

## **MSC(ENG) IN INFRASTRUCTURE ENGINEERING AND MANAGEMENT**

(Applicable to students admitted to the curriculum in the academic year 2025-26 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>Digital Infrastructure Stream</b>
	<b>Infrastructure Project Management Stream</b>
Discipline Courses	Not less than 36 [Include at least 24 credits in Stream Specific Courses in the corresponding stream of study]
Elective Courses	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).

To qualify as a graduate of Digital Infrastructure Stream or Infrastructure Project Management 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**

#### **Digital Infrastructure**

CIVL6054	Engineering for transport systems
CIVL6060	Operation and maintenance of building and civil engineering works

CIVL7007	Building information modeling (BIM): Theories, development and application
CIVL7018	Data science for civil engineering
CIVL7019	Statistical methods for civil engineering
CIVL7022	Artificial intelligence for construction engineering and management
CIVL7023	Industrialized construction with automation and robotics
CIVL7024	Computer Vision for Infrastructure Construction and Management
CIVL7025	IoT Solutions for Infrastructure Diagnosis and Prognosis
CIVL7026	Modular Integrated Construction (MiC)

### **Infrastructure Project Management**

CIVL6009	Building planning and control
CIVL6014	Construction dispute resolution
CIVL6015	Construction financial management
CIVL6025	Environmental impact assessment of engineering projects
CIVL6037	Project management – human and organizational factors
CIVL6047	Traffic management and control
CIVL6049	Urban development management by engineering approach
CIVL6058	Management of infrastructure megaprojects
CIVL6059	Special topic in infrastructure project management: Industrialized Construction
CIVL6060	Operation and maintenance of the building and civil engineering works
CIVL7005	Sustainable construction technology: principles and practices
CIVL7007	Building information modeling (BIM): Theories, development, and application
CIVL7021	NEC Contract Management

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 Infrastructure Engineering and Management 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, except for CIVL7009 ‘Dissertation’.

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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.

Assessment: 100% coursework

#### **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.

#### **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.

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

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

#### **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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**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.

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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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**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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**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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**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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**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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**CIVL7021 NEC Contract Management (6 credits)**

NEC<sup>1</sup> contract suite, NEC Engineering and Construction Contract (ECC) Hong Kong Edition, Z Clauses, Practice Notes. tender strategy, tender documentation, mutual trust and co-operation, communication, early warning, programme, defects, payment, compensation event, title, liabilities, insurance, termination, Key Performance Indicators (KPI), Early Contractor Involvement (ECI), climate change, avoiding and resolving disputes.

[Note 1: NEC is not an abbreviation but a full name which was changed from New Engineering Contract in 1995, to get rid of ‘new’ as it is no longer new and to get rid of ‘engineering’ as the contract is not limited to engineering projects.]

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**CIVL7022. Artificial intelligence for construction engineering and management (6 credits)**

This course aims to provide MSc students with a comprehensive understanding of the role of Artificial Intelligence (AI) in modern construction. The course will cover the latest AI techniques, innovations, and research applications in the construction industry. Students will gain knowledge of cutting-edge AI technologies and tools, learn to conduct research in AI-based construction solutions and develop skills required to contribute to the future of construction through AI.

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**CIVL7023. Industrialized construction with automation and robotics (6 credits)**

This course aims to provide MSc students with a comprehensive understanding of industrialized construction (IC) with automation and robotics and its role in modern civil engineering projects. The course will cover various industrialized construction techniques, technologies, and methodologies used to enhance productivity, improve safety, and reduce costs in the construction industry. Students will gain hands-on experience with industrialized construction processes, learn to analyze and optimize construction workflows, and develop the skills required to address real-world challenges in the field of industrialized construction.

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**CIVL7024 Computer Vision for Infrastructure Construction and Management (6 credits)**

This course introduces cutting-edge computer vision (CV) applications in civil engineering, especially for infrastructure construction and management. The course covers a general background of computer vision techniques, conventional and machine learning-based computer vision algorithms for infrastructure applications, and case studies of CV applications. The students will be equipped with the latest developments in the field by exploring the CV-empowered BIM system for construction and digital twin models for infrastructure management.

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**CIVL7025 IoT Solutions for Infrastructure Diagnosis and Prognosis (6 credits)**

This course is a postgraduate-level course that provides a comprehensive overview of the basic theories, principles, state-of-the-art techniques, and real-life applications of infrastructure diagnosis and prognosis with the help of IoT. The course covers a wide range of topics, including IoT devices, monitoring and NDT methods, and methods for the acquisition, processing, and analysis of sensing data. Students will also explore the application of these techniques to various types of infrastructure, such as bridges, railways, buildings, and tunnels.

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**CIVL7026 Modular integrated Construction (6 credits)**

This course provides Master-level learning about the concepts, theories, methods, technologies, and applications of modular integrated construction (MiC). The topics in this course include but are not limited to those structured in the temporal stages, including MiC design, production, transportation, and assembly, and in the aspects including MiC policy, regulations, cost, productivity, carbon emissions, and sustainability performance. The course includes project case studies to demonstrate the challenges, innovative and smart solutions, and future directions of MiC development in Hong Kong, the Greater Bay Area, and the world.

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