

REGULATIONS FOR THE DEGREE OF MASTER OF SCIENCE IN ENGINEERING (MSc[Eng])

(See also General Regulations)

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 in Engineering (MSc[Eng]) is a postgraduate degree awarded for the satisfactory completion of a course of study in the Faculty of Engineering. The major part of the curriculum must be formed from modules offered in one of the following fields: building services engineering, electrical and electronic engineering, energy engineering, environmental engineering, geotechnical engineering, industrial engineering and logistics management, infrastructure project management, mechanical engineering, structural engineering, and transportation engineering. The MSc(Eng) programme is offered in part-time and full-time mode.

E12 Admission requirements

To be eligible for admission to the courses leading to the degree of Master of Science in Engineering, a candidate shall

- (a) comply with the General Regulations;
 - (b) hold
 - (1) a Bachelor's degree of this University in a relevant subject¹; or
 - (2) another relevant qualification of equivalent standard from this University or from another university or comparable institution accepted for this purpose; or
 - (3) a Postgraduate Diploma in Engineering (PDipEng) of this University in a relevant field²;
 - (c) satisfy the examiners in a qualifying examination if required.
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E13 Qualifying examination

- (a) A qualifying examination may be set to test the candidate's formal academic ability or his ability to follow the courses of study prescribed. It shall consist of one or more written papers or their equivalent and may include a project report.
- (b) A candidate who is required to satisfy the examiners in a qualifying examination shall not be permitted to register until he has satisfied the examiners in the examination.

¹ For MSc(Eng) in Building Services Engineering: engineering or related sciences.

For MSc(Eng) in Electrical and Electronic Engineering: physics, mathematics or engineering.

For MSc(Eng) in Energy Engineering: engineering or related sciences

For MSc(Eng) in Environmental Engineering: engineering or related sciences.

For MSc(Eng) in Geotechnical Engineering: civil engineering.

For MSc(Eng) in Industrial Engineering and Logistics Management: engineering, science, mathematics, statistics or related business studies.

For MSc(Eng) in Infrastructure Project Management: engineering.

For MSc(Eng) in Mechanical Engineering: engineering, physical sciences or mathematics.

For MSc(Eng) in Structural Engineering: civil engineering.

For MSc(Eng) in Transportation Engineering: engineering or related sciences.

² Apply to students admitted to Postgraduate Diploma in Engineering in academic year 1998-99.

E14 Award of degree

- (a) To be eligible for the award of the degree of Master of Science in Engineering a candidate shall comply with the General Regulations; and complete the curriculum and satisfy the examiners in accordance with the regulations set out below.
 - (b) A candidate who has completed eight modules but has not satisfied the examiners for the award of the degree of Master of Science in Engineering may be awarded a PDipEng, subject to approval of the Faculty Board.
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E15 Length of curriculum

For the part-time mode of study, the curriculum shall extend over not less than two and not more than three academic years of study. For the full-time mode, the curriculum shall extend over not less than one and not more than two academic years of study. In both cases, a minimum of 300 hours of prescribed work are required.

E16 Completion of curriculum

- (a) To complete the curriculum a candidate shall, within the prescribed maximum period of study stipulated in Regulation E15 above:
 - (i) follow courses of instruction and complete satisfactorily all prescribed practical / laboratory work; and
 - (ii) satisfy the examiners in all forms of assessment as may be required in either
 - (1) twelve modules which may include a project report or dissertation of four modules;
or
 - (2) at least nine modules successfully completed at this University (which may include a project report or dissertation of four modules) and not more than three modules successfully completed at this or another university before admission to the Master of Science in Engineering and approved by the Faculty Board.
 - (b) A candidate who fails to fulfill the requirements within the specified (i) three years for the part-time mode of study (ii) two years for the full-time mode shall be recommended for discontinuation under the provisions of General Regulation G12, except that a candidate, who is unable because of illness or circumstances beyond his control to complete the requirements within the prescribed maximum period of study, may apply for permission to extend his period of studies. Any such application shall be made within two weeks of the first day of the examination paper in question.
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E17 Course selection

- (a) Selection of study patterns shall be made in consultation with and be subject to the approval of the Head of the Department³ concerned.
- (b) A candidate who is permitted to select 12 modules not including a project report or dissertation of 4 modules shall select eight modules from the syllabuses of the candidate's approved field of study.
- (c) A candidate who is permitted to select 8 modules and a project report or dissertation of 4 modules shall select a minimum of five modules from the syllabuses of the candidate's approved field of study.
- (d) Subject to the approval of the Faculty Higher Degrees Committee on the recommendation

³ The Course Co-ordinator in respect of MSc(Eng) in Building Services Engineering and the Programme Director in MSc(Eng) in Internet Computing and in Electronic Commerce.

of the Head of the Department³ concerned, a candidate may in exceptional circumstances be permitted to select an additional module.

E18 Project report or dissertation

- (a) For part-time mode of study, a candidate shall submit the title of his project report or dissertation by a date specified by the Board of Examiners. A candidate may submit his completed project report or dissertation after the successful completion of four modules but shall not submit it later than the end of April of the third academic year of his studies unless special permission is granted for this period to be extended.
 - (b) For the full-time mode of study, a candidate shall submit the title of his project or dissertation by a date specified by the Board of Examiners. A candidate must submit the completed project report or dissertation not later than the end of April of the second academic year of his studies unless special permission is granted for this period to be extended.
 - (c) All candidates enrolled in any mode of study shall submit a statement that the project report or dissertation represents his own work (or in the case of conjoint work, a statement countersigned by his co-worker, which shows his share of the work) undertaken after the registration as a candidate for the degree.
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E19 Examinations

- (a) The written examination for each module shall be held after the completion of the prescribed course of study for that module, and not later than January, May or August immediately following the completion of the course of study for that module.
 - (b) A candidate who has failed to satisfy the examiners in a module or modules may be permitted to present himself either for re-examination in the module or modules of failure or for examination in the same number of new modules when the examination is next held. To proceed to the following year of the curriculum, a candidate must satisfy the examiners in a minimum of two modules in each academic year. A candidate who passes in less than two modules in an academic year may be recommended for discontinuation of studies under the provisions of General Regulation G12.
 - (c) A candidate who has presented an unsatisfactory project report or dissertation may be required to submit a revised project report or dissertation on the same subject within a specified period.
 - (d) A candidate who has presented an unsatisfactory project report or dissertation for a second time shall be recommended for discontinuation of studies under the provisions of General Regulation G12.
 - (e) A candidate who has failed to submit a satisfactory project report or dissertation within the prescribed maximum period of study, including any extension, shall be recommended for discontinuation of studies under the provisions of General Regulation G12.
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E20 Examination results

At the conclusion of the examination and after presentation of the project reports or dissertations, a pass list shall be published. A candidate who has shown exceptional merit or merit at the whole examination may be awarded a mark of distinction or credit, as appropriate, and this mark shall be recorded on the candidate's degree diploma.

SYLLABUSES FOR THE DEGREE OF MASTER OF SCIENCE IN ENGINEERING⁴ (MSc[Eng])

MSC(ENG) IN BUILDING SERVICES ENGINEERING

Programme Objectives

The programme provides advanced education in the fields of design, management and operation of modern building services engineering systems to practising engineers or related professionals who wish to acquire new knowledge and keep abreast of technical developments in the building services industry.

Modes of Study

There are two modes of study available: full-time or part-time. Classes will normally be arranged in the evening on weekdays and in the morning on Saturdays. For the full-time students, some courses may also be taught in the daytime on weekdays.

The full-time programme requires a student to satisfactorily complete 8 modules and a project within a study period of 1 to 2 years. For the students enrolled in the part-time programme, they may opt to either satisfactorily complete 12 modules or 8 modules plus a project within a study period of 2 to 3 years.

Study Modules

The following study modules are the core courses of the programme. A number of these core courses will be selected for offer to students in each academic year. A student who does not undertake a project must complete at least 8 core courses whereas a student who undertakes a project must complete at least 5 core courses. Optional courses are available from other MSc programmes in the Faculty of Engineering for selection by students.

The following list is not final and some courses may not be offered every year.

MEBS6000 Utility services

Cold and hot water supply: water distribution systems, patterns of usage, estimation of requirements, simultaneous demand, storage capacity, pumping arrangements, calorifiers and water heaters; steam systems: low and high pressure systems, boilers and heat exchangers, steam supply piping and condensate return, insulation, steam trapping; drainage systems and sewage disposal: stormwater and sanitary drainage systems, rainfall intensity, simultaneous sanitary discharge, sizing of drains and sewers, methods of sewage disposal, primary and secondary treatments; types of electric motors; electromagnetism for utilities; lifts, escalators and conveyors: lift traffic analysis, design calculation, electrical and mechanical features, code of practice; electric heating; design challenges in futuristic buildings.

MEBS6001 Electrical installations

Supply rules, standards and codes of practice; types of electrical systems; distribution in buildings; factory built assemblies; protective devices and safety interlocks; overcurrent and fault protection;

⁴ Candidates who have failed to satisfy the examiners for the Degree of M.Sc.(Eng.) may on termination of their study be awarded a Postgraduate Diploma in Engineering, subject to approval of the Faculty Board.

Topics include: characteristic length scales, nanomaterials, nanostructures, physical properties of nanostructures, deposition techniques of nanofabrication, micro/nanolithography, high resolution analysis and characterization, scanning probe methods, nanoindentation, mechanical behaviours of bulk nanostructured materials, processing techniques for bulk nanostructured materials, ultrahigh strength of nanostructures, bio-nanotechnology, energy storage, energy conversion, nanophotonics, plasmonics, optical metamaterial.

Students who have taken and passed MECH 6040 will not be allowed to take MECH6045.

MECH6046 Microsystems for energy, biomedical and consumer electronics applications

Microelectromechanical systems (MEMS) and microfluidics have gradually found numerous applications in modern energy, mechanical engineering and biomedical engineering applications. This course aims to provide students with the necessary fundamental knowledge and experience in the working principles, design, materials, fabrication and packaging, and applications of MEMS and microfluidic systems. MEMS and microfluidic devices are emerging platforms for modern engineering applications in biomedicine, chemistry, material sciences and micro-machines. This is the course that will introduce graduate students and practicing engineers into the growing field of microsystem engineering. Practical examples will be given when delivering each major topic. Teaching of the module is also strengthened with case studies on carefully chosen topics. At the end of this course, students who fulfill the requirements of this course will be able to: (1) demonstrate ability to understand the fundamental principles behind MEMS and microfluidic; (2) differentiate different MEMS and microfluidic techniques and understand their importance in modern engineering; (3) apply concepts of micro-systems for industrial applications, particularly in energy, mechanical engineering and biomedical engineering.

Topics include: MEMS and microsystem products; microsensors; microactuators; microfluidic devices; multidisciplinary nature of microsystem design and manufacture; fluid mechanics in microscaled flows; materials for MEMS and microfluidic devices; fluid mechanics in microscaled flows; fabrication techniques of MEMS and microfluidic devices; flow characterization techniques; flow control with microfluidics; microfluidics for life sciences and chemistry.

Students who have taken and passed MECH 6032 will not be allowed to take MECH6046.

MECH6047 Finite element analysis in mechanics

This course aims to: (1) introduce the basic concepts and procedures in finite element analysis; (2) introduce the methods of analysis using the finite element method for mechanics problems in engineering; and (3) provide hands-on experience on conducting various mechanics analyses by using a state-of-the-art finite element software.

Topics include: concepts and procedures in finite element analysis; elasticity analysis; beam/plate analysis; dynamic analysis; geometric and material nonlinear analysis; contact analysis; hands-on experience of finite element analysis.

CIVL6002 Advanced finite elements

Equilibrium and virtual work principle; variation principle; numerical integration; computer applications; convergence and error estimate; hybrid and mixed methods for multi-field problems; enhanced and assumed strain method; nonlinear problems.

* Approved for reimbursement from the Continuing Education Fund (CEF) (applicable to Hong Kong Residents only).

MSC(ENG) IN STRUCTURAL ENGINEERING

The curriculum provides advanced education in the field of Structural Engineering. Students are required to successfully complete twelve modules which must include a project report or dissertation of four modules, on a subject within his approved field of study.

The list of courses below is not final, and may be changed from time to time. Courses are one-module courses unless otherwise specified. Students who intend to complete the curriculum in one academic year should check with the Department of Civil Engineering for the availability of the courses.

(A) FIVE to EIGHT modules from the following list of courses or courses approved by the Department of Civil Engineering:

CIVL6002 Advanced finite elements

For course descriptions, see the syllabuses of the MSc(Eng) in Geotechnical Engineering programme.

CIVL6003 Advanced reinforced concrete structure design

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.

CIVL6008 Bridge engineering

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

CIVL6009 Building planning and control

For course descriptions, see the syllabuses of the MSc(Eng) in Infrastructure Project Management programme.

CIVL6013 Concrete technology

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

CIVL6025 Environmental impact assessment of engineering projects

For course descriptions, see the syllabuses of the MSc(Eng) in Environmental Engineering programme.

CIVL6026 Finite element method

For course descriptions, see the syllabuses of the MSc(Eng) in Geotechnical Engineering programme.

CIVL6027 Foundation engineering

For course descriptions, see the syllabuses of the MSc(Eng) in Geotechnical Engineering programme.

CIVL6045 Tall building structures

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.

CIVL6053 Wind engineering

For course descriptions, see the syllabuses of the MSc(Eng) in Environmental Engineering programme.

CIVL6060 Operation and maintenance of building and civil engineering works

For course descriptions, see the syllabuses of the MSc(Eng) in Infrastructure Project Management programme.

CIVL6063 Special topic in structural engineering A

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.

CIVL6064 Special topic in structural engineering B

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.

CIVL6072 Design of cold-formed steel structures

Cold-formed steel structures; concepts of local buckling; effective width design method; shift of effective centroid; new design approach using direct strength method; design of structural steel building.

CIVL6073 Professional practice in building development

For course descriptions, see the syllabuses of the MSc(Eng) in Infrastructure Project Management programme.

CIVL6080 Fire engineering design of structures

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.

CIVL7003 Space structures

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.

(B) Not more than THREE modules from the MSc(Eng) courses offered by the Department of Civil Engineering other than those listed in (A) above, or courses offered by other Departments subject to the approval of the Head of the Department of Civil Engineering.

(C) CIVL6001 Project (4 modules)

For course descriptions, see the syllabuses of the MSc(Eng) in Environmental Engineering programme.

MSC(ENG) IN TRANSPORTATION ENGINEERING

The curriculum provides advanced education in the field of Transportation Engineering. Students are required to successfully complete twelve modules which must include a project report or dissertation of four modules, on a subject within his approved field of study. Courses are one-module courses unless otherwise specified. The list below is not final and some courses may not be offered every year. Students who intend to complete the curriculum in one academic year should check with the Department of Civil Engineering for the availability of the courses.

(A) FIVE to EIGHT modules from the following list of courses or courses approved by the Department of Civil Engineering:

CIVL6007 Behavioural travel demand modelling *

This course will cover the basic as well as modern and advanced techniques in travel demand modelling. Topics will include demand theory, statistical models, survey methods in transport, land use transportation models, disaggregate choice models, and behavioural concepts in choice modelling. Software packages such as R, SPSS and SAS will be used to support the demonstration of practical applications of data analysis and model building in the course.

CIVL6025 Environmental impact assessment of engineering projects

For course descriptions, see the syllabuses of the MSc(Eng) in Environmental Engineering programme.

CIVL6035 Highway pavement engineering

For course descriptions, see the syllabuses of the MSc(Eng) in Geotechnical Engineering programme.

CIVL6037 Project management - human and organisational factors *

For course descriptions, see the syllabuses of the MSc(Eng) in Infrastructure Project Management programme.

CIVL6046 Theory of traffic flow *

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

CIVL6047 Traffic management and control *

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

CIVL6048 Planning of transport infrastructure systems *

Introduction to systems engineering, urban system models, network modelling concepts and techniques, trip assignment models.

CIVL6049 Urban development management by engineering approach

For course descriptions, see the syllabuses of the MSc(Eng) in Infrastructure Project Management programme.

CIVL6054 Engineering for transport systems *

This course provides the students an engineering appreciation of the transport systems, including planning, policy formulation, design, implementation and operation. It covers both the theoretical frameworks and practical examples under various topics in transportation engineering. Key aspects of transport infrastructure development, choice of transportation systems, fixed track systems, road safety, application of technology in transport etc. will be presented.

CIVL6056 Special topic in transportation engineering A

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

CIVL6057 Special topic in transportation engineering B

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

CIVL6070 Logistics and transportation *

The logistics supply chain, evolution of logistics and the supply chain as management disciplines; the customer service dimensions; transportation fundamentals, transportation decisions; inventory concepts, inventory management; facility location decisions, the network planning process; logistics organization, best practice and benchmarking; discussion on contemporary issues in logistics.

CIVL6084 Statistical methods for transportation

This course will cover a wide variety of analytical tools used in transportation studies, from the fundamentals to modern and advanced techniques in data analysis. Topics will include basic tools for statistical model building, linear models, time series and forecasting, count and discrete dependent variables, duration models, and analysis of longitudinal data. Software packages such as R, SPSS and SAS will be used to support the demonstration of data analysis in the course.

CIVL7001 Railway asset management

For course descriptions, see the syllabuses of the MSc(Eng) in Infrastructure Project Management programme.

CIVL7004 Traffic impact assessment

This course focuses on Traffic Impact Assessments (TIA's) for professional traffic engineers and transport planners, and aims to upgrade the capability and competency of students to conduct TIA's independently, convincingly and satisfactorily in their professional career. It covers the essence for carrying out TIA's for single isolated developments, TIA's for developments such as extensive developments and reclamation areas, TIA's for the commissioning of highway and public transport infrastructures, TIA's for changes of transport policies, TIA's for special traffic generators, and TIA's encountered in Mainland China. This course also covers the development of technical, presentational and public relation skills for professional TIA report writing and presentation of study findings to public bodies or relevant authorities in a persuasive manner, the applications of the traffic engineering and transport planning techniques in TIA's, as well as the development of skills required to obtain efficient and cost-effective solutions to problems identified in TIA's.

CIVL7006 Optimization techniques for transportation applications

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

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

(B) Not more than THREE modules from the MSc(Eng) courses offered by the Department of Civil Engineering other than those listed in (A) above, or courses offered by other Departments subject to the approval of the Head of the Department of Civil Engineering.

(C) CIVL6001 Project (4 modules)

For course descriptions, see the syllabuses of the MSc(Eng) in Environmental Engineering programme.
