Subject to Approval

CIVIL ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2018-19 and thereafter under the four-year curriculum.

Definition and Terminology

Each course offered by the Department of Civil Engineering shall be classified as either introductory level course or advanced level course.

A Discipline Core course is a compulsory course which a candidate must pass in the manner provided for in the Regulations.

A Discipline Elective course refers to any technical course offered by the Department of Civil Engineering for the fulfillment of the curriculum requirements of the degree of BEng in Civil Engineering that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

Engineering Core Courses
Students are required to complete at least 42 credits of Engineering Core Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses (84 credits), comprising 24 credits of introductory core courses and 60 credits of advanced core courses.

Discipline Elective Courses
Students are required to complete at least 36 credits of advanced discipline elective courses offered by the Department of Civil Engineering.

Elective Courses
Students are required to complete 12 credits of elective course(s) offered by either the Department of Civil Engineering, or other departments within or outside of the Faculty of Engineering.

University Requirements
Students are required to complete:

a) 12 credits in English language enhancement, including 6 credits in "CAES1000 Core University English" and 6 credits in "CAES9540 Technical English for Civil Engineering";
b) 6 credits in Chinese language enhancement course "CENG9001 Practical Chinese for engineering students"; and
c) 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits during the whole period of study.

Capstone Experience
Students are required to complete the 12-credit "CIVL4102 Project" to fulfill the capstone experience requirement for the degree of BEng in Civil Engineering.

Internship

Students are required to complete the non-credit bearing internship "CIVL2114 Internship", which normally takes place after their third year of study.

Degree Classification

The degree of Bachelor of Engineering shall be awarded in five divisions in accordance with EN 15 of the Regulations for the Degree of Bachelor of Engineering and UG 9 of the Regulations for First Degree Curricula.

The details of the distribution of the above course categories are as follows:

The curriculum of BEng (Civil Engineering) comprises 240 credits of courses with the following structure:

UG 5 Requirements (54 credits)

Course Code	Course	No. of credits
CAES1000	Core University English	6
CAES9540	Technical English for Civil Engineering	6
CENG9001	Practical Chinese for engineering students	6
CC##XXXX	University Common Core Course (6 courses)*	36
Total for UG5 Requirements		54

* Students have to complete 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits.

Engineering Core Courses (42 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1300	Fundamental mechanics	6
ENGG1310	Electricity and electronics	6
ENGG1320	Engineers in the modern world	6
ENGG1330	Computer programming I	6
Choose one of the following:		
ENGG1340	Computer programming II	6
ENGG1350	Thermofluid mechanics	6
Total for Engineering Core Courses		42

Discipline Core Courses (84 credits)

Introductory Courses (24 credits)

Course Code	Course	No. of credits
CIVL1105	Environmental engineering	6
CIVL1113	Engineering mechanics & materials	6
CIVL1115	Civil engineering informatics	6
MECH2407	Multivariable calculus and partial differential equations	6
Total for Introductory Discipline Core Courses		24

Advanced Courses (60 credits)

Course Code	Course	No. of credits
CIVL2102	Engineering geology and rock mechanics	6
CIVL2103	Fluid mechanics	6
CIVL2104	Hydraulics and hydrology	6
CIVL2106	Soil mechanics	6
CIVL2108	Principles of civil engineering management	6
CIVL2111	Transportation engineering	6
CIVL2112	Structural analysis	6
CIVL2113	Structural design	6
CIVL4103	Capstone design project	12
Total for Advanced Discipline Core Courses		60

Capstone Experience and Internship (12 credits)

Course Code	Course	No. of credits
CIVL2114	Internship*	0
CIVL4102	Project+	12
Total for Capstone Experience and Internship Courses		12

+Capstone Experience
*Internship

Discipline Elective Courses (36 credits)

Course Code	Course	No. of credits
CIME2101	Water and air quality: concepts and measurement	6
CIVL2110	Experiential learning	6
CIVL3101	Advanced engineering mechanics	6
CIVL3103	Construction project management	6
CIVL3106	Engineering hydraulics	6
CIVL3107	Environmental impact assessment of civil engineering projects	6
CIVL3108	Foundation engineering	6
CIVL3111	Wastewater treatment	6
CIVL3112	Prestressed concrete structures	6
CIVL3114	Slope engineering	6
CIVL3115	Solid and hazardous waste management	6
CIVL3116	Steel structures	6
CIVL3118	Theory and design of structures III	6
CIVL3119	Traffic engineering	6
CIVL3120	Transportation infrastructure engineering	6
CIVL3121	Water resources engineering	6
CIVL3122	Wind engineering	6
CIVL3125	Law for civil engineers	6
CIVL3126	Engineering practice in Mainland China	6
CIVL3127	Professional practice in the built environment	6
CIVL3128	Structural dynamics and earthquake engineering	6
CIVL3129	Numerical analysis in geotechnical engineering	6
CIVL3130	Structural fire engineering	6
CIVL3131	Earth retaining system	6

CIVL3132	Geotechnical testing instrumentation and monitoring	6
CIVL3133	Ground improvement	6
CIVL3134	Environmental geotechnology	6
CIVL3135	Advanced structural analysis	6
Complete six discipline elective courses for a total of 36 credits		36

Elective Courses (12 credits)

At least 12 credits of courses offered by either the Department of Civil Engineering, or other departments within or outside of the Faculty of Engineering.

Elective MSc(Eng) courses
Students may take up to two 6-credit MSc(Eng) courses offered by the Department of Civil Engineering as elective courses, subject to the approval of the Head of Department.

Summary of curriculum structure of BEng (Civil Engineering)

Course Categories	No. of credits
UG5 Requirements	54
Engineering Core Courses	42
Discipline Core Courses (Introductory)	24
Discipline Core Courses (Advanced)	60
Capstone Experience and Internship	12
Discipline Elective Courses	36
Elective Courses	12
Total	**240**

A suggested study plan is given as follows:

FIRST YEAR

Engineering Core Courses (42 credits)		
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1300	Fundamental mechanics	6
ENGG1310	Electricity & electronics	6
ENGG1320	Engineers in the modern world	6
ENGG1330	Computer programming I	6
Choose one of the following:		
ENGG1340	Computer programming II	6
ENGG1350	Thermofluid mechanics	6
University Requirements (UG5) (18 credits)		
CAES1000	Core University English	6
CC##XXXX	Two Common Core Courses	12

SECOND AND THIRD YEARS

Introductory Discipline Core Courses (24 credits)		
CIVL1105	Environmental engineering	6
CIVL1113	Engineering mechanics & materials (pre-requisite: ENGG1300)	6
CIVL1115	Civil engineering informatics	6

MECH2407	Multivariable calculus and partial differential equations	6

Advanced Discipline Core Courses (48 credits)

CIVL2102	Engineering geology and rock mechanics	6
CIVL2103	Fluid mechanics	6
CIVL2104	Hydraulics and hydrology (pre-requisite: CIVL2103)	6
CIVL2106	Soil mechanics	6
CIVL2108	Principles of civil engineering management	6
CIVL2111	Transportation engineering	6
CIVL2112	Structural analysis (pre-requisite: CIVL1113)	6
CIVL2113	Structural design (pre-requisite: CIVL2112)	6

Discipline Elective Courses (18 Credits)

(Note that pre-requisite is required for some courses. Please refer to the course description for individual courses) 18

University Requirements (UG5) (30 credits)

CENG9001	Practical Chinese for engineering students (This course should be enrolled in the third year)	6
CC##XXXX	Four Common Core Courses	24

Internship (0 credit)

CIVL2114	Internship	0

Note: The total number of credits for second and third years should add up to 120

FOURTH YEAR

Advanced Discipline Core Courses (12 credits)

CIVL4103	Capstone design project (This course must be enrolled in the fourth year)	12

Discipline Elective Courses (18 credits)

(Note that pre-requisite is required for some courses. Please refer to the course descriptions for individual courses) 18

Capstone Experience (12 credits)

CIVL4102	Project (This course must be enrolled in the fourth year)	12

University Requirements (UG5) (6 credits)

CAES9540	Technical English for Civil Engineering (This course should be enrolled in the fourth year)	6

Elective Courses (12 credits)

(Note that pre-requisite is required for some courses. Please refer to the course descriptions for individual courses) 12

COURSE DESCRIPTIONS

Candidates will be required to do the coursework in the respective courses selected. Not all courses are offered every semester.

Engineering Core Courses

MATH1851	Calculus and ordinary differential equations (6 credits)
MATH1853	Linear algebra, probability & statistics (6 credits)

ENGG1300 Fundamental mechanics (6 credits)
ENGG1310 Electricity and electronics (6 credits)
ENGG1320 Engineers in the modern world (6 credits)
ENGG1330 Computer programming I (6 credits)
ENGG1340 Computer programming II (6 credits)
ENGG1350 Thermofluid mechanics (6 credits)

Please refer to the Engineering Core Courses in the syllabus for the degree of BEng for details.

University Requirements on Language Enhancement Courses

CAES1000. Core University English (6 credits)
CENG9001. Practical Chinese for engineering students (6 credits)

Please refer to the University Language Enhancement Courses in the syllabus for the degree of BEng for details.

CAES9540. Technical English for Civil Engineering (6 credits)

This one semester 6-credit English course will be offered to final year Civil Engineering and BEng(EngSc) Environmental Engineering students. It will run alongside Civil Engineering core project course. The main course objective is to provide students with training on report writing and oral presentation skills. Students will learn to write a technical report in a professional and effective manner through drafting and revision of their work. They will also be trained to give a technical presentation that focuses on explaining technical information to the general audience, handling over in a group presentation and designing appropriate visual aids to both professional and non-expert audiences. Assessment is by coursework and a final test.

Co-requisite: CIVL4102 Project [for BEng(CivE) students only]
CIVL4103 Capstone design project (for BEng(EngSc) Environmental Engineering students only)

Assessment: 100% continuous assessment.

University Common Core Curriculum

Successful completion of 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits:

- Scientific and Technology Literacy
- Humanities
- Global Issues
- China: Culture, State and Society

Introductory Discipline Core Courses

CIVL1105. Environmental engineering (6 credits)

This is an introductory course on environmental engineering. Students are taught in 31 hours of lecture plus 8 hours of interactive problem-based tutorial (IPBT). The IPBT is designed to train students in small groups for using the knowledge and engineering principles learned from the course to solve practical environmental engineering related problems.

Assessment: 20% continuous assessment, 80% examination

CIVL1113. Engineering mechanics and materials (6 credits)

The primary objective is to provide students with understanding of the behavior of materials and structures, which is required for their future studies in structural geotechnical engineering. For the mechanics part of the course, students will develop the skills of evaluating the performance of engineering structures of various types under external loads within the elastic limit, and analyzing the vulnerability of these structures to various actions. This part covers stress and strain; Mohr's circle, generalized Hooke's law; beams and frames; degrees of freedom; static indeterminacy; torsion; combined loading; column buckling; failure criterion. The materials part aims to provide students with the knowledge in material science, and the properties and applications of common construction materials including steel, concrete, brickwork, timber, masonry and bituminous materials. This part covers construction materials; crystalline structure; plasticity; corrosion; fatigue and fracture.

Pre-requisite: ENGG1300 Fundamental mechanics
Assessment: 15% practical work, 15% continuous assessment, 70% examination

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CIVL1115. Civil engineering informatics (6 credits)

This course aims to provide students with an overview on the applications of advanced computing, modeling, information and communication technologies to facilitate the practice of civil engineering. Students will be introduced to the basic surveying instruments and data collection techniques through lectures and field work, as well as the data presentation techniques for producing of both hand drawings and computer aided drafting (CAD) drawings. Students are expected to understand and appreciate the importance of surveying and drawing in the construction industry in order to prepare them for an engineering career.

Assessment: 35% practical work, 65% continuous assessment

MECH2407. Multivariable calculus and partial differential equations (6 credits)

This course aims to further develop the foundation of mathematics used in engineering discipline. Students will be introduced and explored to: (1) the ideas of periodic functions and their Fourier series representations; (2) the concepts of differentiation and integration of multivariable functions, and their extensions to vector analysis; and (3) the methods for solving elementary partial differential equations. Through the development of solution methods, students will enrich their experience in critical analysis and problem solving.

Topics include: Fourier series; advanced calculus; vector analysis; elementary partial differential equations.

Assessment: 20% continuous assessment, 80% examination

Advanced Discipline Core Courses

CIVL2102. Engineering geology and rock mechanics (6 credits)

This course provides an introduction to engineering geology including rock types and soil formation, acquainting the students with the fundamental aspects of rock mechanics, and developing the students' capability of applying the concepts and knowledge to solve practical problems in rock engineering.

Assessment: 20% practical work, 10% continuous assessment, 70% examination

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CIVL2103. Fluid mechanics (6 credits)

The course introduces the fundamental concepts of fluid flow, and examples of engineering fluid mechanics.

The course helps students to develop a sound understanding of control volume analysis, and its use with mass, momentum, and energy conservation principles. The course prepares students for dimensional analysis for the use of scale models in wind tunnel and hydraulic model testing.

Assessment: 15% practical work, 15% continuous assessment, 70% examination

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CIVL2104. Hydraulics and hydrology (6 credits)

This course is to consolidate the principles of fluid mechanics learnt in CIVL2103, to apply them to civil engineering hydraulic problems, and to provide an understanding of the basic concepts of the hydrological cycle including its relevance and application to civil engineering field.

Pre-requisite: CIVL2103 Fluid mechanics
Assessment: 15% practical work, 15% continuous assessment; 70% examination

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CIVL2106. Soil mechanics (6 credits)

Soil mechanics is a branch of engineering mechanics that describes the behaviour of soils. It differs from fluid mechanics and solid mechanics in the sense that soils consist of a heterogeneous mixture of fluids (usually air and water) and particles (usually clay, silt, sand and gravel) but soil may also contain organic solids, liquids, and gasses and other matter. Along with rock mechanics, soil mechanics provides the theoretical basis for analysis in geotechnical engineering. Soil mechanics is used to analyze the deformations of and flow of fluids within natural and man-made structures that are supported on or made of soil, or structures that are buried in soils. Examples applications are building and bridge foundations, retaining walls, dams, and buried pipeline systems.

Assessment: 20% practical work, 20% continuous assessment, 60% examination

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CIVL2108. Principles of civil engineering management (6 credits)*

Civil engineering projects are characterised by their uniqueness, complexity and uncertainty, and these have posed immense challenges to our industry. To satisfy the client and project requirements, a good

management skill and knowledge is of paramount importance. While engineers play a key role in relevant government departments, client organisations, design offices and contracting firms, they have the responsibilities of improving the efficiency, safety and quality of civil engineering projects and maximising the chance of project success and discharging their duties ethically. Therefore, the aims of this course are to introduce the basic concepts of various aspects of management and to explain how to apply these management principles to plan, organise and control a civil engineering project.

Assessment: 30% continuous assessment, 70% examination

* For the double degree in BEng/BBA, students who have completed the business course of 'Principles of management' are exempted from taking this core course under the BEng curriculum.

CIVL2111. Transportation engineering (6 credits)

This course is an introductory course of Transportation Engineering, and covers the causes and motivations of the movements of people and goods, the basic characteristics of different transportation modes, land use and transportation planning, equilibrium analysis, cost-benefit analysis, travel demand modeling and forecasting, highway alignment and geometric design, transportation surveys, and traffic impact assessment. Hong Kong examples will be used if possible.

Assessment: 20% continuous assessment, 80% examination

CIVL2112. Structural analysis (6 credits)

This course provides students with the basic knowledge and understanding of the behaviour and analysis of both statically determinate structures and statically indeterminate structures. It also provides the background for future study of structural design.

At the end of this course, students who fulfil the requirements of this course will be able to:
1. Understand the fundamental principles of structural theory;
2. Analyse simple structures for their reactions and internal forces;
3. Determine deflections of simple structures; and
4. Analyse statically indeterminate structures for their reactions and internal forces.

Pre-requisite: CIVL1113 Engineering mechanics and materials
Assessment: 15% practical work, 15% continuous assessment, 70% examination

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CIVL2113. Structural design (6 credits)

This course provides students with the basic knowledge and understanding in structural design of both reinforced concrete and steel structures. Students must have taken the pre-requisite CIVL2112 Structural Analysis before taking this course. The course will also have an individual project on preliminary design of a structure which will help students to understand the overall structural design process.

At the end of this course, students who fulfil the requirements of this course will be able to:
1. Identify and understand vertical and lateral loadings and load paths of a structure.
2. Design simple sections and members using reinforced concrete and hot-rolled steel.

Pre-requisite: CIVL2112 Structural analysis
Assessment: 30% continuous assessment, 70% examination

CIVL4103. Capstone Design Project (12 credits)

All modern engineering projects required high-level design capability and communication skills from engineers. With the stronger demand for quality infrastructural projects, many professional engineers are facing the common challenge of working in an interdisciplinary taskforce. Therefore, the aims of this course are to train students to work on civil engineering projects professionally through synergetic teamwork within a realistic working environment. The course will start by introducing the importance of engineering design and communication skills, and then will equip students with the general knowledge of project design across various disciplines by a series of seminars. In each academic year, a few projects will be offered. By dividing into small project groups (5-8 students), each group will be assigned one of the projects and supervised by one of the departmental teaching staff (Staff Tutor) and a part-time teacher from various sectors of the industry (Industrial Tutor). The students will be working closely with their Staff Tutor and Industrial Tutor throughout the project period, together with various advisers, on the engineering feasibility of the assigned project and the preliminary and detailed design of selected components of the project. The assessment of project quality will be based on a series of oral presentations, poster presentations and written reports from the project team. Another departmental teaching staff will act as Moderator to ensure consistency in assessment. The poster presentations allow a fair assessment of all groups taking part in the same project by all teachers engaged in the same project.

Assessment: 100% continuous assessment

Capstone Experience and Internship

CIVL2114. Internship (0 credit)

The course is to provide industrial training to engineering students. The students will have an opportunity to gain practical experience in civil engineering and related professions.

The course requires students to complete a period of full time approved internship in industry, of not less than 4 weeks normally after the end of the second semester of the student's third academic year of study. The students are required to complete the internship to the satisfaction of an engineering professional, who will act as the students' supervisors during the internship.

During the course of their internship, sometimes students will be asked to visit construction sites. To comply with the legal requirements and for safety reasons, all students must complete the Mandatory Basic Safety Training Course (MBST). Through the MBST course, students will gain an understanding on the relevant safety legislation; potential hazards and preventive strategies; use of the protective equipment and the accident reporting mechanism.

Assessment: 100% continuous assessment

CIVL4102. Project (12 credits)

The primary aim of the project is to give each individual student an opportunity to handle a practical engineering problem and to present the findings in a precise and concise report. An important part of the project lies in the way in which the students plan and carry out the task, and apply their engineering knowledge sensibly and diligently to solve the problem. The way in which the students present their findings is equally important.

Assessment: 100% continuous assessment

Discipline Elective Courses

CIME2101. Water and air quality: concepts and measurement (6 credits)

This course will introduce concepts on water/air quality and pollution, the standard methods of water and wastewater examination, air pollution control principles, and measurement techniques for common air pollutants.

Pre-requisite: CIVL1105 Environmental engineering (for students of the Department of Civil Engineering only)
Assessment: 10% practical work, 10% continuous assessment, 80% examination

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CIVL2110 Experiential learning (6 credits)

The course is to provide experiential learning experience to engineering students. The students will have an opportunity to gain practical experience in civil engineering and related professions. Activities for experiential learning will be organized by the course teachers and is mainly related to construction projects in Hong Kong, Mainland China or elsewhere.

The course requires students to complete a period of not less than 160 hours of experiential activities normally after the end of the second semester of the student's second academic year of study. Experiential activities such as those of Project Mingde that design and construct facilities relating to education, environmental protection and poverty relief in less privileged regions on the Mainland will be organised for the students to participate. The students are required to complete the activities to the satisfaction of an engineering professional, who will act as the students' supervisors during the course of studies.

Assessment: 100% continuous assessment

CIVL3101. Advanced engineering mechanics (6 credits)

CIVL3101 Advanced Engineering Mechanics aims to introduce the fundamentals of engineering mechanics and how this is linked to engineering solutions by advanced computation techniques based on the finite element method. Equilibrium in elasticity problems and continuity equation for steady-state field problems are discussed, and by means of the virtual work principle, finite element formulation will be systematically established. Using simple 3-node triangular element as an example, engineering problems in structural mechanics and fluid flow are analysed. A computer demonstration will be presented to show students how complex practical engineering problems are tackled, and allow them to develop the ability to analyse realistic engineering problems by themselves and appreciate the capability and limitations of modern computational tools for engineering solutions. Although the subject is a bit theoretical by nature, students interested in advanced computations or pursuing research in the future should find this course useful.

Assessment: 30% continuous assessment, 70% examination

CIVL3103. Construction project management (6 credits)

This course conveys knowledge of the fundamentals of construction project management, including core principles and their basic applications, which can be further built upon during career development. Topics span both the management of civil engineering designs and the management of construction

projects. The course imparts important basics of the planning and control of time and money, and links these to achieving better value for stakeholders, including quality and life cycle considerations.

The course is designed to enable civil engineering undergraduates to appreciate and assimilate key principles and good practices for the effective, efficient and ethical management of construction projects. It also aims to equip young civil engineers with the basic knowledge that will enable them to perform well and contribute meaningfully in multi-disciplinary project teams that may include financial and legal professionals, apart from those from other core construction industry disciplines

Assessment: 30% continuous assessment, 70% examination

CIVL3106. Engineering hydraulics (6 credits)

The course Engineering Hydraulics covers three major parts: Open Channel Flow, Storm Drainage Design and Environmental Hydraulics.

In Open Channel Flow, emphasis will be placed on the 'gradually varied' open channel flow (GVF), which deals with the classification of GVF profiles and different methods of computation of flow profiles. Some examples of 'rapidly varied' flow, such as energy dissipators and vertical drop structures, will also be given.

In Storm Drainage Design, the classification of drainage and sewerage systems will be introduced. Students will learn the design of urban stormwater drainage system.

In Environmental Hydraulics, students will appreciate the assimilative capacity (self purification) of the natural environment, through the study of basic concepts of turbulent mixing and dispersion of pollutants in water. Examples will be given to demonstrate the use of advective diffusion equation to solve actual environmental problems.

Pre-requisite: CIVL2104 Hydraulics and hydrology
Assessment: 20% practical work, 20% continuous assessment, 60% examination

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CIVL3107. Environmental impact assessment of civil engineering projects (6 credits)

This course will introduce concepts on environmental protection legislation, environmental impact assessment process, environmental impacts during construction and operation of projects, mitigation measures, modelling, environmental monitoring and audit, and case studies.

Pre-requisite: CIVL1105 Environmental engineering and CIVL2103 Fluid mechanics
Assessment: 30% continuous assessment, 70% examination

CIVL3108. Foundation engineering (6 credits)

Foundation engineering deals with the investigation, design and construction of the foundations of engineering structures, which is of prime importance. This course addresses the site investigation of a geotechnical project, follows by the design and construction of shallow and deep foundations in accordance with both ultimate and serviceability criteria. At the end of this course, students should have an overall picture of the geotechnical foundation system and its underlying working principles and potential types of failures. Besides, students should gain fundamental understanding of the geotechnical design and construction of the foundation system.

Pre-requisite: CIVL2102 Engineering geology and rock mechanics and CIVL2106 Soil mechanics
Assessment: 30% continuous assessment, 70% examination

CIVL3111. Wastewater treatment (6 credits)

This course focuses on the theory, design and operation of wastewater treatment. Emphasis will be placed upon a fundamental understanding of commonly used treatment technologies. Major sections of the course cover the generation and characteristics of municipal wastewater, sewerage systems, preliminary treatment, primary sedimentation, secondary biological treatment, nutrient removal, disinfection, sludge treatment and disposal, unit process selection and treatment plant design, characteristics of industrial wastewater, and physical, chemical and biological processes used in industrial wastewater treatment.

The course aims to introduce to students the basic concept of wastewater treatment engineering and the knowledge of unit treatment operations and processes. At the end of this course, students who fulfill the requirement of the course will be able to present the principles and theories behind the common wastewater treatment technologies and to conduct preliminary design of sewerage systems and typical physical, chemical and biological units used in conventional wastewater treatment.

Pre-requisite: CIVL1105 Environmental engineering and CIVL2103 Fluid mechanics
Assessment: 10% practical work, 10% continuous assessment, 80% examination

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CIVL3112. Prestressed concrete structures (6 credits)

This is an elective course to provide students with the basic knowledge for the design of Prestressed Concrete Structures. Apart from introducing students to the fundamental principles of prestressing and application to design of long-span concrete structures, it also provides the background for future study of bridge engineering. Each student is required to submit a comprehensive design of prestressed concrete structure. Students must have taken the pre-requisite CIVL2113 Structural design before taking this course.

Pre-requisite: CIVL2113 Structural design
Assessment: 30% continuous assessment, 70% examination

CIVL3114. Slope engineering (6 credits)

This course is to provide our students with basic knowledge of slope stability analysis and design. It covers slope stability analyses, cases of landslide hazards, landslide investigation, uncertainties in slope stability analysis, landslip preventive measures and design, many case studies and actual examples, a Slope/w software workshop and one field technical trip.

Pre-requisite: CIVL2102 Engineering geology and rock mechanics and CIVL2106 Soil mechanics
Assessment: 20% continuous assessment, 80% examination

CIVL3115. Solid and hazardous waste management (6 credits)

Human activities generate solid waste materials that are often discarded because they are considered useless. However, the disposal of these unwanted waste materials has created a heavy burden to our environment and sometimes even threatened the human health due to its hazardous properties. Waste management has become one of the most significant problems of our time because the current ways of

life in Hong Kong and in many areas of the world produce enormous amounts of waste, and most people want to preserve their lifestyle, while also protecting the environment and public health. Furthermore, if managed properly, many of these waste materials can be reused or recovered for becoming a resource for industrial production or energy generation. This course is an introduction to the key managing concepts and processing technologies of solid waste. It aims to train future engineers capable of conducting solid waste project planning for industries, businesses, communities and governmental sectors. The discussion of context will stem from solid waste materials generated from municipal sources, and then include selected examples from industrial sources and/or of hazardous properties with local relevance. After the training provided by this course, students are expected to be capable of using different planning tools to manage the reduction of solid waste generation, the reuse and recovery of waste materials, or the safe and economical disposal strategies.

Assessment: 30% continuous assessment, 70% examination

CIVL3116. Steel structures (6 credits)

This course aims to provide students with knowledge and understanding in behaviour and design of steel structures. Students will be exposed to plastic analysis, residual stress, slender sections, plate girders, steel frames, connections and composite structures. Students must have fulfill the pre-requisite CIVL2113 Structural design requirement before taking this course.

Pre-requisite: CIVL2113 Structural design
Assessment: 20% continuous assessment, 80% examination

CIVL3118. Theory and design of structures III (6 credits)

The theory part of the course introduces the theory and applications of the matrix method for static and stability analyses of two-dimensional structures together with the elastic and plastic torsional analyses of thin-walled sections. The design part of the course introduces the concept and principles of inelastic design of reinforced concrete structures with emphasis on plastic hinge formation and moment redistribution. On practical design aspects, ultimate limit state design as per Hong Kong Concrete Code of special structural members such as two-way slabs, flat slabs, torsion members and slender columns will be discussed and explained. The course also includes a section of serviceability limit state design of large civil water-retaining reinforced concrete structures, such as underground box culverts, open channels, manholes, inspection chambers and water/sewage treatment tanks.

Pre-requisite: CIVL2113 Structural design
Assessment: 30% continuous assessment, 70% examination

CIVL3119. Traffic engineering (6 credits)

This course is an introduction to the broad disciplines of traffic engineering and its applications to the management and control of traffic flows in highways and the planning and design of highway junctions and interchanges. This course covers the characteristics of traffic flow, mathematical models of traffic flow, traffic management schemes, traffic surveys, traffic design for safety, and the planning and design of different types of road junctions, including priority junctions, roundabouts, traffic signal controlled junctions and grade-separated junctions and interchanges. Hong Kong examples will be used if possible.

Assessment: 30% continuous assessment, 70% examination

CIVL3120. Transportation infrastructure engineering (6 credits)

This course is an introduction to the theory and practice of transportation infrastructure planning, design implementation and maintenance. Emphasis is placed on demand estimation, capacity assessment, facility operational requirements, facility location and arrangements, design codes, properties of construction materials and their underlying theories. The different stages of project development are discussed and illustrated by case studies to cover demand forecast, system planning, feasibility studies, project appraisal, public consultation, preliminary and detailed design, procurement methods and construction.

Pre-requisite: CIVL2111 Transportation engineering
Assessment: 60% continuous assessment, 40% examination

CIVL3121. Water resources engineering (6 credits)

CIVL3121 is a course that focuses on the concept, theory, design and operation of urban water supply systems. Emphasis will be placed upon a fundamental understanding of commonly used water collection and treatment technologies. Major sections of the course cover water cycle, water consumption and demand, water sources, water collection, storage and transportation, drinking water quality, conventional surface water treatment unit operations and processes, advanced water treatment technologies, water stabilisation and corrosion control, urban water distribution and transmission, water reclamation and total water management.

The course aims to introduce to students the basic concept of water resources engineering and the knowledge of urban water supply. At the end of this course, students who fulfill the requirement of the course will be able to present the principles and theories behind the common water collection and treatment technologies and to conduct conceptual design of freshwater collection systems, common surface water treatment processes and urban water distribution systems.

Pre-requisite: CIVL1105 Environmental engineering and CIVL2103 Fluid mechanics
Assessment: 20% practical work, 80% examination

CIVL3122. Wind engineering (6 credits)

The course introduces the effects of wind on buildings, structures and the environment, with emphasis on wind loading of buildings and structures.

The course provides students with the basic scientific knowledge of the engineering description of wind and the engineering phenomena of wind flow around bluff bodies, buildings, bridges and civil engineering structures. The basics of flow-structure interaction and wind-induced vibration of structures are also presented. The course then continues to describe the format and features of a wind loading code and how the code should be interpreted with the knowledge of wind engineering. The course also introduces the effects of wind on pedestrian comfort and pollutant dispersion.

Pre-requisite: CIVL2103 Fluid mechanics
Assessment: 15% practical work, 15% continuous assessment, 70% examination

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CIVL3125. Law for civil engineers (6 credits)

With the changing demands and expectations of civil engineers, law has become an essential part of the body of knowledge important to the discharge of daily tasks of civil engineers. Whether working for

governments, private developers, consultants, contractors, or sub-contractors, a core competence for the planning, design, construction and maintenance of projects is the ability to apply principles of laws to their works. These enable the proper management of projects and the areas of disputes arising thereunder.

This course aims at introducing the basic principles of laws with particular emphasis on those, which are relevant to the construction industry.

Assessment: 30% continuous assessment, 70% examination

CIVL3126. Engineering practice in Mainland China (6 credits)

To enable students to gain basic understanding of engineering design and construction practice in Mainland China. By introducing some commonly used codes of practice, work procedures, quality control system, engineering requirements, practical design case study, design principles and procedure of foundation, building structures with and without seismic design requirement and bridges/highway structures, students will be better equipped to engage in Mainland engineering projects. At the end of this course, students should be able to understand the work procedure in Mainland China. In design, students should be capable of carrying out correct design of foundations and buildings as per various GB Codes and understand the principle of respective design clauses stipulated in the Codes.

Pre-requisite: CIVL2113 Structural design
Assessment: 30% continuous assessment, 70% examination

CIVL3127. Professional practice in the built environment (6 credits)

Building construction is one of the major sectors of the construction industry in Hong Kong. Many high-rise buildings were built in the last three decades, calling for sophisticated designs in building layout, structure and foundation. At the same time it demands high technique in construction skill and management. There are government departments ensuring compliance with statutory standards of safety, health and environment of buildings and building works. Civil engineers would join relevant government departments, client organizations, consultant and contracting firms playing a key role in planning, design and construction of buildings. Therefore, the aims of this course are to introduce the basic knowledge and idea of statutory control on building planning, construction and site supervision.

Assessment: 30% continuous assessment, 70% examination

CIVL3128. Structural dynamics and earthquake engineering (6 credits)

Earthquake disaster is increasingly of global concern as it threatens the world's population, economy, and sustainable development. It is the responsibility of civil engineers to design and build earthquake-resistant structures, in order to minimize the earthquake risk. By reducing losses of lives and properties, socio-economical sustainability can be achieved.

In this course, students will be introduced to the basic science of earthquakes and its effects on the natural and built environment.

Pre-requisite: CIVL2113 Structural design
Assessment: 30% continuous assessment, 70% examination

CIVL3129. Numerical analysis in geotechnical engineering (6 credits)

Advances in computer technology greatly enhance the application of numerical methods in geotechnical engineering. The importance of numerical modelling in geotechnical practice has been increased tremendously over the past decade. In this course, the students will be introduced a proper understanding of the subject, covering from fundamentals of the numerical techniques to geotechnical practical considerations. This course first provides students a basic knowledge of numerical techniques including the finite difference and finite element method. The second part of the course focuses on practical considerations required for applying these techniques to geotechnical problems. It will be concluded by a number of geotechnical applications and case histories.

Pre-requisite: CIVL2106 Soil mechanics
Assessment: 35% continuous assessment, 65% examination

CIVL3130. Structural fire engineering (6 credits)

The major aims of this course are to introduce to the students the concept of fire safety engineering and design of fire resistant structures. Students will be given opportunities to learn Eurocode for the design of steel and concrete structures under elevated temperature. At the end of this course, students will be able to understand the fire development and predict gas temperature of fire compartment and temperature of structural members in fire condition. With respect to structural design, students will appreciate the special structural actions that occur under elevated temperature and capable of carrying out fire resistance design of simple steel and reinforced concrete members.

Pre-requisite: CIVL2113 Structural design
Assessment: 30% continuous assessment, 70% examination

CIVL3131. Earth retaining system (6 credits)

Development in urban areas is often limited by the space available, and efficient use of that space requires building underground or near slopes. Earth retaining systems are the engineering solution to this problem. This course introduces civil engineering students to different types of earth retaining systems, and gives them the means of designing earth retaining walls from first principles. An introduction to unsaturated soils is also given. At the end of the course, the students will have a good understanding of the forces exerted by the ground on retaining structures, for different cases (e.g. inclined ground, inclined wall, embedded wall, wall friction/adhesion), the different stabilizing methods that can be used (e.g. anchors, nails), and be able to use these calculations to design safe retaining walls.

Pre-requisite: CIVL2106 Soil mechanics
Assessment: 30% continuous assessment, 70% examination

CIVL3132. Geotechnical testing, instrumentation and monitoring (6 credits)

Geotechnical testing aims at understanding the behaviour of geomaterials that engineers are dealing with. A proper instrumentation and monitoring scheme provides crucial information for engineers to judge the effectiveness and safety of the engineering design and construction. This course first provides students advanced knowledge on geotechnical testing from both experimental and theoretical perspectives. Students are required to have hands-on experience on a common geotechnical test – multi-stage triaxial test. Then both practical and theoretical aspects of geotechnical instrumentation and monitoring are addressed.

Pre-requisite: CIVL2106 Soil mechanics
Assessment: 15% practical work, 15% continuous assessment, 70% examination

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CIVL3133. Ground improvement (6 credits)

Construction is sometimes needed in ground that has poor strength and stiffness qualities. Improving the ground by reinforcing it or by modifying it can prevent excessive deformations or even failure. This course introduces civil engineering students to ground improvement by modification or reinforcement. At the end of the course, the students will have a good understanding of the different techniques used for ground improvement, and be able to use some of the theory for design.

Pre-requisite: CIVL2106 Soil mechanics
Assessment: 30% continuous assessment, 70% examination

CIVL3134. Environmental geotechnology (6 credits)

Environmental geotechnology can be defined as an interdisciplinary science which covers soil and rock and their interactions with various environmental cycles, including the atmosphere, biosphere, hydrosphere, and lithosphere, as well as the geo-microbiosphere, and human activities, which includes characteristics of tree and vegetation roots and bacterial activities in the subsurface and subsequent response to the engineering behavior of the soil-water system.

The objective of the course is to provide the students with exposure to the geotechnical nature of environmental problems through discussions of contaminant transport in porous media and relationship with remediation technologies for hazardous waste sites and discussions of soil properties relative to waste containment systems, soil stability, and permeability. At the end of the course, the students who fulfill the requirements of this course should be able to understand the importance of Geotechnical Engineering related to environmental issues, to perform preliminary designs of different components of a municipal landfill, and to select appropriate remediation technologies for a given contaminated site.

Pre-requisite: CIVL2106 Soil mechanics
Assessment: 30% continuous assessment, 70% examination

CIVL3135. Advanced Structural Analysis (6 credits)

The course covers the advanced structural theory, including the theory of elasticity and plasticity, unsymmetrical bending, torsional analysis of thin-walled sections and yield criteria. Matrix method is introduced for static and stability analyses of two-dimensional structures.

Pre-requisite: CIVL2112 Structural analysis
Assessment: 30% continuous assessment, 70% examination

CIVL3136 Special Environmental Engineering Project (12 credits)

[For students admitted in the 2013-14 academic year and thereafter and for Minor in Environmental Engineering only]

The primary aim of the project is to give each individual student an opportunity to handle a practical engineering problem related to environmental engineering and to present the findings in a precise and concise report. An important part of the project lies in the way in which the students plan and carry out

the task, and apply their knowledge sensibly and diligently to solve the problem. The way in which the students present their findings is equally important.

Assessment: 100% continuous assessment

CIVL3137 Special Geotechnical Engineering Project (12 credits)

[For students admitted in the 2013-14 academic year and thereafter and for Minor in Geotechnical Engineering only]

The primary aim of the project is to give each individual student an opportunity to handle a practical engineering problem related to geotechnical engineering and to present the findings in a precise and concise report. An important part of the project lies in the way in which the students plan and carry out the task, and apply their knowledge sensibly and diligently to solve the problem. The way in which the students present their findings is equally important.

Assessment: 100% continuous assessment

Minor in Environmental Engineering
[not eligible for BEng(CivE) students]

Candidates are required to complete a total of 48 credits of courses comprising:

(a) Introductory Courses (18 credits)

Course Code	Course	No. of credits
ENGG1350	Thermofluid mechanics *	6
CIVL1105	Environmental engineering	6
CIVL2103	Fluid mechanics **OR**	6
CIME2101	Water and air quality: concepts and measurement	6
Total for Introductory Discipline Core Courses		18

* Students opting for the Minor cannot use the course ENGG1350 Thermofluid mechanics as satisfying the requirements of the Engineering Core Course.

(b) Discipline Elective Courses (30 credits)

Students must complete 30 credits of discipline elective courses to be chosen from the following list:

Course Code	Course	No. of credits
CIME2101	Water and air quality: concepts and measurement	6
CIVL2111	Transportation engineering	6
CIVL2104	Hydraulics and hydrology	6
CIVL3106	Engineering hydraulics	6
CIVL3107	Environmental impact assessment of civil engineering projects	6
CIVL3111	Wastewater treatment	6
CIVL3115	Solid and hazardous waste management	6
CIVL3121	Water resources engineering	6
CIVL3122	Wind engineering	6
CIVL3134	Environmental geotechnology	6

MECH3420	Air pollution control	6
CIVL3136	Special environmental engineering project	12
Total for Discipline Elective Courses		30

COURSE DESCRIPTIONS

For course descriptions, please refer to the syllabuses of the Civil Engineering and Mechanical Engineering programme.

Minor in Geotechnical Engineering
[not eligible for BEng(CivE) students]

Candidates are required to complete a total of 48 credits of courses comprising:

(a) Introductory courses (18 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
CIVL2106	Soil mechanics	6
Total for Introductory Discipline Core Courses		18

(b) Discipline Elective Courses (30 credits)

Students must complete 30 credits of discipline elective courses to be chosen from the following list:

Course Code	Course	No. of credits
CIVL2102	Engineering geology and rock mechanics	6
CIVL3108	Foundation engineering	6
CIVL3114	Slope engineering	6
CIVL3129	Numerical analysis in geotechnical engineering	6
CIVL3131	Earth retaining system	6
CIVL3132	Geotechnical testing, instrumentation and monitoring	6
CIVL3133	Ground improvement	6
CIVL3134	Environmental geotechnology	6
CIVL3137	Special geotechnical engineering project	12
Total for Discipline Elective Courses		30

COURSE DESCRIPTIONS

For course descriptions, please refer to the syllabuses of the Civil Engineering programme.