MSC(ENG) IN GEOTECHNICAL ENGINEERING
(Applicable to students admitted to the curriculum in the academic year 2016-17 and thereafter)

Definition and Terminology

Discipline course -- any course on a list of courses in the discipline of curriculum which a candidate must pass at least a certain number of credits as specified in the Regulations.

Elective course -- any course offered by the Departments of the Faculty of Engineering for the fulfillment of the curriculum requirements of the degree of MSc(Eng) in Geotechnical Engineering that are not classified as discipline courses.

Capstone Experience -- a 24-credit dissertation which is a compulsory and integral part of the curriculum.

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:

<table>
<thead>
<tr>
<th>Course Category</th>
<th>No. of Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discipline Courses</td>
<td>Not less than 30</td>
</tr>
<tr>
<td>Elective Courses</td>
<td>Not more than 18</td>
</tr>
<tr>
<td>Capstone Experience</td>
<td>24</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>72</strong></td>
</tr>
</tbody>
</table>

The curriculum provides advanced education in the field of Geotechnical Engineering.

Candidates shall select courses in accordance with the regulations of the degree. Candidates must complete 8 courses and a dissertation. They may select no more than 3 courses offered by other taught postgraduate curricula in the Faculty of Engineering as electives. All course selection will be subject to approval by the Head of Department of Civil Engineering.

The following is a list of discipline courses offered by the Department of Civil Engineering. 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.
(A) FIVE to EIGHT courses from the following list of discipline courses or courses approved by the Department of Civil Engineering:

**CIVL6002.** Advanced finite elements (6 credits)
Equilibrium and Virtual Work Principle; Variation principle; Numerical integration; Computer applications; Convergence and Error estimate; material and geometrical nonlinearity; resolution of nonlinear systems.

**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.

**CIVL6025.** Environmental impact assessment of engineering projects (6 credits)
For descriptions, see the syllabus of the MSc(Eng) in Environmental Engineering curriculum.

**CIVL6026.** Finite element method (6 credits)
Elasticity; calculus of variation; energy methods; shape functions; two and three-dimensional problems; linear elasticity problems; field problems.

**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.

**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.

**CIVL6035.** Highway pavement engineering (6 credits)
Traffic loading; subgrade properties; soil stabilization; bituminous materials; flexible pavement design; rigid pavement design; pavement maintenance and upgrading; pavement management systems.
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.

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.

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.

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.

Remark: The course title has been changed from CIVL6078 Rock engineering to CIVL6078 Rock mechanics and rock engineering from the academic year of 2020-21 onwards.

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.

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.
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.

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.

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

(C)  CIVL7009.  Dissertation (24 credits)

For descriptions, see the syllabus of the MSc(Eng) in Environmental Engineering curriculum.
MSC(ENG) IN TRANSPORTATION ENGINEERING
(Applicable to students admitted to the curriculum in the academic year 2016-17 and thereafter)

Definition and Terminology

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

Elective course – any course offered by the Departments of the Faculty of Engineering for the fulfillment of the curriculum requirements of the degree of MSc(Eng) in Transportation Engineering that are not classified as discipline courses.

Capstone Experience – a 24-credit dissertation which is a compulsory and integral part of the curriculum.

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:

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The curriculum provides advanced education in the field of Transportation Engineering.

Candidates shall select courses in accordance with the regulations of the degree. Candidates must complete 8 courses and a dissertation. They may select no more than 3 courses offered by other taught postgraduate curricula in the Faculty of Engineering as electives. All course selection will be subject to approval by the Head of Department of Civil Engineering.

The following is a list of discipline courses offered by the Department of Civil Engineering. 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.
(A) **FIVE to EIGHT** courses from the following list of discipline courses or courses approved by the Department of Civil Engineering:

**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.

**CIVL6025.** **Environmental impact assessment of engineering projects** *(6 credits)*
For descriptions, see the syllabus of the MSc(Eng) in Environmental Engineering curriculum.

**CIVL6035.** **Highway pavement engineering** *(6 credits)*
For descriptions, see the syllabus of the MSc(Eng) in Geotechnical Engineering curriculum.

**CIVL6037.** **Project management - human and organisational factors** *(6 credits)*
For descriptions, see the syllabus of the MSc(Eng) in Infrastructure Project Management curriculum.

**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.

**CIVL6047.** **Traffic management and control** *(6 credits)*
Transportation networks; network equilibrium concepts; estimation of origin-destination matrix; traffic management measures; traffic control techniques.

**CIVL6049.** **Urban development management by engineering approach** *(6 credits)*
For descriptions, see the syllabus of the MSc(Eng) in Infrastructure Project Management curriculum.

**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.
CIVL6056. Special topic in transportation engineering A (6 credits)
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 (6 credits)
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 * (6 credits)
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 (6 credits)
Basic tools for statistical model building; linear models; count and discrete dependent variables; duration models; analysis of panel data.

CIVL7001. Railway asset management (6 credits)
For descriptions, see the syllabus of the MSc(Eng) in Infrastructure Project Management curriculum.

CIVL7006. Optimization techniques for transportation applications (6 credits)
Linear programming, nonlinear programming, network optimization, and integer optimization methods for solving transportation problems.

CIVL7011. The economics of transport (6 credits)
Transport versus widgets; profit maximization and competitive equilibrium; costs and externalities; travel demand and the value of travel time; optimal pricing and investment; sustainable transportation; national income change and benefit measures; and cost-benefit analysis of transport projects.

CIVL7012. Traffic impact assessment: Techniques (6 credits)
Traffic impact assessment techniques that involve single isolated developments, transit oriented developments, extensive developments and reclamation areas, highway and public transport infrastructures, special traffic generators, and changes of transport policies; applications of traffic engineering and transport planning techniques to traffic impact assessment in Hong Kong and Mainland, China.
CIVL7013  Traffic impact assessment: Case studies (6 credits)

Review of Traffic Impact Assessment (TIA) Studies and fundamental approach; Conducting TIA Studies including data collection and traffic forecasting techniques, problem identification and quantitative analysis; application of traffic engineering and transport planning techniques and improvement measures development of creative thinking, technical presentational and public relation skills for professional report writing and presentation of study findings.

CIVL7014  Transport planning and infrastructure systems (6 credits)

Introduction to transport and land use planning, transport modelling techniques and application, transport infrastructure appraisal and planning, traffic impact assessment.

CIVL7016  Land transport and the environment (6 credits)

Land transport systems; Rail and road construction; Rail noise emissions and abatement; Air, noise and water pollution of roads; Road related air and noise emission measurements, estimation and abatement approaches.

CIVL7017  Road safety engineering (6 credits)

Road safety strategies and policy; safety in road design; roads safety injuries; accident site investigation and analysis; evaluation of road safety measures; road safety audits.

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

(C)  CIVL7009.  Dissertation (24 credits)

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

* Courses Approved for reimbursement from the Continuing Education Fund (CEF).
MSC(ENG) IN TRANSPORTATION ENGINEERING
(Applicable to students admitted to the curriculum in the academic year 2015-16 and before)

The curriculum provides advanced education in the field of Transportation Engineering. Students are required to successfully complete twelve modules which must include a dissertation of four modules, on a subject within his/her approved field of study. The list below is not final and some modules 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 modules.

All modules are assessed through examination (0%-100%) and/or coursework assessment (0%-100%).

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

CIVL6007. Behavioural travel demand modelling *
Demand theory; statistical models; survey methods in transport; land use transportation models; disaggregate choice models; behavioural concepts in choice modeling.

CIVL6025. Environmental impact assessment of engineering projects
For descriptions, see the syllabus of the MSc(Eng) in Environmental Engineering curriculum.

CIVL6035. Highway pavement engineering
For descriptions, see the syllabus of the MSc(Eng) in Geotechnical Engineering curriculum.

CIVL6037. Project management - human and organisational factors *
For descriptions, see the syllabus of the MSc(Eng) in Infrastructure Project Management curriculum.

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.
CIVL6049. Urban development management by engineering approach
For descriptions, see the syllabus of the MSc(Eng) in Infrastructure Project Management curriculum.

CIVL6054. Engineering for transport systems *
Engineering appreciation of the transport systems; transport infrastructure development; choice of transportation systems; fixed track systems; application of technology in transport.

CIVL6056. Special topic in transportation engineering A
This module 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 module is offered.

CIVL6057. Special topic in transportation engineering B
This module 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 module 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
Basic tools for statistical model building; linear models; count and discrete dependent variables; duration models; analysis of panel data.

CIVL7001. Railway asset management
For descriptions, see the syllabus of the MSc(Eng) in Infrastructure Project Management curriculum.

CIVL7006. Optimization techniques for transportation applications
Linear programming, nonlinear programming, network optimization, and integer optimization methods for solving transportation problems.
CIVL7011. The economics of transport

Transport versus widgets; profit maximization and competitive equilibrium; costs and externalities; travel demand and the value of travel time; optimal pricing and investment; sustainable transportation; national income change and benefit measures; and cost-benefit analysis of transport projects.

CIVL7012. Traffic impact assessment: Techniques

Traffic impact assessment techniques that involve single isolated developments, transit oriented developments, extensive developments and reclamation areas, highway and public transport infrastructures, special traffic generators, and changes of transport policies; applications of traffic engineering and transport planning techniques to traffic impact assessment in Hong Kong and Mainland, China.

CIVL7013. Traffic impact assessment: Case studies

Review of Traffic Impact Assessment (TIA) Studies and fundamental approach; Conducting TIA Studies including data collection and traffic forecasting techniques, problem identification and quantitative analysis; application of traffic engineering and transport planning techniques and improvement measures development of creative thinking, technical presentation and public relation skills for professional report writing and presentation of study findings.

CIVL7014. Transport planning and infrastructure systems

Introduction to transport and land use planning, transport modelling techniques and application, transport infrastructure appraisal and planning, traffic impact assessment.

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

CIVL7016. Land transport and the environment

Land transport systems; Rail and road construction; Rail noise emissions and abatement; Air, noise and water pollution of roads; Road related air and noise emission measurements, estimation and abatement approaches.

CIVL7017. Road safety engineering

Road safety strategies and policy; safety in road design; roads safety injuries; accident site investigation and analysis; evaluation of road safety measures; road safety audits.

(B) Not more than THREE modules from the MSc(Eng) modules offered by the Department of Civil Engineering other than those listed in (A) above, or elective modules at Taught Postgraduate level offered by other Departments of the Faculty of Engineering subject to the approval of the Head of the Department of Civil
(C) CIVL6001. Project (4 modules)
For MSc(Eng) students admitted before the academic year of 2014-2015.
For descriptions, see the syllabus of the MSc(Eng) in Environmental Engineering curriculum.

CIVL7009. Dissertation (4 modules)
For MSc(Eng) students admitted in the academic years of 2014-15 and 2015-2016.
For descriptions, see the syllabus of the MSc(Eng) in Environmental Engineering curriculum.