (6 credits)
- SPSC7020 Propulsion (6 credits)
- SPSC7021 Project management for space science (6 credits)
- SPSC7022 Propulsion (6 credits)
- SPSC7023 Space weather monitoring and forecasting (6 credits)
- SPSC7024 Space science and technology (6 credits)

Elective Courses

The second year of the Taught Master Programme in Space Science will involve further studies in the field. The student will pursue in-depth studies in one or more of the major areas of space science, to pursue a career in industry or academia. The student will be required to complete a Master’s Thesis, which is a substantial piece of independent research. The thesis will be based on the student’s own research and will usually be in the form of a research report. The thesis will be submitted to the Department of Physics, who will then appoint a supervisor to assist the student in the preparation of the thesis. The thesis will be assessed by an internal examiner, who will be a member of the Department of Physics.

Course Description

Core Courses
- SPSC7001 Space flight propulsion and control (6 credits)
- SPSC7015 Atmospheric physics (6 credits)
- SPSC7016 Overview of space astrophysics (6 credits)
- SPSC7017 Introduction to astrophysics (6 credits)
- SPSC7018 Project management for space science (6 credits)
- SPSC7020 Propulsion (6 credits)
- SPSC7021 Project management for space science (6 credits)
- SPSC7022 Propulsion (6 credits)
- SPSC7023 Space weather monitoring and forecasting (6 credits)
- SPSC7024 Space science and technology (6 credits)

Elective Courses

- SPSC7012 Climate change (6 credits)
- SPSC7013 Habitability planets and the origin of life (6 credits)
- SPSC7014 Big data, AI and machine learning in space science (6 credits)
- SPSC7015 Atmospheric physics (6 credits)
- SPSC7016 Overview of space astrophysics (6 credits)
- SPSC7017 Introduction to astrophysics (6 credits)
- SPSC7018 Project management for space science (6 credits)
- SPSC7020 Propulsion (6 credits)
- SPSC7021 Project management for space science (6 credits)
- SPSC7022 Propulsion (6 credits)
- SPSC7023 Space weather monitoring and forecasting (6 credits)
- SPSC7024 Space science and technology (6 credits)
The Department of Physics is offering an exciting new Taught Postgraduate Master of Science in the field of Space Science. Modern Space Science is a highly multi-disciplinary field that encompasses a broad range of sub-disciplines, from astrophysics, to space engineering, electronics, remote sensing, and space exploration. China has recently been investing heavily in Space Science, launching 39 satellites in 2018 alone, over twice as many in 2017 and more than any other country in the world. Given its status as a global metropolis, its strong institutions, and its location in the ‘Greater Bay Area’ (GBA), Hong Kong is ideally placed to capitalize on the growth in China in the area of Space Science. The establishment, in the 2016, of the Laboratory for Space Research (LSR) under the Faculty of Science at The University of Hong Kong (HKU), combined with our strong ties to leading space institutions across the world and in Mainland China1 makes HKU the ideal place for a Taught Master Programme in Space Science. The Department of Physics and Astronomy at HKU, combined with our strong ties to leading space institutions across the world and in Mainland China1 makes HKU the ideal place for a Taught Master Programme in Space Science. The Department of Physics at HKU, combined with our strong ties to leading space institutions across the world and in Mainland China1 makes HKU the ideal place for a Taught Master Programme in Space Science.
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Course Description

Core Courses

**Elective Courses**

Elective Courses offer a broad range of choice, designed to introduce students to different aspects of space science and provide a platform for students to pursue their own research interests. Each Elective Course is worth 6 credits. Students can choose from a variety of Elective Courses offered mainly in the first semester. Students may then choose 2 elective courses out of a broad range of courses. In addition, students must complete 6-credit course SPSC7031. Students are encouraged to approach their Elective Courses with an open mind and without preconceived notions.

**Programme Curriculum**

Our MSc programme is composed of 60 credits of courses. Students must enrol in 4 courses of total 24 credits. Students can choose 6 courses of total 36 credits. The curriculum is the same for the fall and spring semesters. The programme is offered by the Department of Physics, with contributions from the Department of Earth Sciences, Department of Electrical and Electronic Engineering under the auspices of the Centre for Space Science (China), China Space Utilization, Chinese Academy of Sciences (CSU, CAS), Padova-CISAS (Italy), Natural History Museum (UK).

**Programme Highlights**

• Elite guest lecturers
• Internship opportunities in top space science companies in the Mainland and globally
• Promising employment opportunities in public and private sectors

**Core Courses**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
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<tbody>
<tr>
<td>SPSC7001</td>
<td>Space Flight propulsion (6 credits)</td>
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<tr>
<td>SPSC7002</td>
<td>Introduction to space weather (6 credits)</td>
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<td>SPSC7003</td>
<td>Remote sensing (6 credits)</td>
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<tr>
<td>SPSC7004</td>
<td>Radiation detection and measurement (6 credits)</td>
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<td>SPSC7005</td>
<td>Space science entrepreneurship (6 credits)</td>
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<tr>
<td>SPSC7006</td>
<td>Small satellite design (6 credits)</td>
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<tr>
<td>SPSC7007</td>
<td>Space science entrepreneurship (6 credits)</td>
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**Elective Courses**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
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<tbody>
<tr>
<td>SPSC7011</td>
<td>Introduction to space plasma physics (6 credits)</td>
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<tr>
<td>SPSC7012</td>
<td>Magnetospheric plasma physics (6 credits)</td>
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<tr>
<td>SPSC7013</td>
<td>Variable stars and the origin of life (6 credits)</td>
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<tr>
<td>SPSC7014</td>
<td>Big data, AI and machine learning in space science</td>
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<tr>
<td>SPSC7015</td>
<td>Introduction to planetary science (6 credits)</td>
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<tr>
<td>SPSC7016</td>
<td>Overview of space astrophysics (6 credits)</td>
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<tr>
<td>SPSC7021</td>
<td>Introduction to electrochemistry and astrophysics (6 credits)</td>
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<tr>
<td>SPSC7022</td>
<td>Project management for space science (6 credits)</td>
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<td>SPSC7023</td>
<td>Space launch systems (6 credits)</td>
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<td>SPSC7024</td>
<td>Space data analysis (6 credits)</td>
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<tr>
<td>SPSC7025</td>
<td>Scientific and technical writing in space science (6 credits)</td>
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<tr>
<td>SPSC7026</td>
<td>Digital signal processing (6 credits)</td>
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<tr>
<td>SPSC7027</td>
<td>Digital communications (6 credits)</td>
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**Capstone Project**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit</th>
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<tr>
<td>SPSC7099</td>
<td>Capstone Project (6 credits)</td>
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• Tinkering on course may vary in availability of choice. The actual offering of all sub-courses will be decided by demand.

• Students must enrol in 4 courses of total 24 credits. Students can choose 6 courses of total 36 credits.

• Elective Courses offer a broad range of choice, designed to introduce students to different aspects of space science and provide a platform for students to pursue their own research interests.
**SPOC7017** Introduction to astrophysics and astrobiology (6 credits)

This course will introduce the modern methods for constructing and evaluating statistical models and their implementation using computing platforms, such as R or Python. It will cover the basic principles of three types of spatial data: point-level (geostatistical), areal (lattice), and spatial point process. Applications include: channel equalization.

**SPOC7019** Digital communications and wireless technologies (6 credits)

This course will introduce the basic concepts of digital communications technology, including digital signal processing (DSP) including a wide variety of topics such as multidimensional signals and systems, random processes, and digital filter design. The course will cover basic concepts and terminologies of common video, image, and audio standards.

**ELEC6008** Pattern recognition and machine learning (5 credits)

The course will focus on the following topics: Bayes' decision theory, parametric and non-parametric methods, linear discriminant analysis, supervised and unsupervised feature extraction, neural networks, contrast dependent classification, and clustering algorithms.

**ELEC6065** Data compression (6 credits)

This course provides an introduction to the state-of-the-art audio standards. The course will cover the basics of signal processing, coding, and quantization techniques commonly used in speech, audio, and video. Students will also learn about the coding and quantization techniques commonly used in speech, audio, and video.

**ELEC6066** Pattern recognition and machine learning (4 credits)

The course will cover the following topics: Bayes' decision theory, parametric and non-parametric methods, linear discriminant analysis, supervised and unsupervised feature extraction, neural networks, contrast dependent classification, and clustering algorithms.

**ELEC6073** Digital signal processing (3 credits)

This course will cover topics such as multidimensional signals and systems, random processes, and digital filter design. The course will cover basic concepts and terminologies of common video, image, and audio standards.

**STAT2001** Advanced statistical modelling (6 credits)

This course introduces modern methods for constructing and evaluating statistical models and their implementation using computing platforms, such as R or Python. It will cover the basic principles of three types of spatial data: point-level (geostatistical), areal (lattice), and spatial point process. Applications include: channel equalization.
R packages such as geoR. response data, including Bayesian kriging and lattice modelling. (5) spatial trends and directional effects; intrinsic models; estimation
Covered topics include: (1) Outline of three types of spatial data: STAT6016 Spatial data analysis (6 credits)
regression; (iv) Generalized additive models; (v) Hidden Markov both the underlying principles of each modelling approach and popular computing software, such as R or Python. It will cover
exam
STAT6014 Advanced statistical modelling (6 credits) evaulating statistical models and their implementation using

The course will cover the fundamental aspects of project management, including project planning, risk assessment, and major results of astrochemistry and astrobiology, exploring in detail about other advanced topics in digital signal processing such as multidimensional signal processing and system, random processes and applications, and adaptive signal processing. Assessment: 30% written examination

Assessment: 30% written examination

Digital signal processing II (6 credits)
This course provides an introduction to the basic concept and terminologies of common image, video and audio signals.  Specifically, the course will discuss in detail about the coding and quantization techniques commonly used for images, videos and audio. Finally, the course will cover basic concept and terminologies of common image, video and audio standards.

This course aims at providing fundamental knowledge on the digital communication systems. After an overview on basic digital communication concepts, the students will be introduced to the state-of-the-art space communication systems. In particular, the course will cover such as multidimensional signals and systems, random processes and digital filter design. Furthermore, the course will also discuss in detail the physical design and characteristics of the space communication systems.

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Co-Programme Director

Dr Pablo Sanchez
Department of Physics
The University of Hong Kong

Digital communications I (6 credits)
This course aims at providing fundamental knowledge on the digital communication systems. After an overview on basic digital communication concepts, the students will be introduced to the state-of-the-art space communication systems. In particular, the course will cover such as multidimensional signals and systems, random processes and digital filter design. Furthermore, the course will also discuss in detail the physical design and characteristics of the space communication systems.

Space science final project (6 credits)
Students must carry out a research project in consultation with the guidance of a faculty member. Students are encouraged to approach faculty members in their area of interests in order to choose an appropriate project, which they will finally carry out. The course will be assessed on the following criteria: the student’s project, the final report, the oral presentation, and the project timesheet.

Assessment: 50% coursework, 50% final report