

**REGULATIONS FOR THE DEGREES OF  
MASTER OF SCIENCE IN ENGINEERING (MSc[Eng])  
MASTER OF SCIENCE IN COMPUTER SCIENCE (MSc[CompSc]), AND  
MASTER OF SCIENCE IN ELECTRONIC COMMERCE AND INTERNET COMPUTING  
(MSc[ECom&IComp])**

*(Applicable to students admitted in the academic year 2024-25 and thereafter)*

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

The degrees of MSc(Eng), MSc(CompSc) and MSc(ECom&IComp) are each a postgraduate degree awarded for the satisfactory completion of a prescribed curriculum in the Faculty of Engineering.

For the MSc(Eng) degree, the major part of the curriculum must include courses offered in one of the following fields: building services engineering, civil engineering, electrical and electronic engineering, energy engineering, industrial engineering and logistics management, innovative design and technology, mechanical engineering, and microelectronic science and technology.

The MSc(Eng), MSc(CompSc) and MSc(ECom&IComp) curricula are offered in part-time and full-time modes.

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**MSc 1 Admission requirements**

To be eligible for admission to the curriculum leading to the degree of MSc(Eng) / MSc(CompSc) / MSc(ECom&IComp), a candidate shall:

- (a) comply with the General Regulations;
  - (b) comply with the Regulations for Taught Postgraduate Curricula;
  - (c) hold
    - (i) a Bachelor's degree of this University in a relevant field; or
    - (ii) a relevant qualification of equivalent standard from this University or from another university or comparable institution accepted for this purpose; and
    - (iii) in respect of the courses of study leading to the degree of Master of Science in Engineering in the fields of Innovative Design and Technology and Microelectronic Science and Technology, a Bachelor's degree in Engineering or related Science discipline;
    - (iv) in respect of the courses of study leading to the degree of Master of Science in civil engineering, a Bachelor's degree in related disciplines, such as Environmental Engineering, Chemical Engineering, Mechanical Engineering, Environment-related Sciences, Computer Science, Mathematics or Statistics; and
  - (d) satisfy the examiners in a qualifying examination if required.
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## **MSc 2 Qualifying Examination**

- (a) A qualifying examination may be set to test the candidate's academic ability or his/her ability to follow the curriculum prescribed. It shall consist of one or more written papers or their equivalent and may include a dissertation.
  - (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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## **MSc 3 Period of Study**

The curriculum of the degree of MSc(Eng) / MSc(CompSc) / MSc(ES&IC) shall normally extend over one academic year of full-time study or two academic years of part-time study. Candidates 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 Faculty. For both full-time and part-time modes, the period of study shall include any assessment to be held during and/or at the end of each semester.

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## **MSc 4 Curriculum Requirements**

To complete the curriculum, a candidate shall, within the prescribed maximum period of registration stipulated in Regulation MSc3 above:

- (a) satisfy the requirements prescribed in TPG6 of the Regulations for Taught Postgraduate Curricula;
  - (b) take not fewer than 72 credits of courses, in the manner specified in these regulations and syllabuses and pass all courses as specified in the syllabuses;
  - (c) follow courses of instruction and complete satisfactorily all prescribed practical / laboratory work; and
  - (d) satisfy the examiners in all forms of assessment as may be required in either
    - (i) 72 credits of courses which must include a dissertation of 24 credits or a project of 12 credits as capstone experience; or
    - (ii) at least 60 credits of courses successfully completed at this University (which must include a dissertation of 24 credits or a project of 12 credits) and not more than 12 credits of courses successfully completed at this or another university before admission to the MSc(Eng) / MSc(CompSc) / MSc(ES&IC) and approved by the Board of the Faculty.
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## **MSc 5 Dissertation or project report**

- (a) A candidate who is permitted to select a dissertation or a project is required to submit the dissertation or the project report by a date specified by the Board of Examiners.
  - (b) All candidates shall submit a statement that the dissertation or the project report represents his/her own work undertaken after the registration as a candidate for the degree.
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## **MSc 6 Selection of Courses**

- (a) A candidate shall select courses according to the guidelines stipulated in the syllabuses for the degree of MSc(Eng) / MSc(CompSc) / MSc(ECom&IComp).
  - (b) Selection of study patterns, as stipulated in the respective syllabus, shall be subject to the approval of the Head of the Department concerned.
  - (c) Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each academic year.
  - (d) Changes to the selection of courses may be made only during the add/drop period of the semester in which the course begins, and such changes shall not be reflected in the transcript of the candidate.
  - (e) Subject to the approval of the Committee on Taught Postgraduate Curricula on the recommendation of the Head of the Department concerned, a candidate may in exceptional circumstances be permitted to select additional course(s).
  - (f) Requests for changes after the designated add/drop period of the semester shall be subject to the approval of the Committee on Taught Postgraduate Curricula. Withdrawal from courses beyond the designated add/drop period will be subject to the approval of the Committee on Taught Postgraduate Curricula.
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## **MSc 7 Assessment**

- (a) The written examination for each course shall be held after the completion of the prescribed course of study for that course, and not later than January, May or August immediately following the completion of the course of study for that course unless otherwise specified in the syllabuses.
  - (b) A candidate, who is unable to complete the requirements within the prescribed maximum period of registration specified in Regulation MSc 3 because of illness or circumstances beyond his/her control, may apply for permission to extend his/her period of studies.
  - (c) A candidate who has failed to satisfy the examiners in any course(s) is required to make up for failed course(s) in the following manners:
    - (i) undergoing re-assessment/re-examination in the failed course(s); or
    - (ii) repeating the failed course(s) by undergoing instruction and satisfying the assessments; or
    - (iii) taking another course in lieu and satisfying the assessment requirements.
  - (d) A candidate who has failed to satisfy the examiners in his/her dissertation or project report may be required to submit or resubmit a dissertation or a project report on the same subject within a period specified by the Board of Examiners.
  - (e) In accordance with G9(h) of the General Regulation and TPG8(d) of the Regulations for Taught Postgraduate Curricula, there shall be no appeal against the results of examinations and all other forms of assessment.
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## MSc 8 Grading system

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

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

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## MSc 9 Discontinuation of Studies

Unless otherwise permitted by the Board of the Faculty, a candidate will be recommended for discontinuation of their studies in accordance with General Regulation G12 if he/she has:

- (a) failed to pass 12 credits in an academic year; or
- (b) failed to satisfy the examiners at a second attempt in his/her dissertation or project report within the specified period; or
- (c) failed to achieve a cumulative grade point average\* (CGPA) of 1.0 or higher for two consecutive semesters with course enrolment; or
- (d) exceeded the maximum period of registration specified in Regulation MSc3.

\* *At the end of each semester, a cumulative grade point average (CGPA) for all courses, except cross-listed undergraduate courses and outside curriculum requirement optional courses as specified in the syllabuses, taken by a student (including failed courses) at the time of calculation is computed.*

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## MSc 10 Advanced Standing

Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum in accordance with TPG3 of the Regulations for Taught Postgraduate Curricula. Candidates who are awarded Advanced Standing will not be granted any further credit transfer for those studies for which Advanced Standing has been granted. The amount of credits to be granted for Advanced Standing shall be determined by the Board of the Faculty, in accordance with the following principles:

- (a) a candidate may be granted a total of not more than 20% of the total credits normally required under a curriculum for Advanced Standing unless otherwise approved by the Senate; and
  - (b) credits granted for advanced standing shall not be included in the calculation of the GPA but will be recorded on the transcript of the candidate.
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**MSc 11 Award of Degree**

To be eligible for the award of the degree of MSc(Eng) / MSc(CompSc) / MSc(ECom&IComp), a candidate shall:

- (a) comply with the General Regulations and the Regulations for Taught Postgraduate Curricula;
  - (b) complete the curriculum and satisfy the examiners in accordance with the regulations set out; and
  - (c) achieve a cumulative grade point average (CGPA) of 1.0 or higher.
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**MSc 12 Assessment results**

On successful completion of the curriculum, candidates who have shown exceptional merit of achieving a cumulative grade point average (CGPA) of 3.6 or higher may be awarded a mark of distinction, and this mark shall be recorded on the candidates' degree diploma.

Subject to the University's approval

## **SYLLABUS FOR THE DEGREE OF MASTER OF SCIENCE IN ENGINEERING**

### **MSC(ENG) IN CIVIL ENGINEERING**

(Applicable to students admitted to the curriculum in the academic year 2022-23 and thereafter)

#### **Terminology**

Discipline course – a list of courses in the discipline within the curriculum which a candidate must pass at least a certain number of credits as specified in the regulations.

Stream specific course – course within a subject group which corresponds to the specialisation of the stream of study.

Elective course – any taught postgraduate level course offered by the Departments of the Faculty of Engineering.

#### **Curriculum Structure**

Candidates are required to complete 72 credits of courses as set out below, normally over one academic year of full-time study or two academic years of part-time study:

<b>Course Category</b>	<b>General Stream</b>	<b>Environmental Engineering Stream</b>
		<b>Geotechnical Engineering Stream</b>
		<b>Structural Engineering Stream</b>
	<b>No of credits</b>	
Discipline Courses	Not less than 36 (from Groups A to D)	Not less than 36 [Include at least 24 credits in Stream Specific Courses in the corresponding stream of study from Groups B to D]
Elective Courses	Not more than 12	Not more than 12
Capstone Experience		24
Total		72

#### **Course selection**

Candidates should select courses in accordance with the regulations of the degree. Candidates must complete 8 courses plus a dissertation (Capstone Experience).

For the General Stream, candidate can choose any discipline courses listed below in subject groups A to D, and undertake a dissertation in any area in civil engineering.

For the General Stream, students are not allowed to take more than four construction management related courses from Group A.

To qualify as a graduate of Environmental Engineering, Geotechnical Engineering or Structural Engineering Stream, candidates must pass at least 4 stream specific courses (at least 24 credits in total) in the corresponding subject group, and successfully complete a dissertation in the area of the corresponding stream.

## **Subject Groups**

### **A. General**

CIVL6007	Behavioural travel demand modelling
CIVL6009	Building planning and control
CIVL6014	Construction dispute resolution <sup>#</sup>
CIVL6015	Construction financial management <sup>#</sup>
CIVL6037	Project management – human and organisational factors <sup>#</sup>
CIVL6046	Theory of traffic flow
CIVL6047	Traffic management and control
CIVL6049	Urban development management by engineering approach <sup>#</sup>
CIVL6054	Engineering for transport systems
CIVL6058	Management of infrastructure megaprojects <sup>#</sup>
CIVL6059	Special topic in infrastructure project management
CIVL6060	Operation and maintenance of building and civil engineering works
CIVL7005	Sustainable construction technology: principles and practices <sup>#</sup>
CIVL7006	Optimization techniques for transportation applications
CIVL7007	Building information modelling (BIM): Theories, development and application <sup>#</sup>
CIVL7018	Data science for civil engineering
CIVL7019	Statistical methods for civil engineering

Students should not take more than four construction management courses (as shown in pound #).

Any courses from Group B to Group D

### **B. Environmental Engineering**

CIVL6005	Data analysis in hydrology
CIVL6006	Advanced water and wastewater treatment
CIVL6023	Environmental chemistry
CIVL6025	Environmental impact assessment of engineering projects
CIVL6029	Groundwater hydrology
CIVL6034	Municipal wastewater treatment
CIVL6040	Solid and hazardous waste management engineering
CIVL6050	Urban hydrology and hydraulics
CIVL6053	Wind engineering
CIVL6061	Special topic in environmental engineering A

CIVL6062	Special topic in environmental engineering B
CIVL6081	Recent advances in water and environmental engineering
MEBS6004	Built environment
MEBS6010	Indoor air quality
MECH6017	Noise and vibration
MECH6019	Sources and control of air pollution

### **C. Geotechnical Engineering**

CIVL6004	Advanced soil mechanics
CIVL6025	Environmental impact assessment of engineering projects
CIVL6026	Finite element method
CIVL6027	Foundation engineering
CIVL6028	Ground improvement
CIVL6043	Special topic in geotechnical engineering A
CIVL6044	Special topic in geotechnical engineering B
CIVL6077	Ground investigation and soil testing
CIVL6078	Rock mechanics and rock engineering
CIVL6079	Slope engineering
CIVL6083	Practical design and construction of tunnels in Hong Kong
CIVL7002	Geotechnical analysis and case histories
CIVL7010	Advanced engineering geology

### **D. Structural Engineering**

CIVL6003	Advanced reinforced concrete structure design
CIVL6008	Bridge engineering
CIVL6009	Building planning and control
CIVL6013	Concrete technology
CIVL6025	Environmental impact assessment of engineering projects
CIVL6026	Finite element method
CIVL6027	Foundation engineering
CIVL6045	Tall building structures
CIVL6053	Wind engineering
CIVL6060	Operation and maintenance of building and civil engineering works
CIVL6063	Special topic in structural engineering A
CIVL6064	Special topic in structural engineering B
CIVL6080	Fire engineering design of structures
CIVL7003	Space structures
CIVL7008	Seismic analysis for building structures
CIVL7020	Advanced prestressed concrete

Candidates may select no more than 2 courses (at most 12 credits in total) offered by other taught postgraduate curricula in the Faculty of Engineering as electives. All course selection will be subject to approval by the Programme Director and Course Coordinators concerned.

The following is a list of the discipline courses offered by the Department of Civil Engineering for the MSc(Eng) in Civil Engineering curriculum. The list below is not final and some courses may not be offered every year.



All courses are assessed through examination and/or coursework assessment, the weightings of which are subject to approval by the Board of Examiners. The coursework:examination ratio for courses ranged from 15:85 to 50:50.

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### **CIVL7009    Dissertation (24 credits)**

On admission to the curriculum, students will undertake a supervised dissertation which will be assessed. The dissertation must relate to the subject matter and be agreed by the Department of Civil Engineering. The progress of the dissertation work will be assessed according to a timeframe set by the Department of Civil Engineering for submission of the following:

- (a) a tentative title, an outline and an inception report on the dissertation,
- (b) a written report on the preliminary findings of the dissertation, and
- (c) a draft dissertation and the final version of dissertation.

Failure to satisfy the examiners in the dissertation milestones specified by the Department of Civil Engineering shall be considered as unsatisfactory performance or progress.

Students also have to attend some supporting courses, such as visits, seminars and workshops (on report writing, professional ethics and safety...etc). Assessment will be based on completion of quizzes of the workshops; attendance and summary reports for the visits and/or seminars.

The final assessment of the dissertation shall be by an oral presentation AND a dissertation. Students are **REQUIRED** to give an oral presentation on the findings of their dissertation in the form of a seminar at a time agreed by the Department of Civil Engineering prior to the submission of the dissertation. Failure in the oral presentation may lead to a failure in the dissertation as a whole.

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### **CIVL6003    Advanced reinforced concrete structure design (6 credits)**

Flexural, shear and torsional behaviours of reinforced concrete members; yield line theory; strut and tie theory; ductile design of reinforced concrete beams and columns; design of high-strength concrete members.

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### **CIVL6004    Advanced soil mechanics (6 credits)**

Soil behaviour; stresses and strains in soil masses; stress path; soil deformation and consolidation theory; soil strength and failure criteria of soils; soil modelling techniques; laboratory testing applications.

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**CIVL6005 Data analysis in hydrology (6 credits)**

Time series analysis; hydrological forecasting; artificial neural networks in hydrology; chaos in hydrological time series.

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**CIVL6006 Advanced water and wastewater treatment (6 credits)**

Water/wastewater characteristics and standards; coagulation/flocculation; sedimentation and filtration; membrane separation; adsorption; chemical oxidation; disinfection; biological removal of organic pollutants and nutrient.

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**CIVL6007 Behavioural travel demand modelling \* (6 credits)**

Demand theory; statistical models; survey methods in transport; land use transportation models; disaggregate choice models; behavioural concepts in choice modeling.

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**CIVL6008 Bridge engineering (6 credits)**

Choice of structural systems; construction materials; construction methods; loading on bridges; structural analysis of bridges; bridge substructures; bridge parapets, bearings and movement joints.

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**CIVL6009 Building planning and control (6 credits)**

Advanced building planning and control methods; Buildings ordinance and regulations; Building control mechanism; Site safety supervision and safety assurance; Quality assurance of materials and construction; Demolition works; Excavations, shoring, and temporary works; Project management and contract administration.

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**CIVL6013 Concrete technology (6 credits)**

Concrete mixes; quality control; in-situ strength assessment; non-destructive testing; cracks and other defects; maintenance and repair.

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**CIVL6014 Construction dispute resolution (6 credits)**

Introduction to disputes, claims and methods of dispute avoidance and resolution in construction; mediation; arbitration: fundamental principles, arbitration agreement, arbitration rules, appointment of arbitrators, power and duties of arbitrators, pre-hearing proceedings, hearing, award, role of the court; other ADR (alternative dispute resolution) methods; litigation.

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**CIVL6015 Construction financial management \* (6 credits)**

Estimating and costing; tendering strategy; productivity analysis; financial accounting; financial management; management accounting; taxation effects.

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**CIVL6023 Environmental chemistry (6 credits)**

Water chemistry; microbial biochemistry; water pollution and treatment; soil chemistry; hazardous wastes; environmental chemical analyses.

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**CIVL6025 Environmental impact assessment of engineering projects (6 credits)**

Environmental impact assessment process; methodologies to assess environmental impacts on water, air, and land; environmental management; case studies, e.g. on transportation projects, environmental control facilities and reclamation works.

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**CIVL6026 Finite element method (6 credits)**

Elasticity; calculus of variation; energy methods; shape functions; two and three-dimensional problems; linear elasticity problems; field problems.

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**CIVL6027 Foundation engineering (6 credits)**

Introduction to foundation engineering; shallow foundations; bearing capacity; stress distribution and settlements; deep foundations; pile installation and construction control; pile load tests; inspection of deep foundations; foundation on slopes.

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**CIVL6028 Ground improvement (6 credits)**

Some principal ground improvement techniques for both granular and soft deposits, viz. surcharging with and without vertical drains, deep mixing methods, dynamic compaction and vibration, stone columns, grouting, geosynthetics and reinforced soil techniques, soil nailing and other novel schemes; principles and design considerations through worked examples and case studies; techniques of obtaining relevant soil parameters for design and the verification methods.

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**CIVL6029 Groundwater hydrology (6 credits)**

Principle of groundwater flow, flow equations and modeling. Flow to wells, groundwater monitoring, contamination and remediation. Special topics such as surface water groundwater interactions and sea water intrusion.

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**CIVL6034    Municipal wastewater treatment (6 credits)**

Municipal wastewater flows and characteristics; sewerage systems; preliminary, primary and secondary treatment processes; wastewater disinfection; advanced treatment for nutrient removal; sludge processing and disposal.

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**CIVL6037    Project management - human and organisational factors \* (6 credits)**

Management theories; organisations structures and cultures; project management and project teams; leadership; ethics; communication; negotiations; recruitment; engineers in the society.

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**CIVL6040    Solid and hazardous waste management engineering (6 credits)**

Resource use in modern society; sources, characteristics, and quantities of waste; environmental impact; waste prevention, reduction, and recycling; collection, transfer and transport; mechanical, biological, chemical and thermal processing; final disposal; case studies.

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**CIVL6043    Special topic in geotechnical engineering A (6 credits)**

This course provides an opportunity for students to study in-depth an area of geotechnical engineering of interest to students and staff alike. The topic will be announced in the beginning of the semester when the course is offered.

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**CIVL6044    Special topic in geotechnical engineering B (6 credits)**

This course provides an opportunity for students to study in-depth an area of geotechnical engineering of interest to students and staff alike. The topic will be announced in the beginning of the semester when the course is offered.

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**CIVL6045    Tall building structures (6 credits)**

Coupled shear/core walls; coupling effects of beams and slabs; finite element analysis of building structures; wall-frame interaction; framed-tube structures; tube-in-tube structures; outrigger braced structures; shear lag effects in core walls.

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**CIVL6046 Theory of traffic flow \* (6 credits)**

Measurements and statistical distributions of traffic characteristics; traffic stream models; car-following theories; hydrodynamic theory of traffic flow; traffic queues and delays.

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**CIVL6047 Traffic management and control \* (6 credits)**

Transportation networks; network equilibrium concepts; estimation of origin-destination matrix; traffic management measures; traffic control techniques.

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**CIVL6049 Urban development management by engineering approach (6 credits)**

Urban development process, introductory town planning; transport modelling; integration of infrastructure and service planning; optimisation and risk management; integration of planning and implementation of engineering works; urban development; project management; principles of building control; integration of theory and practice; case studies.

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**CIVL6050 Urban hydrology and hydraulics (6 credits)**

Rainfall-runoff; hydrograph prediction; unsteady flow, flood routing; culvert hydraulics; flood control structures; stormwater management; storage concepts; river restoration; case studies.

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**CIVL6053 Wind engineering (6 credits)**

Statistical description of wind, parent and extreme wind data, wind profiles, wind effects on buildings and structures, wind pressures, quasi-steady approach, wind-induced vibration, dampers, codification of dynamic effects, wind effects on building ventilation, pedestrian-level wind environment, wind effects on pollutant dispersion, wind tunnel techniques.

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**CIVL6054 Engineering for transport systems \* (6 credits)**

Engineering appreciation of the transport systems; transport infrastructure development; choice of transportation systems; fixed track systems; application of technology in transport.

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**CIVL6058 Management of infrastructure megaprojects (6 credits)**

Public Works financing; Public-Private-Partnerships (PPPs) including BOT-type developments; selecting appropriate procurement frameworks; multi-party contractual links; co-ordinating large work packages; interface management; JVs and cross-cultural issues; risk management; decision analysis; value management.

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**CIVL6059 Special topic in infrastructure project management (6 credits)**

This course provides an opportunity for students to study in-depth an area of infrastructure project management of interest to students and staff alike. The topic will be announced in the beginning of the semester when the course is offered.

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**CIVL6060 Operation and maintenance of building and civil engineering works (6 credits)**

Maintenance Strategies and Techniques; Digital Documentation and Information Management; Maintenance Planning and Control; Energy Efficiency and Carbon Emission in Maintenance; Artificial Intelligence for Maintenance; Details of MBIS and MWIS; Maintenance Practice of Private Buildings in HK; Design Factors for Buildings; Bridge Operation incl. Prestressing & Steel Bridges; Bridge Maintenance Strategies; An Introduction to Forensic Engineering; Expert Evidence and Expert Witness.

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**CIVL6061 Special topic in environmental engineering A (6 credits)**

This course provides an opportunity for students to study in-depth an area of environmental engineering of interest to students and staff alike. The topic will be announced in the beginning of the semester when the course is offered.

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**CIVL6062 Special topic in environmental engineering B (6 credits)**

This course provides an opportunity for students to study in-depth an area of environmental engineering of interest to students and staff alike. The topic will be announced in the beginning of the semester when the course is offered.

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**CIVL6063 Special topic in structural engineering A (6 credits)**

This course provides an opportunity for students to study in-depth an area of structural engineering of interest to students and staff alike. The topic will be announced in the beginning of the semester when the course is offered.

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**CIVL6064 Special topic in structural engineering B (6 credits)**

This course provides an opportunity for students to study in-depth an area of structural

engineering of interest to students and staff alike. The topic will be announced in the beginning of the semester when the course is offered.

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**CIVL6077 Ground investigation and soil testing (6 credits)**

Need for ground investigation; planning and procedures of ground investigation; drilling and sampling methods; *in-situ* tests; geophysics; soil and rock classification systems; geological modelling; ground investigation contract; supervision and statutory control of ground investigation works; groundwater measurement and hydrogeology; field instrumentation techniques; observational method in civil engineering; laboratory soil tests; stress-path and its applications.

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**CIVL6078 Rock mechanics and rock engineering (6 credits)**

Rock mass classification; rock mass strength and deformability as a function of structural defects such as joints; faults and bedding planes; in-situ rock stresses and their measurement; ground water percolation in rock; underground excavations and rock support system design; rock slope stability analysis; rock foundations; case histories in rock engineering; numerical methods; rock joint strength parameters; rockfall control.

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**CIVL6079 Slope engineering (6 credits)**

Slope engineering in Hong Kong; geological models for slopes; slope stability analysis methods; landslip investigation; soil nailing; slope stabilization measures; surface drainage and protection; slope construction and monitoring; slope safety management and maintenance; natural terrain study.

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**CIVL6080 Fire engineering design of structures (6 credits)**

Fire behaviour, fire safety, design principles for structures in fire, prescriptive and performance-based approach, fire load and standard fire test, temperature prediction of compartment, temperature prediction of steel and reinforced concrete members, behaviour of concrete material under elevated temperature, design of steel, reinforced concrete and composite structures in fire, practical structural fire design.

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**CIVL6081 Recent advances in water and environmental engineering (6 credits)**

Environmental hydraulics, fluid mechanics, hydrology, environmental microbiology, water chemistry, water and wastewater treatment technologies.

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**CIVL6083 Practical design and construction of tunnels in Hong Kong (6 credits)**

Introduction to tunneling; shallow tunnels; deep tunnels; stress distribution and settlements around underground opening; site investigation requirements; analysis and design of underground opening; ground convergence support reaction curves, soil structure interaction; construction methods; control of groundwater; construction monitoring; risk management and construction contract.

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**CIVL7002 Geotechnical analysis and case histories (6 credits)**

Reviewing basics of finite difference and finite element techniques; common soil constitutive models; numerical modelling in geotechnical construction; potentials and limitations of modelling; analytical solutions in geotechnics; lesson learnt from case histories.

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**CIVL7003 Space structures (6 credits)**

Design considerations for planar frames; double layer grids; barrel vaults, braced domes; geodesic domes; cable structures; membrane structures; expandable and foldable systems; joint systems; construction methods, optimisation techniques and stability checks.

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**CIVL7005 Sustainable construction technology: principles and practices (6 credits)**

This course provides in-depth knowledge of technology in the context of sustainable construction, with the syllabus covering concepts of sustainable construction; systems theories; technological innovation theories; types of technology and their applications; technology selection and management strategy.

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**CIVL7006 Optimization techniques for transportation applications (6 credits)**

Linear programming, nonlinear programming, network optimization, and integer optimization methods for solving transportation problems.

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**CIVL7007 Building information modelling (BIM): Theories, development and application (6 credits)**

This course is designed to equip students with the basic concept of BIM, its history in Hong Kong, the value to project management, the best practice and the way to apply BIM in infrastructure and construction projects.

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**CIVL7008 Seismic analysis for building structures (6 credits)**

Structural dynamics; vibration of single-degree-of-freedom systems; vibration of multiple-degree-of-freedom systems; base-shear method; response spectrum analysis; coefficient-based method; Seismic drift demand and capacity.

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**CIVL7010 Advanced engineering geology (6 credits)**

Hard rock geology and geological structures; the sedimentary system; geological controls of engineering works; engineering geology of Hong Kong rocks and soils; earth surface processes; weathering and ground profiles; unsaturated soils; problematic soils; aquifers and source protection zones; desk studies and applied geophysics; ground models.

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**CIVL7018 Data science for civil engineering (6 credits)**

Machine learning (including supervised learning, unsupervised learning, reinforcement learning) for solving civil engineering problems.

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**CIVL7019 Statistical methods for civil engineering (6 credits)**

This course aims to provide students with a comprehensive exposition of the use of statistical methods/models that are useful in analyzing data commonly encountered in civil engineering. Topics will include basic tools for statistical model building, linear models, logit models, count and discrete dependent variables, and duration models. Software packages such as EXCEL, SPSS, and R will be used to support the demonstration of the practical application of data analysis and model building in the course.

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**CIVL7020 Advanced prestressed concrete (6 credits)**

This course covers the basic concepts and theories of prestressed concrete analysis and design as well as advanced topics such as time-dependent effects, external prestressing and seismic resistance for prestressed concrete structures. It also provides students with the background knowledge on prestressing operations in construction and an overview of the practical applications of prestressing, with further focus on its application to bridge construction.

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**MEBS6004 Built environment (6 credits)**

For descriptions, see the syllabus of the MSc(Eng) in Building Services Engineering curriculum.

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**MEBS6010 Indoor air quality (6 credits)**

For descriptions, see the syllabus of the MSc(Eng) in Building Services Engineering curriculum.

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**MECH6017 Noise and vibration (6 credits)**

For descriptions, see the syllabus of the MSc(Eng) in Mechanical Engineering curriculum.

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**MECH6019 Sources and control of air pollution (6 credits)**

For descriptions, see the syllabus of the MSc(Eng) in Mechanical Engineering curriculum.

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\* Approved for reimbursement from the Continuing Education Fund (CEF).

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