



# Master of Science in the field of **APPLIED GEOSCIENCES**

*A springboard for a robust and fruitful career*

**Apply for entry in September 2023**

# IS THE PROGRAMME FOR YOU

## Why this Programme

**Aim:** to help engineering geologists improve their performance in professional work. Engineers and scientists wanting to advance their understanding of geology and geotechnics are also invited to apply.

**Two themes are accredited by the Geological Society of London**

- Engineering Geology Theme\*
- Engineering Geology with HKIE Approved Courses Theme\*
- Offers courses which graduates in Earth Sciences or Geology would need to meet the entry requirements of the HKIE in the Geotechnical Discipline

\* Applications for Chartered Geologist or Scientist (CGeol/CSci) with an accredited MSc benefit from an accelerated route, subject to satisfying all other criteria.



The Geological Society

accredited degree programme

## World-class Rankings of HKU

Quacquarelli Symonds (QS)



#21

World Rankings 2023

#3

Asia Rankings 2022

Times Higher Education (THE)



#30

World Rankings 2022

#4

Asia Rankings 2022

Eminent Subject Rankings



QS World University Rankings by Subject 2022:

#31

Environmental Sciences

- Geology
- Earth & Marine Sciences

#51-100

Top-notch Scientists in the Faculty

Clarivate Analytics' Essential Science Indicators 2021

18%

of our professoriate staff are the world's Top 1% scholars

## Engineering Geology Theme

### Focus

- ◇ Application of geology and mechanics in geotechnical practice
- ◇ Development of professional skills

### Coverage

- ◇ Offers 11 of the additional courses which graduates in Earth Sciences or Geology would need to meet the entry requirements of the Hong Kong Institution of Engineers (HKIE) in the Geotechnical Discipline

## Engineering Geology with HKIE Approved Courses Theme



### Coverage

- ◇ Offers all 14 of the additional courses which graduates in Earth Sciences or Geology would need to meet the entry requirements of the Hong Kong Institution of Engineers in the Geotechnical Discipline



### Tuition fees

Composition fee: HK\$150,000\* (subject to approval)

Students are required to pay Caution Money (HK\$350, refundable on graduation subject to no claims being made) and Graduation Fee (HK\$350)



### Programme duration

Full-time: 1 year

Part-time: 2 years



### Study load

Credits: 66 / 69 credits

Learning hours: 1,440 or 1,500 hours

(including 360 hours for the project and contact hours of 400 / 415 hours)

- Remarks:
- The 2-year programme imposes a heavy workload on a part-time student in a full-time job
  - An annual MSc workload of 720 hours is approximately 40% of the working hours of a full-time job



### Class schedule

- Teaching: mainly on weekday evenings
- Students are expected to study until 31 August and teaching is also conducted during Reading Weeks and Summer Semester
- Field and laboratory work: weekends



### Medium of instruction

English



### Assessment

Mostly coursework and written examination

\*The fee shall generally be payable in 2 instalments over 1 year for full-time and 4 instalments over 2 years for part-time

## What the Programme Covers



## Professional recognition

- ◇ The two themes offered in 2023 are accredited by the Geological Society of London which awards the qualification of Chartered Geologist
- ◇ Candidates with an accredited MSc can apply for Chartered Geologist with fewer years of working experience
- ◇ 14 courses of the MSc are approved by the HKIE

## Network and transferable skills

- ◇ The chance to learn from top professors and leading practitioners from industry
- ◇ Technical knowledge and professional skills you can apply anywhere
- ◇ An internship in industry for selected full-time students
- ◇ A valuable network of industry connections, career advice and inspiration

## Career development

Employers of recent MSc graduates include: AECOM, Airport Authority, Arup, Arcadis, Atkins, Dragages, Fugro, Gammon, Geotechnical Engineering Office, Jacobs, MTRC, Meinhardt and Vibro

## Scholarships and financial support

- ◇ Association of Geotechnical and Geoenvironmental Specialists (Hong Kong) Scholarship
  - ◇ This \$10,000 scholarship is awarded annually on a merit basis
- ◇ Government's Extended Non-means Tested Loan Scheme (for local students only)
  - ◇ <https://www.wfsfaa.gov.hk/sfo/en/postsecondary/enls/overview.htm>
- ◇ Taufik Ali Memorial Scholarships for Postgraduate Studies
  - ◇ Persons of the Muslim faith born in Hong Kong or Penang are eligible to apply
  - ◇ The scholarship may cover tuition fees and living allowance on a case-by-case basis
  - ◇ Please contact Programme Admissions Advisor Professor Malone for details
  - ◇ For more details: <https://www.scholarships.hku.hk/Scholarships/detail/255>



## Prizes

Halcrow Prizes are awarded to the Best Student and for the Best Dissertation

## Courses reimbursable by the Continuing Education Fund (CEF)

- ◇ GEOS7012 **Site investigation and engineering geological techniques**
- ◇ GEOS8101 **Engineering geology and geotechnical design**
- ◇ GEOS8102 **Rock engineering and geomaterials**



## Host

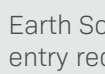
### Department of Earth Sciences

Since its establishment in 1995 the Department has focused primarily on the geology of Asia and the Asia Pacific Regions, carrying out cutting-edge research and dealing with fundamental scientific challenges of societal relevance.

Our work on applied geosciences is of importance, considering the highly urbanised setting of Hong Kong and the region. We have made significant contributions in hydrogeology, rock mechanics, engineering geology, geophysics and applied geochemistry.



Engineering geologists who wish to improve their performance in professional work

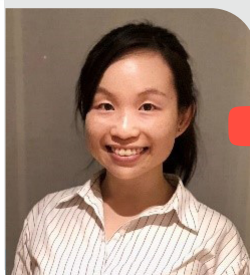


Earth Sciences or Geology graduates who wish to fulfil the entry requirements of HKIE in the Geotechnical Discipline



Engineers and scientists wanting to advance their understanding of geology and geotechnics

## Hear from our graduate



Olivia LAM  
Class of 2017

Scan to watch:



[bit.ly/3LdAdAD](https://bit.ly/3LdAdAD)

Olivia LAM (Class of 2017) is working as the Senior Business Analyst for the Group Director Development & Digital Transformation at Fugro NV in The Netherlands. Her job supports the company's mid-term strategic implementation.

# WHAT YOU WILL LEARN

## Engineering Geology theme (66 credits)

### Core courses

GEOS7010 Geology principles and practice (6 credits)<sup>^</sup> **OR**

GEOS7011 Advanced geology of Hong Kong (6 credits)\*

GEOS7033 Geology of Hong Kong (6 credits)<sup>^</sup>

GEOS7012 Site investigation and engineering geological techniques (6 credits)

GEOS7015 Rock mechanics (3 credits)

GEOS7016 Soil mechanics (3 credits)

GEOS7020 Project Part I (6 credits)

GEOS7021 Geological fieldwork I (3 credits)<sup>^</sup> **OR**

GEOS8021 Geological fieldwork II (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)

GEOS8020 Project Part II (12 credits)

GEOS8101 Engineering geology and geotechnical design (6 credits)

GEOS8102 Rock engineering and geomaterials (6 credits)

GEOS8104 Natural hillside landslide and hazard studies (3 credits)\*

GEOS8204 Basic structural mechanics and behaviour (3 credits)\*

### Elective courses

GEOS7022 Course of directed studies (3 credits)<sup>#</sup>

GEOS7036 Innovative Technology and Environmental Sustainability (3 credits)<sup>#</sup>

*Core courses for students with a first degree in Geology or a related subject:* GEOS7011, 7012, 7015, 7016, 7020, 8001, 8002, 8003, 8020, 8021, 8101, 8102, 8104, 8204 – 66 credits. GEOS7022 may be substituted for GEOS8204 if directed by the Programme Director.

*Core courses for students whose first degree is not in Geology or a related subject:* GEOS7010, 7012, 7015, 7016, 7020, 7021, 7033, 8001, 8002, 8003, 8020, 8101, 8102 – 66 credits.

## Engineering Geology with HKIE Approved Course Theme (69 credits)

### Core courses

GEOS7012 Site investigation and engineering geological techniques (6 credits)

GEOS7015 Rock mechanics (3 credits)

GEOS7016 Soil mechanics (3 credits)

GEOS7020 Project Part I (6 credits)

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)

GEOS8020 Project Part II (12 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)

### Elective course

GEOS7036 Innovative Technology and Environmental Sustainability (3 credits)<sup>#</sup>

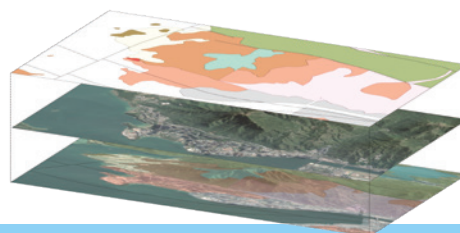
Remarks:

1. Certain courses may be accepted as electives at the discretion of the Programme Director
2. The programme structure will be reviewed from time to time and is subject to change
3. To be eligible for the award of the MSc in the field of Applied Geosciences, a student shall complete all core courses and total credits prescribed in a selected theme

\* For students with a first degree in Geology or a related subject

<sup>^</sup> For students whose first degree is not in Geology or a related subject

<sup>#</sup> As directed by the Programme Director





# WHAT YOU WILL LEARN

## **GEOS7010 Geology principles and practice**

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.

## **GEOS7011 Advanced geology of Hong Kong**

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.

## **GEOS7012 Site investigation and engineering geological techniques**

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.

## **GEOS7015 Rock mechanics**

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.

## **GEOS7016 Soil mechanics**

An examination of the basic soil mechanics theory used in geotechnical practice. The course reviews phase relationships, elasticity and plasticity, soil classification, compaction, seepage and effective stress concepts; and provides a more detailed analysis of lateral earth pressures, shear strength and consolidation.

## **GEOS7020 Project Part I**

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. This course provides a capstone experience.

## **GEOS7021 Geological fieldwork I**

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.

## **GEOS7022 Course of directed studies**

Studies to assist learning in the core courses, involving some of the following activities: professional activities, field work, laboratory work, internship, class exercises, tutorials and reading.

## **GEOS7024 Management**

This course introduces the basic knowledge of project management practice. It will cover the following topics: engineering processes, programming and procurement strategies; contract management; construction site safety, health and environmental aspects; quality control and quality assurance.

## **GEOS7033 Geology of Hong Kong**

To provide an understanding of the principal components of the geology of Hong Kong and its regional setting, including the distribution and interpretation of the main rock types, age relationships; and superficial deposits; and the locations and orientations of the main regional and local structures.

## **GEOS7036 Innovative Technology and Environmental Sustainability**

The course introduces the government policy on the adoption of digital technology and sustainability assessment in public works projects, and provides an understanding of the role of innovative technology and environmental sustainability in engineering practice through case histories and examples.

## **GEOS8001 Hydrogeology**

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.

## **GEOS8002 Professional practice in applied geosciences**

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

## **GEOS8003 Seminars on unforeseen ground conditions, geotechnical and environmental failures**

A series of student-led seminars on case histories of landslides, collapses of engineering structures, excessive ground settlement and environmental disasters. Presentations of facts and opinions are given by students based on suggested reading material. This course provides a capstone experience.

## **GEOS8020 Project Part II**

The second phase of an independent study of a problem in applied geosciences culminating in the preparation of a project report of about 10,000 words. Students will be required to make a presentation of their preliminary results. This course provides a capstone experience.

## **GEOS8021 Geological fieldwork II**

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.

## **GEOS8101 Engineering geology and geotechnical design**

An examination of civil engineering design methodology and the application of soil mechanics theory and empiricism in geotechnical design. Emphasis is given to soil slopes and embankments, earth pressure and retaining structures; and shallow and deep foundations.

## **GEOS8102 Rock engineering and geomaterials**

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.

## **GEOS8104 Natural hillside landslide and hazard studies**

The contents of this course will include most of the following topics: classification of landslides; Hong Kong terminology, examples of natural terrain landslides and documentary sources of information; hillslope evolution, geomorphological principles (including the evolutionary landform models of Dalrymple and Hansen) and Quaternary geology of Hong Kong; hillslope hydrology, modes of groundwater flow, runoff and infiltration, piping; hydrological and morphological conditions for initiation of shallow landslides in regolith; engineering geological

and geomorphological mapping; landform processes; regolith mapping, boulder identification; landslide hazard assessment; landslide susceptibility assessment for risk quantification; design event approach; landslide mobility modelling.

## **GEOS8204 Basic structural mechanics and behaviour**

The course covers most of the following topics: Behaviour of structural members subjected to tension, compression, bending, shear and torsion. Buckling of compression members. Statically determinate and indeterminate structures; including the concept of redundancy of structural members. Load transfer mechanisms of structural systems including foundations and shoring systems. General behaviour and basic concepts in design of reinforced concrete members. Structural design of foundations and retaining walls.

## **GEOS8205 Mathematics I**

This course (together with GEOS8206 Mathematics II) strives to provide a comprehensive introduction to the fundamental mathematics that all earth scientists need. Topics include the language of sets, the concept of matrices and its applications, functions, limits, first order differentiation, applications of derivatives, first order Taylor's expansion, properties of exponential and logarithmic functions, the notation of integration, integration techniques, volume of revolution, higher order differentiation and Taylor's expansion, Hessian test for functions of two variables, the concept of multiple integration, and volume using triple integration.

## **GEOS8206 Mathematics II**

This course is a continuation of GEOS8205 (Mathematics I). The first part of the course aims to teach students different solution methods to first order differential equations (separable, linear, Bernoulli, exact/non-exact types), second order linear differential equations with constant coefficients using characteristic equation, method of variation of parameters, method of educated guess. The second part introduces the concept of probability and statistics, topics include counting, probability (using the language of sets), random variables (including Binomial, Poisson, Exponential, Normal), probability density/distribution functions, cumulative distribution functions, joint distributions, independence, mean, variance, covariance, moment generating functions, sampling and confidence intervals (using Normal/t- distributions).



# YOUR PROGRAMME EXPERTS



“ We design the courses to strike a balance between basic scientific principles, applications and intellectual developments. Teaching is conducted by top professors and leading practitioners from industry. This is an MSc programme to prepare students for a robust and fruitful career. ”

## Programme Director

**Dr Louis N Y WONG**

BSc HKU; PhD MIT; FGS

## Projects Coordinator

**Professor W K PUN**

BBS; BSc HKU; MSc Lond; DIC; FHKIE

## Programme Admissions Advisor

**Professor Andrew W MALONE**

BBS; BSc Leeds; PhD Lond; DIC; FGS; FHKIE; FICE; CEng

## Part-time Lecturers

**Professor P W K CHUNG**

BSc HKU; MSc Lond; DIC; CEng; FHKIE; FGS

**Mr J HART**

BSc Edin; MSc Lond; C Geol; GeoRisk Solutions Ltd

**Professor K K S HO**

BSc (Eng), ACGI; MSc Lond; DIC; FICE; FHKIE; CEng, RPE (Geotechnical), RPE (Civil); Eurlng

**Ir I M L HO**

BEng, MPhil HKUST; MHKIE; MICE; CEng; GEO

**Mr B P HOY**

LLB; Solicitor Hong Kong, Robertsons

**Ir K C HUNG**

BEng, MSc HKUST; LLB Lond; MHKIE; MStructE, MIOM3, CEng; GEO

**Ms Rita S W HUNG**

BBA(Law), LLB, PCLL HKU; Solicitor Hong Kong; Clyde & Co

**Ir Florence W Y KO**

BEng HKUST; LLB Lond; MSc Lond; DIC; MA HKCityU; MICE; MHKIE; CEng; GEO

**Dr Vickie W W KONG**

BEng, MEng Auckland; PhD UWA; MICE; MHKIE; CEng; GEO

**Ir P C T KWOK**

MSc HKU; MHKIE; RSE; Fugro

**Ir S MILLIS**

BSc Staff; MSc Leeds; CGeol; CEng; MIMMM; MHKIE; CCBM; RPE; FGS; Arup

**Dr S W P NG**

BSc, MPhil HKU; DPhil Oxon; FGS; SEG; MinSoc; CUHK

**Dr P L NG**

BEng, PhD HKU; MBA; MHKIE; MICE; CEng; RPE; HKUST

**Professor R J SEWELL**

BSc, PhD Cant; FGS; CGeol; CSci; Eur. Geol; AGU

**Ir K STYLES**

BSc UNSW; CGeol.FGS; FIMMM; CEng; FHKIE; RPE(GEL) Meinhardt

**Dr Tammy P Y TAM**

BSc, PhD HKU; CUHK

**Dr Denise L K TANG**

BSc, MPhil HKU; PhD Wellington; GEO

**Mr M I WALLACE**

BSc Glasgow; MSc Durham; CGeol; Arup

## Admissions

### Requirements

Applicants should fulfil the University Entrance Requirements and should possess a Bachelor's degree with First or Second Class Honours (or GPA equivalent) in Science, Engineering or a related subject.

### How to apply

Application opens in **October 2022**

Application deadlines:

Non-local students: Round 1: **12:00 noon (GMT +8), January 31, 2023**

Round 2: **12:00 noon (GMT +8), April 28, 2023**

Local students: Round 1: **12:00 noon (GMT +8), January 31, 2023**

Round 2: **12:00 noon (GMT +8), May 31, 2023**

Online application  
[admissions.hku.hk/tpg/](https://admissions.hku.hk/tpg/)



### Expected graduation time for normal course of studies

Full-time: Winter (November / December 2024)

Part-time: Winter (November / December 2025)

## Further Information

### Programme details



[bit.ly/2uw5uvP](https://bit.ly/2uw5uvP)



[bit.ly/3Bbu82T](https://bit.ly/3Bbu82T)

### Support for students



[www.cedars.hku.hk/](https://www.cedars.hku.hk/)

### Enquiries

#### Department of Earth Sciences

Tel: (852) 2857 8247 E-mail: [esctpg@hku.hk](mailto:esctpg@hku.hk)

#### Programme Admissions Advisor

Professor Andrew MALONE


Tel: (852) 2559 2555 E-mail: [awmalone@hku.hk](mailto:awmalone@hku.hk)


#### Programme Director

Dr Louis N Y WONG

Tel: (852) 2241 5970 E-mail: [lrywong@hku.hk](mailto:lrywong@hku.hk)

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HKU Science

