REGULATIONS FOR THE DEGREE OF BACHELOR OF ENGINEERING (BENG)

These regulations apply to students admitted to the four-year BEng curriculum in the academic year 2016-17 and thereafter.
(See also General Regulations and Regulations for First Degree Curricula)

EN 1 Admission to the Degree

To be eligible for admission to the Bachelor of Engineering (BEng) degree, a candidate shall

(a) comply with the General Regulations;
(b) comply with the Regulations for First Degree Curricula; and
(c) satisfy all the requirements of the curriculum in accordance with these regulations and the syllabuses.

EN 2 Period of Study

The curriculum for the BEng degree shall normally require eight semesters of full-time study, extending over not fewer than four academic years, and shall include any assessment to be held during and/or at the end of each semester. Candidates shall not in any case be permitted to extend their studies beyond the maximum period of registration of six academic years.

EN 3 Curriculum Requirements

To complete the curriculum, a candidate shall

(a) satisfy the requirements prescribed in UG 5 of the Regulations for the First Degree Curricula; and
(b) take not fewer than 240 credits of courses, in the manner specified in these regulations and syllabuses; candidates are also required to pass all courses as specified in the syllabuses.

EN 4 Candidates shall normally select not fewer than 24 and not more than 30 credits of courses in any one semester (except the summer semester), unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of credits required to satisfy the outstanding curriculum requirements is fewer than 24 credits. Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. Candidates may, with the approval of the Board of the Faculty, exceed 72 credits in an academic year provided that the total number of credits taken shall not exceed 288 credits. Students making up for failed credits can be permitted by the Faculty to take up to 432 credits.

EN 5 Candidates with unsatisfactory academic progress may be required by the Board of the Faculty to take a reduced study load.

EN 6 Selection of Courses

Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each academic year. Changes to the selection of courses may be made only during the add/drop period of the semester in which the course begins, and such changes shall not be reflected in the transcript of the candidate. Requests for changes after the designated add/drop period of the semester shall be subject to the approval of the Board of the Faculty. Withdrawal from courses beyond the designated add/drop period will be subject to the approval of the Board of the Faculty.

EN 7 Assessment and Grades

Candidates shall be assessed for each of the courses for which they have registered, and assessment may be conducted in any one or any combination of the following manners: written examinations or tests, continuous assessment, laboratory work, field work, project reports, or in any other manner as specified in the syllabuses. Grades shall be awarded in accordance with UG8 of the Regulations for the First Degree Curricula.

EN 8 Written examinations or tests shall normally be held at the end of each semester unless otherwise specified in the syllabuses.

EN 9 Candidates are required to make up for failed courses in the following manner:

a) undergoing re-assessment/re-examination in the failed course to be held no later than the end of the following semester (not including the summer semester); or
b) re-submitting failed coursework, without having to repeat the same course of instruction; or
c) repeating the failed course by undergoing instruction and satisfying the assessments; or
d) for elective courses, taking another course in lieu and satisfying the assessment requirements.

EN 10 Candidates shall not be permitted to repeat a course for which they have received a grade D or above for the purpose of upgrading.

EN 11 There shall be no appeal against the results of examinations and all other forms of assessment.

EN12 Unless otherwise permitted by the Board of the Faculty, a candidate will be recommended for discontinuation of their studies if

(a) he/she fails to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take 36 credits in the two given semesters; or
(b) he/she fails to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester); or
(c) he/she has exceeded the maximum period of registration specified in EN2.

EN 13 Absence from Examination

Candidates who are unable, because of illness, to be present at the written examination of any course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within two weeks of the first day of the candidate's absence from any examination. Any supplementary examination shall be part of that academic year's examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

EN 14 Advanced Standing

Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum in accordance with UG2 of the Regulations for First Degree Curricula. The amount of advanced credits to be granted shall be determined by the Board of the Faculty, in accordance with the following principles:

(a) a minimum of four semesters of study at this University shall be required before the candidate is considered for the award of the degree; and
(b) at least half of the credits requirements of the degree curriculum shall be accumulated through study at this University, or from transfer of credits for courses completed at other institutions in accordance with UG4(d) of the Regulations for the First Degree Curricula.

Credits granted for advanced standing shall not be included in the calculation of the GPA but will be recorded on the transcript of the candidate.

EN15 Degree Classification

To be eligible for the award of the BEng degree, candidates shall have:

(a) satisfied all the requirements in the UG5 of the Regulations for First Degree Curricula;
(b) passed not fewer than 240 credits, comprising
    i) introductory courses, including General Engineering courses;
    ii) advanced courses;
    iii) capstone experience;
    iv) a Chinese language enhancement course[1];
    v) two English language enhancement courses, including Core University English[2]

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[1] Students are required to successfully complete the 6-credit Faculty-specific Chinese language enhancement course, except for:

(a) Putonghua-speaking students who should take CUND9002 (Practical Chinese and Hong Kong Society) or CUND9003 (Cantonese for Non-Cantonese Speaking Students); and
(b) students who have not studied Chinese language during their secondary education or who have not attained the requisite level of competence in the Chinese language to take the Chinese language enhancement course should seek approval from the Board of the Faculty of Engineering for exemption from the Chinese language requirement, and
    (i) take a 6-credit Cantonese or Putonghua language course offered by the School of Chinese especially for international and exchange students; OR
    (ii) take an elective course in lieu.

[2] Candidates who have achieved Level 5** in English Language in the HKDSE or equivalent are exempted from this requirement but must take an elective in lieu.

and English in the Discipline;
vi) Common Core Curriculum courses;
vii) all required courses as prescribed in respective syllabuses; and
viii) elective courses.

EN16 The degree of Bachelor of Engineering shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the degree of BEng with the following Cumulative GPA (CGPA) scores, with all courses taken (including failed courses) carrying equal weighting:

Class of honours	***CGPA range***
First Class	3.60 – 4.30
Second Class	(2.40 – 3.59)
Division One	3.00 – 3.59
Division Two	2.40 – 2.99
Third Class	1.70 – 2.39
Pass	1.00 – 1.69

EN 17 Honours classification may not be determined solely on the basis of a candidate's Cumulative GPA and the Board of Examiners for the BEng degree may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Cumulative GPA falls below the range stipulated in EN16 of the higher classification by not more than 0.1 of a Grade Point.

EN 18 A list of candidates who have successfully completed all degree requirements shall be posted on Faculty notice boards.

SYLLABUSES FOR THE DEGREE OF BACHELOR OF ENGINEERING (BENG)

General Engineering courses (applicable to candidates admitted to the four-year curriculum in the academic year 2016-17 and thereafter)

General Engineering courses include:

Computer Programming Courses

ENGG1111	Computer programming and applications (6 credits)
ENGG1112	Computer programming and applications I (6 credits)

Mathematics and Physics Courses

MATH1011	University mathematics I (6 credits)
MATH1851	Calculus and ordinary differential equations (6 credits)
MATH1853	Linear algebra, probability and statistics (6 credits)
MECH2407	Multivariable calculus and partial differential equations (6 credits)
PHYS1050	Physics for Engineering Students (6 credits)

Discipline Specific Courses

ENGG1201	Engineering for sustainable development (6 credits)
ENGG1202	Introduction to computer science (6 credits)
ENGG1203	Introduction to electrical and electronic engineering (6 credits)
ENGG1204	Industrial management and logistics (6 credits)
ENGG1205	Introduction to mechanical engineering (6 credits)
ENGG1206	Introduction to biomedical engineering (6 credits)
ENGG1207	Foundations of biochemistry for medical engineering (6 credits)

Candidates are required to satisfactorily complete General Engineering courses as specified in the syllabus of the programme concerned.

The course descriptions of the General Engineering courses are as follows:

ENGG1111. Computer programming and applications (6 credits)

This course covers both the basic and advanced features of the C/C++ programming languages, including syntax, identifiers, data types, control statements, functions, arrays, file access, objects and classes, class string, structures and pointers. It introduces programming techniques such as recursion, linked lists and dynamic data structures. The concept and skills of program design, implementation and debugging, with emphasis on problem-solving, will also be covered.

Target students are those who wish to complete the programming course in a more intensive mode in 1 semester. Students with some programming knowledge are encouraged to take this course.

Assessment: 50% continuous assessment, 50% examination

ENGG1112. Computer programming and applications I (6 credits)

This course covers both the basic and advanced features of the C/C++ programming languages, including syntax, identifiers, data types, control statements, functions, arrays, file access, objects and classes, class string, structures and pointers. It introduces programming techniques such as recursion, linked lists and dynamic data structures. The concept and skills of program design, implementation and debugging, with emphasis on problem-solving, will also be covered.

Target students are those who wish to complete the programming course in a slower pace covering 2 semesters.

Assessment: 50% continuous assessment, 50% examination

MATH1011. University mathematics I (6 credits)

This course aims at students with only HKDSE Mathematics (or equivalent) background and provides them with basic knowledge of mathematics that serves as essential foundation in various disciplines. It is expected to be followed by MATH1013 University mathematics II.

Assessment: 50% continuous assessment, 50% examination

MATH1851. Calculus and ordinary differential equations (6 credits)

In this course, students will be introduced to fundamental concepts of calculus and ordinary differential equations with a view on applications in different engineering fields. A concrete foundation of mathematics that underpins the various engineering subjects will be built. Mathematical concepts and principles, as well as some typical engineering applications, would be emphasized so that students could enhance their mathematical skills in solving engineering problems, and be well prepared in learning a higher level of applied mathematics required in different engineering disciplines.

This course is exclusively for Engineering students.

Pre-requisite: Level 2 or above in Module 1, or Module 2 of the HKDSE Mathematics or equivalent, or Pass in "MATH1011 University mathematics I"

Assessment: 30% continuous assessment, 70% examination

MATH1853. Linear algebra, probability and statistics (6 credits)

As the consecutive course of MATH1851, students will be introduced to more topics of mathematics commonly applied in engineering so that students could be further enhanced with a concrete skill in mathematics underpinned for different engineering subjects. The course emphasizes mathematical concepts, principles, analysis, and their relationship to the modelling of engineering systems. Students could be furnished with the essential mathematical skill to analytically tackle some typical engineering problems to prepare for all the engineering subjects.

This course is exclusively for Engineering students.

Pre-requisite: Level 2 or above in Module 1, or Module 2 of the HKDSE Mathematics or equivalent, or Pass in "MATH1011 University mathematics I"

Assessment: 20% continuous assessment, 80% examination

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

PHYS1050. Physics for engineering students (6 credits)

This one-semester course offers a comprehensive training of physics for engineering students. It covers the major physical laws on mechanics, electricity and magnetism. Specifically, it will introduce and discuss the motion of a particle in one and higher dimensions, Newton's laws of motion, friction, circular motion, forces, impulse and momentum, force polygon and static equilibrium, work and energy, system of particles, moment of inertia and rotation of a rigid body, angular momentum, simple harmonic motion and pendulum; electrostatic fields and potential, Gauss's law, DC circuits, magnetic field due to moving charges, force on a moving charge in magnetic field, Biot-Savart law, Ampere's law, electromagnetic induction, Faraday's law, Eddy currents, AC circuits, phases in capacitive and inductive circuits, power, DC and AC generators, and transformer.

Pre-requisite: Level 2 or above in Module 1, or Module 2 of the HKDSE Mathematics or equivalent, or Pass in "MATH1011 University mathematics I"

Assessment: 30% continuous assessment, 70% examination

ENGG1201. Engineering for sustainable development (6 credits)

This course is an introduction to the broad disciplines of civil, environmental and mechanical engineering and is presented in the context of sustainable development of the built environment. At the end of this course, students should gain an informed understanding of the central issues associated with sustainable development of the built environment. They should also gain an understanding of the roles engineering professionals have played, as well as the ethical and professional responsibilities of engineers, in response to these issues throughout history and the present day. Students will also develop the ability to formulate clear strategies by drawing upon relevant best practices and technologies.

Assessment: 50% continuous assessment, 50% examination

ENGG1202. Introduction to computer science (6 credits)

This course introduces a number of real-world computational problems taken from different areas of computer science (e.g. security and cryptography, artificial intelligence, database, web and networking). Through these problems and some hands-on exercises, students are exposed to the mathematics, data structures and algorithms that form the foundations of computer science and see how these elements integrated together to solve those problems.

Assessment: 100% continuous assessment

ENGG1203. Introduction to electrical and electronic engineering (6 credits)

This course provides an overview of the field of electrical and electronic engineering and its role in the modern world. The function of different electronic engineering disciplines in modern electronic system designs will be introduced, including signal processing, system-level design, digital logic design, circuits design, as well as electronic devices design. The role of electrical systems and their impact on the environment will also be discussed. The design and implementation of an open-ended group project bring these topics into practice.

Assessment: 30% practical work, 30% continuous assessment, 40% examination

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ENGG1204. Industrial management and logistics (6 credits)

The fundamental role of logistics and supply chain management in the economy and organisation; contribution of logistics and supply chain management to value creation; introduction to logistics industry in Hong Kong; contemporary topics in logistics and supply chain management.

Essential management and business skills for engineers; introduction to project management; global manufacturing; applications of industrial engineering principles in different sectors and industries; quality functions; performance improvement; basics of problem solving and decision making.

Assessment: 100% continuous assessment

ENGG1205. Introduction to Mechanical Engineering (6 credits)

This is one of the common engineering courses offered to BEng students in their first year of study. Students who choose to study BEng in Mechanical Engineering must study this course either in their first year or second year. This course aims to provide students with a comprehensive knowledge in the nature of mechanical engineering by studying some important applications including robots, aircrafts and strong materials.

Topics include: modelling of mechanical systems; working principles of robots; mechanics and propulsion of aircrafts; strong materials; hands-on projects.

Assessment: 30% practical work, 20% continuous assessment, 50% examination

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ENGG1206. Introduction to biomedical engineering (6 credits)

This course is an overview of the essential areas in biomedical engineering, including technologies and applications in life sciences and medicine. The course is broadly divided into 4 areas: biomechanics and biomaterial; cell and tissue engineering; biomedical instrumentations and signals, and medical imaging. The global development and other issues, such as safety, ethics and industry will also be addressed. The course has a laboratory component to provide the students with some hands-on experience in the subject.

Assessment: 60% continuous assessment, 40% examination

ENGG1207. Foundations of biochemistry for medical engineering (6 credits)

The course is comprised of four areas of fundamentals, namely:

A. Chemistry for Biochemistry

The elements and bonding (from carbon to Coenzyme A); Resonance and orbital theory (a focus on the electron); Structure and conformation (thinking in 3 dimensions); Isomerism (from mirrors to thalidomide); Water (the universal biochemical solvent) & buffer; Quantitation in chemistry (who was Avogadro anyway?)

B. Biology for Biochemistry

The basic building blocks of life (proteins, DNA, lipids, carbohydrate); The Central Dogma of Molecular Biology; Evolution (considering molecular evolution); Origins of life (the chicken-egg paradox of proteins and DNA)

C. Physics and Mathematics for Biochemistry

Thermodynamics from a Biological Perspective; Introduction to molecular recognition and binding (DNA melting); Statistics for biochemistry (applied statistics for what you really need to know); Thinking numbers (exponentials, logs and the limits of life).

D. Inspiring Biochemistry

The protein (from Perutz to the frontier of proteomics); The gene (from the double helix to the human genome project and how it failed to live up to its expectations); Vitamins and disease (stories of scientific discovery motivated by human suffering); Synthetic biology (a cure to the world's energy problems or misplaced trust in dangerous technology); The challenges of modern-day genetics (will we ever really understand individuality; Drugs-successes, failures, and perhaps the most challenging business on earth.

Assessment: 20%practical work, 30% continuous assessment, 50% examination

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University Language Enhancement Courses

All the students admitted to the Bachelor of Engineering curriculum under common code admission are required to take two English language enhancement courses and one Chinese language enhancement course in the study year as specified in the syllabuses of respective BEng curriculum:

CAES1000 Core University English
CAES95## English in the Discipline course for respective BEng curriculum
CENG9001 Practical Chinese for engineering students[1]

COURSE DESCRIPTIONS

CAES1000. Core University English (6 credits)

The Core University English (CUE) aims to enhance first-year students' academic English language proficiency in the university context. CUE focuses on developing students' academic English language skills for the Common Core Curriculum. These include the language skills needed to understand and produce spoken and written academic texts, express academic ideas and concepts clearly and in a well-structured manner and search for and use academic sources of information in their writing and speaking. Four online-learning modules through the Moodle platform on academic speaking, academic grammar, academic vocabulary, citation and referencing skills and avoiding plagiarism will be offered to students to support their English learning. This course will help students to participate more effectively in their first-year university studies in English, thereby enriching their first-year experience.

Assessment: 65% continuous assessment, 35% examination.

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[1] Students are required to successfully complete the 6-credit Faculty-specific Chinese language enhancement course, except for:

(a) Putonghua-speaking students who should take CUND9002 (Practical Chinese and Hong Kong Society) or CUND9003 (Cantonese for Non-Cantonese Speaking Students); and

(b) students who have not studied Chinese language during their secondary education or who have not attained the requisite level of competence in the Chinese language to take the Chinese language enhancement course should seek approval from the Board of the Faculty of Engineering for exemption from the Chinese language requirement, and

  (i) take a 6-credit Cantonese or Putonghua language course offered by the School of Chinese especially for international and exchange students; OR

  (ii) take an elective course in lieu.

CENG9001. Practical Chinese for engineering students (6 credits)
(normally to be taken at the first semester of third year of study)

The course is designed to enable students to gain a mastery of the varieties of the Chinese language as used in the field of Engineering. It introduces students to various techniques for the effective use of practical Chinese. The course will familiarize students with traditional Chinese characters, simplified Chinese characters, modern Chinese grammar and rhetoric through outcomes-based assignments. Special training that is intended to sharpen students' presentation skills in Cantonese and Putonghua will also be provided.

Assessment: 50% continuous assessment, 50% examination.

CAES95## English in the Discipline course for respective BEng curriculum (6 credits)
[to be taken in the study year as specified in the syllabuses of respective BEng curriculum]

Apart from "CAES1000 Core University English", BEng students must complete a 6-credit English in the Discipline (ED) course as specified in the syllabuses of respective BEng curriculum, with the summary of the list of ED courses as follows:

Course Code	Course Title	BEng Curriculum	Year/Semester (normally to be taken)
CAES9532	Technical English for Industrial and Manufacturing Systems Engineering	BEng(IELM)	Semester 1, Year 3
CAES9544	Technical English for Mechanical Engineering	BEng(ME)	Semester 2, Year 4
CAES9531	Technical English for Medical Engineering	BEng(MedE)	Semester 1, Year 3
CAES9540	Technical English for Civil Engineering	BEng(CivE)	Semester 1, Year 4
CAES9541	Technical English for Electrical and Electronic Engineering	BEng(CE) BEng(ElecE) BEng(EE)	Semester 2, Year 4
CAES9542	Technical English for Computer Science	BEng(CompSc)	Semester 1, Year 4

<u>Minor Option</u>

Candidates are given an option to pursue a minor in a discipline outside their own degree curriculum. Candidates who wish to have their minor recorded on the transcript must take and pass all the required courses in the selected minor as specified by the offering Department/Faculty in addition to the graduation requirements of their own degree curriculum. For the descriptions of the course under minor options, candidates should refer to the syllabuses of the relevant degree.

Courses taken to fulfil the Minor Option requirements may also be considered as equivalent courses that satisfy the elective requirements of the BEng curriculum, subject to the approval of the Board of the Faculty of Engineering.

Double Degree in BEng/BBA Option

Candidates are given an option to pursue the double degree in BEng/BBA, subject to the approval of the Boards of the Faculty of Engineering and Faculty of Business and Economics upon their meeting the prescribed admission requirements as laid down by both the Faculty of Engineering and the Faculty of Business and Economics.

Courses taken to fulfil the double degree curriculum requirements may also be considered as equivalent courses that satisfy the elective requirements of the BEng curriculum, subject to the approval of the Board of the Faculty of Engineering.

Candidates who have satisfied all the requirements of the BEng curriculum will be awarded the degree of Bachelor of Engineering. To be eligible for proceeding to the BBA programme in the 5th year, candidates must:

(1) fulfil the requirements of the BEng curriculum;
(2) hold a degree of BEng with Second Class Honours from The University of Hong Kong; and
(3) pass the 54 credits of courses, as listed below, as required by the Faculty of Business and Economics during their study for BEng:

Course Code	**Course**	**Credits**
ACCT1101	Introduction to financial accounting	6
IIMT2601	Management information systems	6
MKTG2501	Introduction to marketing	6
MGMT2401	Principles of management	6
ECON1210	Introductory microeconomics	6
FINA1310	Corporate finance	6
ACCT2105	Introduction to management accounting	6
	Electives (Any 2 courses in HRM, Marketing or Wealth Management major as specified below)	12
	Total	***54***

Elective courses for BEng/BBA (Human Resource Management, HRM)

Course Code	**Course**	**Credits**
MGMT3403	Leadership	6
MGMT3404	Cross-cultural management	6
MGMT3405	Organizational behaviour	6
MGMT3415	Principles of entrepreneurship	6
MGMT3429	Strategic human resources management	6
MGMT3434	Human resource: theory and practice	6
MGMT3475	Current topics in human resource management	6
MGMT3476	Managing organizational change	6

Elective courses for BEng/BBA (Marketing)

Course Code	**Course**	**Credits**
MKTG3501	Consumer behaviour	6
MKTG3502	Marketing research	6
MKTG3525	Services marketing	6
MKTG3531	Strategic marketing management	6

Elective courses for BEng/BBA (Wealth Management)

Course Code	Course	Credits
ACCT3107	Hong Kong taxation	6
FINA2320	Investment and portfolio analysis	6
FINA2322	Derivatives	6
FINA2325	Alternative investments	6
FINA2342	Insurance: theory and practice	6

Subject to approval of the Board of the Faculty of Engineering, candidates who have completed the requirements of BEng and decide not to proceed to the study for BBA may be awarded with a minor as specified by the Faculty of Business and Economics, if they have completed not less than 36 to 48 credits of courses in compliance with the syllabuses for the minor programme.

To obtain the degree of BBA, candidates must satisfactorily complete 114 credits of courses, 54 of which shall be completed during the study for BEng and 60 of which shall be completed during the 5th year in accordance with the Regulations and Syllabuses for the Degree of BBA in Conjunction with the Degree of BEng. The required courses in the first four years of BEng degree and the fifth year BBA degree are not interchangeable. Change of order of study of the course is not allowed. Students can neither defer any required courses to the second degree BBA (year 5) nor advance any required courses to the first degree BEng (year 1 - 4).

Note: Candidates may refer to the "Regulations for the Degree of Bachelor of Business Administration (BBA) in conjunction with the Degree of Bachelor of Engineering (BEng)" and "Syllabuses for the Degree of Bachelor of Business Administration (BBA) in conjunction with the Degree of Bachelor of Engineering (BEng)" for the regulations, length and contents of courses for the double degree in BEng/BBA option.

CIVIL ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2016-17 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:

General Engineering Courses
Students are required to complete at least 36 credits of General Engineering Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses (78 credits), comprising 24 credits of introductory core courses and 54 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 18 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.

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 6-credit internship "CIVL2109 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 EN16 of the Regulations for the Degree of Bachelor of Engineering and UG9 of the Regulations for the 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1111/ ENGG1112	Computer programming and applications/ Computer programming and applications I	6
PHYS1050	Physics for engineering students	6
ENGG1201	Engineering for sustainable development	6
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering[+]	6
Total for General Engineering Courses		36

[+] Choose one General Engineering Course from the following list:

ENGG1202	Introduction to computer science
ENGG1203	Introduction to electrical and electronic engineering
ENGG1204	Industrial management and logistics
ENGG1205	Introduction to mechanical engineering
ENGG1206	Introduction to biomedical engineering
ENGG1207	Foundations of biochemistry for medical engineering

Discipline Core Courses (78 credits)

Introductory Courses (24 credits)

Course Code	Course	No. of credits
CIVL1105	Environmental engineering	6
CIVL1113	Engineering mechanics & materials	6
CIVL1114	Surveying & drawing	6
MECH2407	Multivariable calculus and partial differential equations	6
Total for Introductory Discipline Core Courses		24

Advanced Courses (54 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
CIVL4101	Capstone design project	6
Total for Advanced Discipline Core Courses		54

Capstone Experience and Internship (18 credits)

Course Code	Course	No. of credits
CIVL2109	Internship*	6
CIVL4102	Project^{+}	12
Total for Capstone Experience and Internship Courses		18

+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 (18 credits)

At least 18 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
General Engineering Courses	36
Discipline Core Courses (Introductory)	24
Discipline Core Courses (Advanced)	54
Capstone Experience and Internship	18
Discipline Elective Courses	36
Elective Courses	18
Total	**240**

A suggested study plan is given as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and ordinary differential equations
MATH1853	Linear algebra, probability & statistics
ENGG1111/	Computer programming and applications/
ENGG1112	Computer programming and applications I
PHYS1050	Physics for engineering students
ENGG1201	Engineering for sustainable development
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering

University Requirements (UG5) (24 credits)

CAES1000	Core University English
CC##XXXX	Three Common Core Courses

SECOND AND THIRD YEARS

Introductory Discipline Core Courses (24 credits)

CIVL1105	Environmental engineering
CIVL1113	Engineering mechanics & materials
CIVL1114	Surveying & drawing
MECH2407	Multivariable calculus and partial differential equations

Advanced Discipline Core Courses (48 credits)

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

Discipline Elective Courses (18 Credits)

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

University Requirements (UG5) (24 credits)

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

Internship (6 credits)

CIVL2109	Internship (This course must be enrolled in the Summer semester of the third year)

FOURTH YEAR

Advanced Discipline Core Courses (6 credits)

CIVL4101	Capstone design project (This course must be enrolled in the fourth year)

Discipline Elective Courses (18 credits)

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

Capstone Experience (12 credits)

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

University Requirements (UG5) (6 credits)

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

Elective Courses (18 credits)

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

COURSE DESCRIPTIONS

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

General Engineering Courses

ENGG1111	Computer programming (6 credits)
ENGG1112	Computer programming I (6 credits)
MATH1851	Calculus and ordinary differential equations (6 credits)
MATH1853	Linear algebra, probability & statistics (6 credits)
MECH2407	Multivariable calculus and partial differential equations (6 credits)
PHYS1050	Physics for engineering students (6 credits)
ENGG1201	Engineering for sustainable development (6 credits)
ENGG1202	Introduction of computer science (6 credits)
ENGG1203	Introduction to electrical and electronic engineering (6 credits)
ENGG1204	Industrial management and logistics (6 credits)
ENGG1205	Introduction to mechanical engineering (6 credits)
ENGG1206	Introduction to biomedical engineering (6 credits)
ENGG1207	Foundations of biochemistry for medical engineering (6 credits)

Please refer to the General Engineering 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
CIVL4101 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 Engineering Mechanics part of this course aims to provide students with a firm foundation of engineering mechanics, which is needed for their later studies in structural engineering and geotechnical engineering. This part covers equilibrium of forces; bending moment, shear and axial forces; beam theory for bending and shear; torsion of circular sections; shear centre; analysis of stress and strain; and column buckling.

The Materials part of this course aims to provide students with a general knowledge of common construction materials and some background knowledge of material science. This part covers major applications and required properties of construction materials; structural steel; concrete; masonry; timber; bituminous materials; crystalline structure; elastic and plastic deformation; phase diagram; alloying; material forming and heat treatment; and corrosion.

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

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CIVL1114. Surveying and drawing (6 credits)

The Surveying part of this course aims to provide students with an overview on the surveying principles in determination of the differences in levelling between stations and of the coordinates of stations. Students will be introduced to basic surveying instruments and techniques through lectures and field work. The aim of the Drawing part of this course is to familiarize the students with the techniques for reading and production 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

Advanced Discipline Core Courses

CIVL2102. Engineering geology and rock mechanics (6 credits)

This course provides an introduction to engineering geology, 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

CIVL4101. Capstone Design Project (6 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

CIVL2109. Internship (6 credits)

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 CIVL2107 Theory and Design of Structures II / CIVL2113 Structural design before taking this course.

Pre-requisite: CIVL2107 Theory and design of structures II or 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 CIVL2107 Theory and Design of Structures II / CIVL2113 Structural design requirement before taking this course.

Pre-requisite: CIVL2107 Theory and design of structures II or 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: CIVL2107 Theory and design of structures II or 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: CIVL2107 Theory and design of structures II or 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: CIVL2107 Theory and design of structures II or 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: CIVL2107 Theory and design of structures II or 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]

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]

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
ENGG1201	Engineering for sustainable development*	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 ENGG1201 Engineering for sustainable development as satisfying the requirements of the General Engineering 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.

COMPUTER SCIENCE

SYLLABUS

The syllabus applies to students admitted in the academic year 2016-17 and thereafter under the four-year curriculum.

Definition and Terminology

Each course offered by the Department of Computer Science 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 Computer Science for the fulfillment of the curriculum requirements of the degree of BEng in Computer Science that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

General Engineering Courses
Students are required to complete at least 36 credits of General Engineering Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses (60 credits), comprising 24 credits of introductory core courses and 36 credits of advanced core courses.

Discipline Elective Courses
Students are required to complete at least 30 credits of discipline elective courses offered by the Department of Computer Science.

Elective Courses
Students are required to complete 42 credits of elective course(s) offered by either the Department of Computer Science, 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 "CAES9542 Technical English for computer science";
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.

Capstone Experience
Students are required to complete the 12-credit "COMP4801 Final year project" to fulfill the capstone experience requirement for the degree of BEng in Computer Science.

Internship

Students are required to complete the 6-credit internship "COMP3412 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 EN16 of the Regulations for the Degree of Bachelor of Engineering and UG9 of the Regulations for the First Degree Curricula.

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

The curriculum of BEng (Computer Science) 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
CAES9542	Technical English for computer science	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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability and statistics	6
ENGG1111/ ENGG1112	Computer programming and applications/ Computer programming and applications I	6
PHYS1050	Physics for engineering students	6
ENGG1202	Introduction to computer science	6
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering+	6
Total for General Engineering Courses		36

+Choose one General Engineering Course from the following list:

ENGG1201	Engineering for sustainable development
ENGG1203	Introduction to electrical and electronic engineering
ENGG1204	Industrial management and logistics
ENGG1205	Introduction to mechanical engineering
ENGG1206	Introduction to biomedical engineering
ENGG1207	Foundation of biochemistry for medical engineering

Discipline Core Courses (60 credits)

Introductory Courses (24 credits)

Course Code	Course	No. of credits
COMP2119	Introduction to data structures and algorithms	6
COMP2120	Computer organization	6
COMP2121	Discrete mathematics	6
COMP2123	Programming technologies and tools	6
Total for Introductory Discipline Core Courses		24

Advanced Courses (36 credits)

Course Code	Course	No. of credits
COMP3230	Principles of operation systems	6
COMP3234	Computer and communication networks	6
COMP3250	Design and analysis of algorithms	6
COMP3278	Introduction to database management systems	6
COMP3297	Introduction to software engineering	6
COMP3311	Legal aspects of computing	6
Total for Advanced Discipline Core Courses		36

Capstone Experience and Internship (18 credits)

Course Code	Course	No. of credits
COMP4801	Final year project^{+}	12
COMP3412	Internship*	6
Total for Capstone Experience and Internship		18

+Capstone Experience
*Internship
*Students who are selected to participate in the Undergraduate Research Fellowship Programme are required to complete COMP3413 Research internship and are not required to complete COMP3412 Internship.

Discipline Elective Courses (30 credits)

Course Code	Course	No. of credits
COMP2396	Object-oriented programming and Java	6
COMP3231	Computer architecture	6
COMP3235	Compiling techniques	6
COMP3258	Functional programming	6
COMP3259	Principles of programming languages	6
COMP3270	Artificial intelligence	6
COMP3271	Computer graphics	6
COMP3314	Machine learning	6
COMP3315	Multimedia computing and applications	6
COMP3316	Quantum information and computation	6
COMP3317	Computer vision	6
COMP3320	Electronic commerce technology	6
COMP3322	Modern technologies on World Wide Web	6
COMP3323	Advanced database systems	6
COMP3327	Computer and network security	6
COMP3329	Computer game design and programming	6
COMP3330	Interactive mobile application design and programming	6
COMP3351	Advanced algorithm analysis	6

COMP3402	System architecture and distributed computing	6
COMP3403	Implementation, testing and maintenance of software systems	6
COMP3404	Software quality and project management	6
COMP3407	Scientific computing	6
COMP3413	Research internship	6
Complete at least five discipline elective courses for a total of 30 credits		30

Elective Courses (42 credits)

At least 42 credits of courses offered by either the Department of Computer Science, or other departments within or outside of the Faculty of Engineering.

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

Summary of curriculum structure of BEng (Computer Science)

Course Categories	No. of credits
UG5 Requirements	54
General Engineering Courses	36
Discipline Core Courses (Introductory)	24
Discipline Core Courses (Advanced)	36
Capstone Experience and Internship	18
Discipline Elective Courses	30
Elective Courses	42
Total	**240**

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and ordinary differential equations
MATH1853	Linear algebra, probability and statistics
ENGG1111/	Computer programming and applications/
ENGG1112	Computer programming and applications I
PHYS1050	Physics for engineering students
ENGG1202	Introduction to computer science
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering

University Requirements (UG5) (24 credits)

CAES1000	Core University English
CC##XXXX	Three Common Core Courses

SECOND YEAR

Introductory Core Courses (24 credits)

COMP2119	Introduction to data structures and algorithms
COMP2120	Computer organization
COMP2121	Discrete mathematics

COMP2123 Programming technologies and tools

Discipline Elective Courses (6 credits)

Elective Courses (12 credits)

University Requirements (UG5) (18 credits)
CC##XXXX Three Common Core Courses

THIRD YEAR

Advanced Core Courses (36 credits)
COMP3230 Principles of operation systems
COMP3234 Computer and communication networks
COMP3250 Design and analysis of algorithms
COMP3278 Introduction to database management systems
COMP3297 Introduction to software engineering
COMP3311 Legal aspects of computing

Internship (6 credits)
COMP3412 Internship

University Requirements (UG5) (6 credits)
CENG9001 Practical Chinese for engineering students

Discipline Elective Courses (12 credits)

Elective Courses (6 credits)

FOURTH YEAR

Discipline Elective Courses (12 credits)

Capstone Experience (12 credits)
COMP4801 Final year project

University Requirements (UG5) (6 credits)
CAES9542 Technical English for computer science

Elective Courses (24 credits)

MAJOR IN COMPUTER SCIENCE
(for non-BEng(CompSc) students)

The curriculum comprises 84 credits of courses with the following structure:

Prerequisite: Level 3 or above in Mathematics in the Hong Kong Diploma of Secondary Education (HKDSE) Examination

Introductory Courses (30 credits)

Course Code	Course	No. of credits
COMP1117	Computer programming	6
COMP2119	Introduction to data structures and algorithms	6

COMP2120	Computer organization	6
COMP2121	Discrete mathematics	6
COMP2123	Programming technologies and tools	6
Total for Introductory Courses		30

Advanced Courses (48 credits)

Course Code	Course	No. of credits
	12 credits of courses to be chosen from the following list:	12
COMP3230	Principles of operating systems	
COMP3234	Computer and communication networks	
COMP3278	Introduction to database management systems	
COMP3297	Introduction to software engineering	
	36 credits of elective courses to be chosen from the following list:	36
COMP3230	Principles of operating systems	
COMP3234	Computer and communication networks	
COMP3278	Introduction to database management systems	
COMP3297	Introduction to software engineering	
COMP2396	Object-oriented programming and Java	
COMP3231	Computer architecture	
COMP3235	Compiling techniques	
COMP3250	Design and analysis of algorithms	
COMP3258	Functional programming	
COMP3259	Principles of programming languages	
COMP3270	Artificial intelligence	
COMP3271	Computer graphics	
COMP3311	Legal aspects of computing	
COMP3314	Machine learning	
COMP3315	Multimedia computing and applications	
COMP3316	Quantum information and computation	
COMP3317	Computer vision	
COMP3320	Electronic commerce technology	
COMP3322	Modern technologies on World Wide Web	
COMP3323	Advanced database systems	
COMP3327	Computer and network security	
COMP3329	Computer game design and programming	
COMP3330	Interactive mobile application design and programming	
COMP3351	Advanced algorithm analysis	
COMP3402	System architecture and distributed computing	
COMP3403	Implementation, testing and maintenance of software systems	
COMP3404	Software quality and project management	
COMP3407	Scientific computing	
Total for Advanced Courses		48

Capstone Experience (6 credits)

Course Code	Course	No. of credits
COMP4805	Project	6
Total for Capstone Experience		6

Note 1 Students who have completed MATH3600 Discrete mathematics are deemed to have completed COMP2121, they are not permitted to take COMP2121 and are required to complete one more elective in Computer Science as replacement.

Note 2 Course enrollment in elective courses is subject to the approval of the Department of Computer Science, in consideration of class quota and other academic issues.

MINOR IN COMPUTER SCIENCE
(This minor option is not available for BEng(CE) and BEng(CompSc) students)

The curriculum comprises 42 credits of courses with the following structure:

Prerequisite: Level 3 or above in Mathematics in the Hong Kong Diploma of Secondary Education (HKDSE) Examination

Introductory Courses (18 credits)

Course Code	Course	No. of credits
COMP1117	Computer programming	6
COMP2119	Introduction to data structures and algorithms	6
COMP2123	Programming technologies and tools	6
Total for Introductory Courses		18

Advanced Courses (24 credits)

Course Code	Course	No. of credits
	24 credits of courses to be chosen from the following list:	24
COMP2120	Computer organization	
COMP2121	Discrete mathematics	
COMP2396	Object-oriented programming and Java	
COMP3230	Principles of operation systems	
COMP3231	Computer architecture	
COMP3234	Computer and communication networks	
COMP3235	Compiling techniques	
COMP3250	Design and analysis of algorithms	
COMP3258	Functional programming	
COMP3259	Principles of programming languages	
COMP3270	Artificial intelligence	
COMP3271	Computer graphics	
COMP3278	Introduction to database management systems	
COMP3297	Introduction to software engineering	
COMP3311	Legal aspects of computing	
COMP3314	Machine learning	
COMP3315	Multimedia computing and applications	
COMP3316	Quantum information and computation	
COMP3317	Computer vision	
COMP3320	Electronic commerce technology	
COMP3322	Modern technologies on World Wide Web	
COMP3323	Advanced database systems	

COMP3327	Computer and network security	
COMP3329	Computer game design and programming	
COMP3330	Interactive mobile application design and programming	
COMP3351	Advanced algorithm analysis	
COMP3402	System architecture and distributed computing	
COMP3403	Implementation, testing and maintenance of software systems	
COMP3404	Software quality and project management	
COMP3407	Scientific computing	
Total for Advanced Courses		24

Note 1 BEng students who have completed ENGG1111 Computer programming and applications are deemed to have completed COMP1117 Computer programming, and they are required to complete one more elective in Computer Science as replacement (i.e. a total of 30 credits).

Note 2 Course enrollment in elective courses is subject to the approval of the Department of Computer Science, in consideration of class quota and other academic issues.

COURSE DESCRIPTIONS

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

General Engineering Courses

ENGG1111 Computer programming and applications (6 credits)
ENGG1112 Computer programming and applications I (6 credits)
MATH1851 Calculus and ordinary differential equations (6 credits)
MATH1853 Linear algebra, probability and statistics (6 credits)
PHYS1050 Physics for engineering students (6 credits)
ENGG1201 Engineering for sustainable development (6 credits)
ENGG1202 Foundation of computer science (6 credits)
ENGG1203 Introduction to electrical and electronic engineering (6 credits)
ENGG1204 Industrial management and logistics (6 credits)
ENGG1205 Introduction to mechanical engineering (6 credits)
ENGG1206 Introduction to biomedical engineering (6 credits)
ENGG1207 Foundation of biochemistry for medical engineering

Please refer to the General Engineering 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.

CAES9542. Technical English for computer science (6 credits)

Running alongside Computer Science project based courses, this one semester, 6-credit course will

build and consolidate final year CS and Computing and data analytics students' ability to compose technical reports, and make technical oral presentations. The focus of this course is on helping students to report on the progress of their Final Year Project in an effective, professional manner in both written and oral communication. Topics include accessing, abstracting, analyzing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; and technical presentations. Assessment is wholly by coursework.

Co-requisite: COMP4801 or COMP4804
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

Courses with prefix CSISxxxx are offered to students admitted to the 3-year curriculum in 2012/13 and before, courses with prefix COMPxxxx are offered to students admitted to the 4-year curriculum in 2012/13 and thereafter.

COMP1117. Computer programming (6 credits)

This course covers both the basic and advanced features of the C/C++ programming languages, including syntax, identifiers, data types, control statements, functions, arrays, file access, objects and classes, class string, structures and pointers. It introduces programming techniques such as recursion, linked lists and dynamic data structures. The concept and skills of program design, implementation and debugging, with emphasis on problem-solving, will also be covered.

Assessment: 50% continuous assessment, 50% examination

COMP2119. Introduction to data structures and algorithms (6 credits)

Arrays, linked lists, trees and graphs; stacks and queues; symbol tables; priority queues, balanced trees; sorting algorithms; complexity analysis.

Prerequisite: CSIS1117 or COMP1117 or ENGG1002 or ENGG1111 or ENGG1112
Pre-/Co-requisite: CSIS1122 or CSIS1123 or COMP2123
Assessment: 40% continuous assessment, 60% examination

COMP2120. Computer organization (6 credits)

Introduction to computer organization and architecture; data representations; instruction sets; machine and assembly languages; basic logic design and integrated devices; the central processing unit and its control; memory and caches; I/O and storage systems; computer arithmetic.

Co-requisite: CSIS1117 or COMP1117 or ENGG1002 or ENGG1111 or ENGG1112
Mutually exclusive with: ELEC2441
Assessment: 50% continuous assessment, 50% examination

COMP2121. Discrete mathematics (6 credits)

This course provides students a solid background on discrete mathematics and structures pertinent to computer science. Topics include logic; set theory; mathematical reasoning; counting techniques; discrete probability; trees, graphs, and related algorithms; modeling computation.

Mutually exclusive with: MATH3600
Assessment: 50% continuous assessment, 50% examination

COMP2123. Programming technologies and tools (6 credits)

This course introduces various technologies and tools that are useful for software development, including Linux, C++ STL, the C language, shell scripts, python and xml. Learning materials will be provided but there will be no lecture. This strengthens the self-learning ability of the students.

Prerequisite: CSIS1117 or COMP1117 or ENGG1002 or ENGG1111 or ENGG1112
Assessment: 70% continuous assessment, 30% examination

COMP2396. Object-oriented programming and Java (6 credits)

Introduction to object-oriented programming; abstract data types and classes; inheritance and polymorphism; object-oriented program design; Java language and its program development environment; user interfaces and GUI programming; collection class and iteration protocol; program documentation.

Prerequisite: CSIS1117 or COMP1117 or ENGG1002 or ENGG1111 or ENGG1112
Mutually exclusive with: ELEC2543
Assessment: 50% continuous assessment, 50% examination

COMP3230. Principles of operating systems (6 credits)

Operating system structures, process and thread, CPU scheduling, process synchronization, deadlocks, memory management, file systems, I/O systems and device driver, mass-storage structure and disk scheduling, case studies.

Prerequisites: CSIS1122 or CSIS1123 or COMP2123 and CSIS1120 or COMP2120 or ELEC1401 or ELEC2441
Assessment: 50% continuous assessment, 50% examination

COMP3231. Computer architecture (6 credits)

Introduction to computer design process; performance and cost analysis; instruction set design; data-path and controller design; pipelining; memory system; I/O design; introduction to advanced topics.

Prerequisite: CSIS1120 or COMP2120
Assessment: 40% continuous assessment, 60% examination

COMP3234. Computer and communication networks (6 credits)

Network structure and architecture; reference models; stop and wait protocol; sliding window protocols; character and bit oriented protocols; virtual circuits and datagrams; routing; flow control; congestion control; local area networks; issues and principles of network interconnection; transport protocols and application layer; and examples of network protocols.

Prerequisite: CSIS0230 or COMP3230
Mutually exclusive with: ELEC3443
Assessment: 50% continuous assessment, 50% examination

COMP3235. Compiling techniques (6 credits)

Lexical analysis; symbol table management; parsing techniques; error detection; error recovery; error diagnostics; run-time memory management; optimization; code generation.

Prerequisite: CSIS1119 or COMP2119; and CSIS1122 or CSIS1123 or COMP2123
Assessment: 50% continuous assessment, 50% examination

COMP3250. Design and analysis of algorithms (6 credits)

The course studies various algorithm design techniques, such as divide and conquer, and dynamic programming. These techniques are applied to design novel algorithms from various areas of computer science. Topics include: advanced data structures; graph algorithms; searching algorithms; geometric algorithms; overview of NP-complete problems.

Prerequisite: CSIS1119 or COMP2119 or ELEC1502 or ELEC1503 or ELEC2543
Assessment: 50% continuous assessment, 50% examination

COMP3258. Functional programming (6 credits)

The course teaches the basics of functional programming using the language Haskell. The main goal is introduce students to fundamental programming concepts such as recursion, abstraction, lambda expressions and higher-order functions and data types. The course will also study the mathematical reasoning involved in the design of functional programs and techniques for proving properties about functions so defined. With the adoption of lambda expressions recent versions of Java, C++ or C#, functional programming and related programming techniques are becoming increasingly more relevant even for programmers of languages that are not traditionally viewed as functional. This course is important to introduce students to such techniques.

Prerequisite: CSIS1118 or CSIS1121 or COMP2121
Assessment: 50% continuous assessment, 50% examination

COMP3259. Principles of programming languages (6 credits)

Syntax and semantics specification; data types; data control and memory management; expressions,

precedence and associativity of operators; control structures; comparative study of existing programming languages; advanced topics such as polymorphism, programming paradigms, exception handling and concurrency.

Prerequisites: CSIS1119 or COMP2119
Assessment: 40% continuous assessment, 60% examination

COMP3270. Artificial intelligence (6 credits)

This is an introduction course on the subject of artificial intelligence. Topics include: intelligent agents; search techniques for problem solving; knowledge representation; logical inference; reasoning under uncertainty; statistical models and machine learning.

Prerequisite: CSIS1119 or COMP2119 or CSIS1122 or CSIS1123 or COMP2123
Mutually exclusive with: BUSI0088 or IIMT3688
Assessment: 50% continuous assessment, 50% examination

COMP3271. Computer graphics (6 credits)

Overview of graphics hardware, basic drawing algorithms, 2-D transformations, windowing and clipping, interactive input devices, curves and surfaces, 3-D transformations and viewing, hidden-surface and hidden-line removal, shading and colour models, modelling, illumination models, image synthesis, computer animation.

Prerequisite: CSIS1119 or COMP2119 or CSIS1122 or CSIS1123 or COMP2123
Assessment: 50% continuous assessment, 50% examination

COMP3278. Introduction to database management systems (6 credits)

This course studies the principles, design, administration, and implementation of database management systems. Topics include: entity-relationship model, relational model, relational algebra, database design and normalization, database query languages, indexing schemes, integrity and concurrency control.

Prerequisite: CSIS1119 or COMP2119 or ELEC1502 or ELEC1503 or ELEC2543
Mutually exclusive with: BUSI0052 or IIMT3601
Assessment: 50% continuous assessment, 50% examination

COMP3297. Introduction to software engineering (6 credits)

This course introduces the fundamental principles and methodologies of software engineering. It covers the software process and methods and tools employed in the development of modern systems. The use of CASE tools and the UML are emphasized. The course includes a team-based project in which students apply their new knowledge to a full development lifecycle, including maintenance.

Prerequisite: CSIS1122 or CSIS1123 or COMP2123
Assessment: 50% continuous assessment, 50% examination

COMP3311. Legal aspects of computing (6 credits)

To introduce students to the laws affecting computing and the legal issues arising from the technology. Contents include: the legal system of Hong Kong; copyright protection for computer programs; intellectual property issues on the Internet; data privacy; computer-related crimes; codes of professional conduct for computer professionals.

Prerequisite: CSIS1122 or CSIS1123 or COMP2123
Assessment: 40% continuous assessment, 60% examination

COMP3314. Machine learning (6 credits)

An introduction to algorithms and applications of machine learning. Topics include: decision theory; parametric models; supervised learning (classification and regression); unsupervised learning (clustering, mixture models, principal component analysis); Bayesian methods.

Prerequisite: MATH1853; and CSIS1119 or COMP2119 or ELEC1502 or ELEC1503 or ELEC2543
Assessment: 50% continuous assessment, 50% examination

COMP3315. Multimedia computing and applications (6 credits)

This course introduces various aspects of the interdisciplinary and multidisciplinary field of multimedia computing. Current developments of technologies and techniques in multimedia will also be covered. Applications of multimedia techniques are also highlighted through a media production course project. Major topics include: what are media, audio, acoustics and psychoacoustics, MIDI, basic compression techniques, video compression techniques, standards, and current multimedia technologies.

Prerequisite: CSIS1119 or COMP2119
Mutually exclusive with: BUSI0068 or IIMT3668
Assessment: 50% continuous assessment, 50% examination

COMP3316. Quantum information and computation (6 credits)

This course offers a gentle introduction to the interdisciplinary field of quantum information and computation. We will start from the basic principles of quantum theory and become familiar with the counterintuitive notions of quantum superposition and entanglement. Once the basics have been covered, we will explore the cornerstones of quantum information theory: quantum cloning machines, quantum teleportation, quantum state discrimination, quantum error correction, quantum cryptography and data compression. Finally, we will provide an overview of quantum computation and of the main quantum algorithms, including Shor's algorithm for prime factorization in polynomial time and Grover's quantum search algorithm.

Prerequisite: MATH1853 or MATH2101 or PHYS2155 or equivalent
Assessment: 50% continuous assignment, 50% examination

COMP3317. Computer vision (6 credits)

This course introduces the principles, mathematical models and applications of computer vision. Topics include: image processing techniques, feature extraction techniques, imaging models and camera calibration techniques, stereo vision, and motion analysis.

Prerequisite: CSIS1119 or COMP2119 or CSIS1122 or CSIS1123 or COMP2123
Assessment: 50% continuous assessment, 50% examination

COMP3320. Electronic commerce technology (6 credits)

This course aims to help students to understand the technical and managerial challenges they will face as electronic commerce becomes a new locus of economics activities. Topics include Internet and WWW technology, information security technologies, public-key crypto-systems, public-key infrastructure, electronic payment systems, and electronic commerce activities in different sectors.

Prerequisite: CSIS0278 or COMP3278
Assessment: 30% continuous assessment, 70% examination

COMP3322. Modern technologies on World Wide Web (6 credits)

Basics on Internet and network protocols (TCP and IP); Internet applications; Domain Name System; World Wide Web; Web addressing; HTTP; HTML, XML, style sheets, etc.; programming the Web: PHP, JavaScript, etc.; other topics of current interest (AJAX, HTML5, web services, cloud computing).

Prerequisite: CSIS1117 or COMP1117 or ENGG1002 or ENGG1111 or ENGG1112
Mutually exclusive with: BUSI0063 or IIMT3663
Assessment: 50% continuous assessment, 50% examination

COMP3323. Advanced database systems (6 credits)

The course will study some advanced topics and techniques in database systems, with a focus on the system and algorithmic aspects. It will also survey the recent development and progress in selected areas. Topics include: query optimization, spatial-spatiotemporal data management, multimedia and time-series data management, information retrieval and XML, data mining.

Prerequisite: CSIS0278 or COMP3278
Assessment: 50% continuous assessment, 50% examination

COMP3327. Computer and network security (6 credits)

This course introduces the principles, mechanisms and implementation of computer security and data protection. Knowledge about the attack and defend are included. Topics include notion and terms of information security; introduction to encryption: classic and modern encryption technologies include public-key systems; authentication methods; access control methods; system integrity attacks and defences (e.g. viruses); introduction to network/Internet security; analysis and models of secure systems.

Pre-requisites: CSIS0230 or COMP3230; and CSIS0234 or COMP3234
Mutually exclusive with: ELEC4641
Assessment: 30% continuous assessment, 70% examination

COMP3329. Computer game design and programming (6 credits)

The course will study practical topics in game design. Topics includes: types of game, game platforms,

design of game, 3D model and kinematics, rendering techniques, collision detection, project management, AI, UI, sound effects, and networking.

Pre-requisite: CSIS1122 or CSIS1123 or COMP2123
Assessment: 50% continuous assessment, 50% examination

COMP3330. Interactive mobile application design and programming (6 credits)

This course introduces the Android platform for developing interactive mobile applications. Topics include user interface, parallel computing, graphics, multimedia, sensors, database, and social computing. Students participate in both individual assignments and group projects to practice ideation, reading, writing, coding, and presentation.

Prerequisite: CSIS0396 or COMP2396
Assessment: Assessment: 70% continuous assessment, 30% examination

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COMP3351. Advanced algorithm analysis (6 credits)

This class introduces advanced mathematical techniques for analyzing the complexity and correctness of algorithms. NP-complete problems are believed to be not solvable in polynomial time and we study how approximation algorithms could give near optimal solutions. In particular, we will see that probability theory gives us a very powerful tool to tackle problems that are otherwise hard to solve.

Prerequisite: CSIS0250 or COMP3250; or basic knowledge in probability and algorithms
Assessment: 50% continuous assessment, 50% examination

COMP3402. System architecture and distributed computing (6 credits)

This course introduces the architecture of modern systems and the concepts and principles of distributed computing. Topics include: client-server computing, multi-tier architectures, data/object persistence, parallel server systems, naming services, transaction processing, middleware and messaging, component technologies, and web services/APIs.

Prerequisite: CSIS0396 or COMP2396
Mutually exclusive with: ELEC3643
Assessment: 50% continuous assessment, 50% examination

COMP3403. Implementation, testing and maintenance of software systems (6 credits)
This course examines the theory and practice of software implementation, testing and maintenance. Topics in implementation include: detailed design issues and implementation strategies; coding style and standards; the review process; pattern implementation and reuse. Testing covers strategies and techniques for unit and component testing; integration testing; system, performance and acceptance testing; test documentation and test management. Topics in maintenance include maintenance techniques, tools and metrics; software rejuvenation; and refactoring.

Pre/Co-requisite: CSIS0396 or COMP2396
Assessment: 50% continuous assessment, 50% examination

COMP3404. Software quality and project management (6 credits)

Topics in software quality include: software quality models; quality assurance; software quality metrics; quality reviews, inspections and audits. Topics in project management include: project planning, cost estimation and scheduling; project monitoring and control; agile, traditional and extreme process models and their management; risk analysis; configuration management and control; software acquisition; contract management; and process improvement.

Prerequisite: CSIS0297 or COMP3297
Mutually exclusive with: BUSI0060 or BUSI0061 or IIMT4601
Assessment: 50% continuous assessment, 50% examination

COMP3407. Scientific computing (6 credits)

This course provides an overview and covers the fundamentals of scientific and numerical computing. Topics include numerical analysis and computation, symbolic computation, scientific visualization, architectures for scientific computing, and applications of scientific computing.

Prerequisites: CSIS1117 or COMP1117 or ENGG1002 or ENGG1111 or ENGG1112; and CSIS1118 or ENGG1007 or COMP2121
Assessment: 50% continuous assessment, 50% examination

COMP3412 Internship (6 credits) *[for intakes of 2012 and thereafter (4-year curriculum)]*

The course consists of two components: internship and professionalism. Internship requires students to spend a minimum of four weeks employed, full-time, as IT interns or trainees. During this period, they are engaged in work of direct relevance to their programme of study. The Internship provides students with practical, real-world experience and represents a valuable complement to their academic training. Professionalism exposes students to social and professional issues in computing. Students need to understand their professional roles when working as computer professionals as well as the responsibility that they will bear. They also need to develop the ability to ask serious questions about the social impact of computing and to evaluate proposed answers to those questions. Topics include social context of computing, risks, safety and security concerns for computer professionals, professional and ethical responsibilities, and continuing professional development.

Assessment: 100% continuous assessment

COMP3413. Research internship (6 credits)

The student will participate in a research project under the guidance and supervision of a teacher over a prescribed period of time; the results will be presented in an oral and a written report.

Assessment: 100% continuous assessment

COMP4801. Final year project (12 credits)

Student individuals or groups, during the final year of their studies, undertake full end-to-end development of a substantial project, taking it from initial concept through to final delivery. Topics range from applied software development to assignments on basic research. In case of a team project, significant contribution is required from each member and students are assessed individually, such that

each student is given a separate project title. Strict standards of quality will be enforced throughout the project development.

Assessment: 100% continuous assessment

COMP4804 Computing and data analytics project (6-credits) *[for candidates pursuing the degree BEng(EngSc) – Computing and Data Analytics]*

Students during the final year of their studies undertake a substantial project, taking it from initial concept through to final delivery, and integrating their knowledge and skills on computing and data analytics.

Assessment: 100% continuous assessment

COMP4805 Project (6-credits) *[for non-BEng(CompSc) candidates pursuing Computer Science as second major]*

Students during the final year of their studies undertake a substantial project, taking it from initial concept through to final delivery, and integrating their knowledge and skills on computing.

Assessment: 100% continuous assessment

COMPUTER ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2016-2017 and thereafter under the four-year curriculum.

Definition and Terminology

Each course offered by the Departments of Electrical and Electronic Engineering and Computer Science 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 Departments of Electrical and Electronic Engineering or Computer Science for the fulfillment of the curriculum requirements of the degree of BEng in Computer Engineering that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

General Engineering Courses
Students are required to complete at least 36 credits of General Engineering Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses (84 credits), comprising 42 credits of introductory core courses and 42 credits of advanced core courses.

Discipline Elective Courses
Students are required to complete at least 30 credits of discipline elective courses offered by the Department of Electrical and Electronic Engineering and the Department of Computer Science.

Elective Courses
Students are required to complete 18 credits of elective courses offered by either the Departments of Electrical and Electronic Engineering and Computer Science, 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 "CAES9541 Technical English for Electrical and Electronic 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.

Capstone Experience
Students are required to complete the 12-credit "ELEC4848 Senior design project" to fulfill the capstone experience requirement for the degree of BEng in Computer Engineering.

Internship
Students are required to complete the 6-credit internship "ELEC3840 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 EN16 of the Regulations for the Degree of Bachelor of Engineering and UG9 of the Regulations for the First Degree Curricula.

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

The curriculum of BEng (Computer 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
CAES9541	Technical English for Electrical and Electronic 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1111	Computer programming and applications	6
PHYS1050	Physics for engineering students	6
ENGG1202	Introduction to Computer Science	6
ENGG1203	Introduction to electrical and electronic engineering	6
Total for General Engineering Courses		36

Discipline Core Courses (84 credits)

Introductory Courses (42 credits)

Course Code	Course	No. of credits
COMP2119	Introduction to data structures and algorithms	6
COMP2121	Discrete mathematics	6
COMP2123	Programming technologies and tools	6
ELEC2346	Electric circuit theory	6
ELEC2441	Computer organization and microprocessors	6

ELEC2840	Engineering training	6
MECH2407 or COMP3250	Multivariable calculus and partial differential equations or Design and analysis of algorithms	6
Total for Introductory Discipline Core Courses		42

Advanced Courses (42 credits)

Course Code	Course	No. of credits
COMP3230	Principles of operating systems	6
COMP3234	Computer and communication networks	6
COMP3297	Introduction to software engineering	6
ELEC3342	Digital system design	6
ELEC3844	Engineering management and society	6
ELEC3848	Integrated design project	6
ELEC3441 or ELEC3442	Computer architecture or Embedded systems	6
Total for Advanced Discipline Core Courses		42

Capstone Experience and Internship (18 credits)

Course Code	Course	No. of credits
ELEC4848	Senior design project^{+}	12
ELEC3840	Internship*	6
Total for Capstone Experience and Internship		18

+Capstone Experience
*Internship

Discipline Elective Courses (30 credits)

Course Code	Course	No. of credits
ELEC####/ COMP####	Elective Courses offered by the Departments of Electrical and Electronic Engineering and Computer Science: a) 12 credits of Advanced Courses from Groups E, J; and b) 18 credits of Courses from Groups A, B, C, D, E, I, J	30
Complete at least five discipline elective courses for a total of 30 credits		30

Elective Courses (18 credits)

At least 18 credits of courses offered by either the Departments of Electrical and Electronic Engineering or Computer Science, or other departments within or outside of the Faculty of Engineering.

Elective MSc courses
Students may take up to two 6-credit MSc courses offered by the Departments of Computer Science or Electrical and Electronic Engineering as elective courses, subject to the approval of the Head of the Department.

Summary of curriculum structure of BEng (Computer Engineering)

Course Categories	No. of credits
UG5 Requirements	54
General Engineering Courses	36
Discipline Core Courses (Introductory)	42
Discipline Core Courses (Advanced)	42
Capstone Experience and Internship	18
Discipline Elective Courses	30
Elective Courses	18
Total	**240**

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and ordinary differential equations
MATH1853	Linear algebra, probability & statistics
ENGG1111	Computer programming and applications
PHYS1050	Physics for engineering students
ENGG1202	Introduction to computer science
ENGG1203	Introduction to electrical and electronic engineering

University Requirements (UG5) (24 credits)

CAES1000	Core University English
CC##XXXX	Three Common Core Courses

SECOND YEAR

Introductory Core Courses (42 credits)

COMP2119	Introduction to data structures and algorithms
COMP2121	Discrete mathematics
COMP2123	Programming technologies and tools
ELEC2346	Electric circuit theory
ELEC2441	Computer organization and microprocessors
ELEC2840	Engineering training
MECH2407 or	Multivariable calculus and partial differential equations or
COMP3250	Design and analysis of algorithms

University Requirements (UG5) (18 credits)

CC##XXXX	Three Common Core Courses

THIRD YEAR

Advanced Core Courses (42 credits)

COMP3230	Principles of operating systems
COMP3234	Computer and communication networks
COMP3297	Introduction to software engineering
ELEC3342	Digital system design
ELEC3844	Engineering management and society
ELEC3848	Integrated design project
ELEC3441 or	Computer architecture or
ELEC3442	Embedded systems

Internship (6 credits)
ELEC3840 Internship

University Requirements (UG5) (6 credits)
CENG9001 Practical Chinese for engineering students

Discipline Elective Courses (6 credits)

FOURTH YEAR

Discipline Elective Courses (24 credits)

Capstone Experience (12 credits)
ELEC4848 Senior design project

University Requirements (UG5) (6 credits)
CAES9541 Technical English for Electrical and Electronic Engineering

Elective Courses (18 credits)

ELECTRICAL ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2016-2017 and thereafter under the four-year curriculum.

Definition and Terminology

Each course offered by the Department of Electrical and Electronic 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 Electrical and Electronic Engineering for the fulfillment of the curriculum requirements of the degree of BEng in Electrical Engineering that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

General Engineering Courses
Students are required to complete at least 36 credits of General Engineering Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses (72 credits), comprising 36 credits of introductory core courses and 36 credits of advanced core courses.

Discipline Elective Courses
Students are required to complete at least 48 credits of discipline elective courses offered by the Department of Electrical and Electronic Engineering.

Elective Courses
Students are required to complete 12 credits of elective courses offered by either the Department of Electrical and Electronic 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 "CAES9541 Technical English for Electrical and Electronic 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.

Capstone Experience
Students are required to complete the 12-credit "ELEC4848 Senior design project" to fulfill the capstone experience requirement for the degree of BEng in Electrical Engineering.

Internship
Students are required to complete the 6-credit internship "ELEC3840 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 EN16 of the Regulations for the Degree of Bachelor of Engineering and UG9 of the Regulations for the First Degree Curricula.

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

The curriculum of BEng (Electrical 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
CAES9541	Technical English for Electrical and Electronic 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits

MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1111	Computer programming and applications	6
PHYS1050	Physics for engineering students	6
ENGG1203	Introduction to electrical and electronic engineering	6
ENGG120#	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering+	6
Total for General Engineering Courses		36

+Choose one General Engineering Course from the following list:

ENGG1201	Engineering for sustainable development
ENGG1202	Foundation of computer science
ENGG1204	Industrial management and logistics
ENGG1205	Introduction to mechanical engineering
ENGG1206	Introduction to biomedical engineering
ENGG1207	Foundations of biochemistry for medical engineering

Discipline Core Courses (72 credits)

Introductory Courses (36 credits)

Course Code	Course	No. of credits
ELEC2147	Electrical energy technology	6
ELEC2242	Introduction to electromagnetic waves and fields	6
ELEC2346	Electric circuit theory	6
ELEC2441	Computer organization and microprocessors	6
ELEC2840	Engineering training	6
MECH2407	Multivariable calculus and partial differential equations	6
Total for Introductory Discipline Core Courses		36

Advanced Courses (36 credits)

Course Code	Course	No. of credits
ELEC3141	Power transmission and distribution	6
ELEC3142	Electrical energy conversion	6
ELEC3143	Power electronics	6
ELEC3241	Signal and linear systems	6
ELEC3844	Engineering management and society	6
ELEC3848	Integrated design project	6
Total for Advanced Discipline Core Courses		36

Capstone Experience and Internship (18 credits)

Course Code	Course	No. of credits
ELEC4848	Senior design project^{+}	12
ELEC3840	Internship*	6
Total for Capstone Experience and Internship		18

+Capstone Experience
*Internship

Discipline Elective Courses (48 credits)

Course Code	Course	No. of credits
ELEC####	Elective Courses offered by the Department of Electrical and Electronic Engineering: a) 24 credits of Courses from Groups A, B, C, D, E, J; and b) 6 credits of Course from Group I; and c) 18 credits of Advanced Courses from Group A	48
Complete at least eight discipline elective courses for a total of 48 credits		48

Elective Courses (12 credits)

At least 12 credits of courses offered by either the Department of Electrical and Electronic 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 Electrical and Electronic Engineering as elective courses, subject to the approval of the Head of the Department.

Summary of curriculum structure of BEng (Electrical Engineering)

Course Categories	No. of credits
UG5 Requirements	54
General Engineering Courses	36
Discipline Core Courses (Introductory)	36
Discipline Core Courses (Advanced)	36
Capstone Experience and Internship	18
Discipline Elective Courses	48
Elective Courses	12
Total	**240**

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and ordinary differential equations
MATH1853	Linear algebra, probability & statistics
ENGG1111	Computer programming and applications
PHYS1050	Physics for engineering students
ENGG1203	Introduction to electrical and electronic engineering
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering

University Requirements (UG5) (24 credits)

CAES1000	Core University English
CC##XXXX	Three Common Core Courses

SECOND YEAR

Introductory Core Courses (36 credits)

ELEC2147	Electrical energy technology
ELEC2242	Introduction to electromagnetic waves and fields
ELEC2346	Electric circuit theory
ELEC2441	Computer organization and microprocessors
ELEC2840	Engineering training
MECH2407	Multivariable calculus and partial differential equations

Advanced Core Courses (6 credits)

ELEC3241	Signal and linear systems

University Requirements (UG5) (18 credits)

CC##XXXX	Three Common Core Courses

THIRD YEAR

Advanced Core Courses (30 credits)

ELEC3141	Power transmission and distribution
ELEC3142	Electrical energy conversion
ELEC3143	Power electronics
ELEC3844	Engineering management and society
ELEC3848	Integrated design project

Internship (6 credits)

ELEC3840	Internship

University Requirements (UG5) (6 credits)

CENG9001	Practical Chinese for engineering students

Discipline Elective Courses (18 credits)

FOURTH YEAR

Discipline Elective Courses (30 credits)

Capstone Experience (12 credits)

ELEC4848	Senior design project

University Requirements (UG5) (6 credits)

CAES9541	Technical English for Electrical and Electronic Engineering

Elective Courses (12 credits)

ELECTRONIC ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2016-2017 and thereafter under the four-year curriculum.

Definition and Terminology

Each course offered by the Department of Electrical and Electronic 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 Electrical and Electronic Engineering for the fulfillment of the curriculum requirements of the degree of BEng in Electronic Engineering that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

General Engineering Courses
Students are required to complete at least 36 credits of General Engineering Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses (78 credits), comprising 42 credits of introductory core courses and 36 credits of advanced core courses.

Discipline Elective Courses
Students are required to complete at least 42 credits of discipline elective courses offered by the Department of Electrical and Electronic Engineering.

Elective Courses
Students are required to complete 12 credits of elective courses offered by either the Department of Electrical and Electronic 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 "CAES9541 Technical English for Electrical and Electronic 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.

Capstone Experience
Students are required to complete the 12-credit "ELEC4848 Senior design project" to fulfill the capstone experience requirement for the degree of BEng in Electronic Engineering.

Internship
Students are required to complete the 6-credit internship "ELEC3840 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 EN16 of the Regulations for the Degree of Bachelor of Engineering and UG9 of the Regulations for the First Degree Curricula.

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

The curriculum of BEng (Electronic 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
CAES9541	Technical English for Electrical and Electronic 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1111	Computer programming and applications	6
PHYS1050	Physics for engineering students	6
ENGG1203	Introduction to electrical and electronic engineering	6
ENGG120#	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering+	6
Total for General Engineering Courses		36

+Choose one General Engineering Course from the following list:

ENGG1201	Engineering for sustainable development
ENGG1202	Foundation of computer science
ENGG1204	Industrial management and logistics
ENGG1205	Introduction to mechanical engineering
ENGG1206	Introduction to biomedical engineering
ENGG1207	Foundations of biochemistry for medical engineering

Discipline Core Courses (78 credits)

Introductory Courses (42 credits)

Course Code	Course	No. of credits
ELEC2147	Electrical energy technology	6
ELEC2242	Introduction to electromagnetic waves and fields	6
ELEC2346	Electric circuit theory	6
ELEC2347	Fundamentals of optics	6
ELEC2441	Computer organization and microprocessors	6
ELEC2840	Engineering training	6
MECH2407	Multivariable calculus and partial differential equations	6
Total for Introductory Discipline Core Courses		42

Advanced Courses (36 credits)

Course Code	Course	No. of credits
ELEC3241	Signal and linear systems	6
ELEC3242	Communications engineering	6
ELEC3346	Electronic circuits	6
ELEC3348	Electronic devices	6
ELEC3844	Engineering management and society	6
ELEC3848	Integrated design project	6
Total for Advanced Discipline Core Courses		36

Capstone Experience and Internship (18 credits)

Course Code	Course	No. of credits
ELEC4848	Senior design project[+]	12
ELEC3840	Internship*	6
Total for Capstone Experience and Internship		18

+Capstone Experience
*Internship

Discipline Elective Courses (42 credits)

Course Code	Course	No. of credits
ELEC####	Elective Courses offered by the Department of Electrical and Electronic Engineering: a) 24 credits of Courses from Groups A, B, C, D, E, J; and b) 6 credits of Course from Group I; and c) 12 credits of Advanced Courses from Groups B, C, D, E	42
Complete at least seven discipline Elective courses for a total of 42 credits		42

Elective Courses (12 credits)

At least 12 credits of courses offered by either the Department of Electrical and Electronic 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 Electrical and Electronic Engineering as elective courses, subject to the approval of the Head of the Department.

Summary of curriculum structure of BEng (Electronic Engineering)

Course Categories	No. of credits
UG5 Requirements	54
General Engineering Courses	36
Discipline Core Courses (Introductory)	42
Discipline Core Courses (Advanced)	36
Capstone Experience and Internship	18
Discipline Elective Courses	42

Elective Courses	12
Total	**240**

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and ordinary differential equations
MATH1853	Linear algebra, probability & statistics
ENGG1111	Computer programming and applications
PHYS1050	Physics for engineering students
ENGG1203	Introduction to electrical and electronic engineering
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering

University Requirements (UG5) (24 credits)

CAES1000	Core University English
CC##XXXX	Three Common Core Courses

SECOND YEAR

Introductory Core Courses (42 credits)

ELEC2147	Electrical energy technology
ELEC2242	Introduction to electromagnetic waves and fields
ELEC2346	Electric circuit theory
ELEC2347	Fundamentals of optics
ELEC2441	Computer organization and microprocessors
ELEC2840	Engineering training
MECH2407	Multivariable calculus and partial differential equations

University Requirements (UG5) (18 credits)

CC##XXXX	Three Common Core Courses

THIRD YEAR

Advanced Core Courses (36 credits)

ELEC3241	Signal and linear systems
ELEC3242	Communications engineering
ELEC3346	Electronic circuits
ELEC3348	Electronic devices
ELEC3844	Engineering management and society
ELEC3848	Integrated design project

Internship (6 credits)

ELEC3840	Internship

University Requirements (UG5) (6 credits)

CENG9001	Practical Chinese for engineering students

Discipline Elective Courses (12 credits)

FOURTH YEAR

Discipline Elective Courses (30 credits)

Capstone Experience (12 credits)
ELEC4848 Senior design project

University Requirements (UG5) (6 credits)
CAES9541 Technical English for Electrical and Electronic Engineering

Elective Courses (12 credits)

Minor in Electrical and Electronic Engineering
[not eligible for students of BEng(CE), BEng(EE) and BEng(ElecE)]

Candidates who are interested in pursuing minor in Electrical and Electronic Engineering must satisfy the following prerequisites:

- Level 3 or above in Mathematics and
- Level 3 or above in Physics or Combined Science with Physics component in the Hong Kong Diploma in Secondary Education (HKDSE) Examination

Candidates are required to complete a total of 48 credits of courses in the following manner:

Code	Course Name	Credits
(i) 12 credits of core courses		
ELEC2346	Electric circuit theory	6
ENGG1203	Introduction to electrical and electronic engineering*	6
(ii) 36 credits of disciplinary elective courses selected from the following:		
ELEC2147	Electrical energy technology	6
ELEC2242	Introduction to electromagnetic waves and fields	6
ELEC2347	Fundamentals of optics	6
ELEC2441	Computer organization and microprocessors	6
ELEC3141	Power transmission and distribution	6
ELEC3142	Electrical energy conversion	6
ELEC3143	Power electronics	6
ELEC3241	Signals and linear systems	6
ELEC3242	Communications engineering	6
ELEC3244	Digital signal processing	6
ELEC3245	Control and instrumentation	6
ELEC3247	Engineering electromagnetism	6
ELEC3342	Digital system design	6
ELEC3346	Electronic circuits	6
ELEC3347	Electronic materials and quantum physics	6
ELEC3348	Electronic devices	6
ELEC3349	Optical devices	6
ELEC3441	Computer architecture	6
ELEC3443	Computer networks	6
ELEC3641	Human computer interaction	6
ELEC3643	Systems and network programming	6
ELEC4343	Design of digital integrated circuits	6

*ENGG1203 cannot be used for satisfying the requirement of both this Minor programme and another degree programme. If ENGG1203 has already been taken for to fulfill the requirement of another degree programme, the student should take 6 credits of disciplinary Elective course in list (ii) in lieu.

COURSE DESCRIPTIONS

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

General Engineering Courses

ENGG1111	Computer programming and applications (6 credits)
MATH1851	Calculus and ordinary differential equations (6 credits)
MATH1853	Linear algebra, probability & statistics (6 credits)
MECH2407	Multivariable calculus and partial differential equations (6 credits)
PHYS1050	Physics for engineering students (6 credits)
ENGG1201	Engineering for sustainable development (6 credits)
ENGG1202	Foundation of computer science (6 credits)
ENGG1203	Introduction to electrical and electronic engineering (6 credits)
ENGG1204	Industrial management and logistics (6 credits)
ENGG1205	Introduction to mechanical engineering (6 credits)
ENGG1206	Introduction to biomedical engineering (6 credits)
ENGG1207	Foundations of biochemistry for medical engineering (6 credits)

Please refer to the General Engineering 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.

CAES9541. Technical English for Electrical and Electronic Engineering (6 credits)

Running alongside the Senior Design Projects, this one semester, 6-credit course will build and consolidate final year BEng (CE), (EE), (ElecE) and BEng(EngSc) Energy Engineering students' ability to compose technical reports and technical papers, and make technical oral presentations. The focus of this course is on helping students to present the findings of their Senior Design Project in an effective, professional manner in both written and oral communication. Topics include accessing, abstracting, analyzing, organizing and summarizing information; making effective grammatical and lexical choices; technical report/paper writing; and technical presentations. Assessment is wholly by coursework.

Adjunct course: ELEC4848 Senior design project
ELEC3848 Integrated design project

Co-requisite: ELEC4848 Senior design project
ELEC3848 Integrated design project [for BEng(EngSc) Energy 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

ELEC2147. Electrical energy technology (6 credits)

This is an introductory course on various electrical energy technologies and systems by which students will be able to comprehend their major industry and their applications.

The course covers: Characteristics of values of electricity; Renewable electrical energy sources, convertible forms and sustainability; Generation and delivery; Direct current and alternating current supplies, Single-phase and three-phase systems, waveform inversion, rectification and transformation, Engineering and service applications of electrical technology; Analogue and digital instruments and measurements.

At the end of this course, students who fulfill the requirements of this course will be able to:
1. link technology to betterment of the society in a renewable manner;
2. describe the generation, delivery and utilization of electrical energy;
3. use circuit diagrams, phasor diagrams, graphs and mathematical equations to describe systems and to analyse performances;
4. manage electrical technology in a valuable, sustainable, dependable, efficient and smart manner.

Mutually exclusive with: ELEC1107
Assessment: 20% practical work, 20% continuous assessment, 60% examination

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ELEC2242. Introduction to electromagnetic waves and fields (6 credits)

This is the first course introducing basic mathematical and physical concepts of electromagnetism. It aims at providing fundamental understanding about key electromagnetic principles. It tries to establish the mathematical foundation through vector analysis and then gradually go through essentials of Maxwell's equations. Wave equations, boundary conditions and the basic methods of solving Poisson and Helmholtz equations are all discussed to provide a complete picture of electromagnetic problems. Material properties are studied and compared to understand various wave propagation features in different medium.

Specifically, the course covers the following topics in contemporary electromagnetics: vectors and fields, Gauss' Law, Ampere's Circular Law, Faraday's Law, electrostatic field, wave propagations, material properties, and transmission lines (optional). It serves as the entry class of engineering electromagnetism.

Mutually exclusive with: ELEC1202
Assessment: 60% continuous assessment, 40% examination

ELEC2346. Electric circuit theory (6 credits)

This is an introductory course that provides students with a solid foundation of knowledge on electric circuits and concepts, to prepare them for subsequent circuit-related courses. At the end of the course, the student will be able to identify, analyse, design and optimize basic circuits based on fundamental circuit laws and theorems, using passive and active circuit components as well as the op-amp.

The topics to be covered include basic circuit concepts and laws, methods of analysis, circuit theorems, op-amps, first and second order circuits, ac-analysis, diode and diode circuits.

Mutually exclusive with: ENGG1008, ELEC1306
Assessment: 10% practical work, 30% continuous assessment, 60% examination

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ELEC2347. Fundamentals of optics (6 credits)

This is an introductory course that provides students with a solid foundation of knowledge on optics, to prepare them for subsequent photonics-related courses. At the end of the course, the student will be able to identify, analyse, design and optimize optical systems such as microscopy based on fundamental laws and theorems.

The topics to be covered include ray optics, wave optics, beam optics, polarization optics, guided-wave optics and quantum optics.

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

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ELEC2441. Computer organization and microprocessors (6 credits)

This course aims at providing fundamental knowledge on the principles of computer organization and microprocessors, and serves as the first course to other more advanced computer courses. In order to bring out the essential principles, a simple processor is used for illustration and is studied in detail, and on top of it, more general systems are also introduced.

Specifically, the course covers the following topics: integer and floating point number representations; basic computer building blocks; register transfers and phases of instruction execution; micro-computer system organization - bus signals, timing, and address decoding; study of a simple model microprocessor: signals, instruction set and addressing modes; subroutines; reentrancy; context switching; I/O programming; interrupt I/O and DMA; memory cells and systems; exception handling; assembler, linker and loader.

Mutually exclusive with: COMP2120, ELEC1401
Assessment: 10% practical work, 20% continuous assessment, 70% examination

ELEC2543. Object-oriented programming and data structures (6 credits)

This course aims to provide a hands-on and in depth survey of object oriented programming paradigm, and the basic concepts of data structures through the Java programming language. It serves to provide a solid foundation of essential concepts on object oriented programming and data structures that will be required in its sequels —including the Systems and Network Programming, Distributed Computing Systems or Embedded Systems .

Specifically, the course covers the following topics: basics of the Java development environment; Java applications and applets; Java syntaxes; control structures; methods in Java; iteration; recursion; objects; classes; interfaces; inheritance; polymorphism; overloading; overriding; wrapper classes; type conversions; strings; string manipulations in Java; Java exceptions; try blocks; throwing and catching exceptions in Java; byte and character streams; stream classes; file classes; file manipulation in Java; arrays; dynamic memory allocation; dynamic data structures including the dynamically linked lists, stacks, queues, trees, graphs, hash tables; sorting; searching; examples of Java applications.

Pre-requisite: ENGG1111 Computer programming and applications
Mutually exclusive with: ELEC1502, COMP2396, ELEC1503
Assessment: 50% continuous assessment, 50% examination

ELEC2840. Engineering training (6 credits)

The aims of this course are to provide practical trainings for students to acquire essential practical skills related to Electrical and Electronic Engineering. There are 5 modules namely Electronic Practice, Practical Networking, CAD/CAE tools practice, Virtual Instrumentation and Microcontroller. Students of each program are required to take 4 compulsory modules to fulfill the workshop training requirement. The aims of each module are:-

- CAD/CAE tools practice – To learn how to use CAD software application to design circuit
- Electronics Practice – To learn how to produce a PCB circuit broad and soldering technique
- Practical Networking – To learn how to design and configure a data network
- Microcontroller – To learn how to design and program a microcontroller
- Virtual instrumentation – To learn how to write codes and build hardware on virtual instrumentation circuits

Mutually exclusive with: ELEC1812, ELEC1810, ELEC1803
Assessment: 100% continuous assessment

ELEC3141. Power transmission and distribution (6 credits)

The course aims at providing detailed understanding about power transmission and distribution systems. The emphasis is on the mathematical models and equivalent circuits of power transmission lines and the basic structure of distribution systems. The model for high voltage transmission system is the basis for power system analysis and operation. The introduction of distribution systems provides the basic understanding of how power is distributed to customers and the technologies applied in power distribution.

Specifically, the course covers the following topics:

- Power transmission systems
- Transmission line model
- Power distribution systems
- Distribution overhead lines and underground cables
- Various issues in distribution systems

Co-requisite: ELEC2147 Electrical energy technology
Mutually exclusive with: ELEC2101
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC3142. Electrical energy conversion (6 credits)

This course aims at providing sound understanding of various electrical energy conversion devices and systems. The emphasis is on four kinds of electrical energy conversion – electromechanical motion, electric heating, electric lighting and electrochemistry.

Specifically, the course covers the following topics: electric machines including DC machines, synchronous machines, induction machines and special machines; electric heating including resistive heating, induction heating and dielectric heating; electric lighting including incandescent lighting, discharge lighting and LED lighting; electrochemical sources including batteries and ultracapacitors.

Pre-requisite: ELEC2147 Electrical energy technology
Mutually exclusive with: ELEC2102
Assessment: 20% practical work, 20% continuous assessment, 60% examination

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ELEC3143. Power electronics (6 credits)

Electrical energy is essential today. In order to effectively utilize electrical energy it must be converted and processed to the right forms for different types of loads. A modern microprocessor might need low voltage high current DC for its power supply whereas a rotational machine might need high voltage high frequency AC for its operation. Power electronics is a power conversion technology. It enables conversion of electrical energy to the right form. It also enables the conversion process to be carried out with high efficiency. High efficiency power conversion plays a crucial role in energy saving, reducing carbon emission and global warming. Power electronics is based on the application of electronics technology to control the electrical conversion process. It is a field that spreads across various disciplines such as electrical, electronics and control.

The course starts with an introduction to various power semiconductors. Power semiconductors are the basic components for power converters. Power converters for AC to DC, AC to AC, DC to DC and DC to AC conversions are studied. Students are expected to learn the operation and design of these converters. Students should also know where and how these converters are applied in various electrical and electronic engineering systems.

Mutually exclusive with: ELEC2103
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC3241. Signals and linear systems (6 credits)

Signals and linear system theory is fundamental to all engineering discipline, especially in the field of electrical, computer and medical engineering. This is a first course in signals and linear systems for engineering students without any pre-requisite knowledge in signal theory or signal processing other than some knowledge in fundamental calculus and use of complex numbers. The course uses simple real life examples of signals and systems to illustrate how signal theory can be used in practical application, and will including an introduction to MATLAB as a tool for signal analysis and system modelling.

This course aims to help students gain a firm understanding of the fundamentals of signal and linear systems concepts and theory using adequate mathematical and computing techniques to tackle simple signal processing problems. It serves as a pre-requisite course for many other courses including Digital Signal Processing, Control and Instrumentation, Communication Systems, and Digital Image Processing.

Specifically, the course covers the following topics: time-domain signal representation, periodic and aperiodic signals; spectral representation of signals, Fourier series and Fourier transform; system responses and linear system modelling; sampling, aliasing and analog-to-digital conversion; z-transform and concepts of poles and zeros; convolution; FIR filters and digital filtering; IIR filters and frequency response of digital filters; continuous-time systems and Fourier transform properties; application examples of signal analysis and processing.

At the end of the course, students should have a clear understanding of the fundamentals of signals and system theory to enable them to perform simple signal analysis and processing using both analytical method as well as using computing tools, link the mathematical representation of signals to some very simple real life signals and vice versa, and appreciate the applications of linear systems theory in solving some simple real life problems. In addition, students should be aware of the complexity of real life problems and the need to continue investigation in practice after graduation.

Mutually exclusive with: ELEC2201
Assessment: 40% continuous assessment, 60% examination

ELEC3242. Communications engineering (6 credits)

This course is an introduction to communications systems taught at a level appropriate for second-year undergraduates in electrical and electronic engineering. It is aimed at providing a general understanding of the basic communications theory and the principles of communications systems.

The following topics will be covered in the course: communications system models; modes of transmissions; properties of signals; baseband transmission; analogue modulations such as amplitude modulation, phase modulation and frequency modulation; noise in CW modulations; digital modulations such as binary-phase shift keying, quaternary binary-phase shift keying, frequency-shift keying, quadrature-amplitude modulation; antenna basic; basic concepts of modern communications systems such as cellular mobile systems and GPS system.

At the end of the course, students should have gained an understanding of the concepts of communications systems and modern communications systems.

Co-requisite: ELEC3241 Signals and linear systems
Mutually exclusive with: ELEC2202
Assessment: 20% practical work, 20% continuous assessment, 60% examination

ELEC3244. Digital signal processing (6 credits)

This course aims to help students gain a firm understanding of digital signal processing theory and practice. It includes the discussion on the theoretical aspect of the interfaces between the continuous-time domain and the discrete-time domain, and the design of discrete-time infinite impulse response filters as well as finite impulse response filters. It also covers the formulation of convolution, correlation and fast algorithms. Moreover, it outlines the derivation of discrete Fourier transform, from which a detailed study of fast Fourier transform algorithms is given. It concludes by the study of sampling rate conversion and its application.

Specifically, the course covers the following topics in digital signal processing: DSP fundamentals, filter structures, analog-to-digital conversion, digital-to-analog conversion, design of IIR filters, design of other frequency selective filters, design of FIR filters, digital convolution, cross- and auto-correlation, fast convolution, discrete Fourier transform, fast Fourier transform algorithms, decimation, interpolation, sampling rate conversion, applications of multi-rate signal processing.

Pre-requisite: ELEC3241 Signals and linear systems
Mutually exclusive with: ELEC2204
Assessment: 20% practical work, 20% continuous assessment, 60% examination

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ELEC3245. Control and instrumentation (6 credits)

Control systems and instrumentation methods are fundamental to many engineering disciplines. In this course, a general approach will be taken to study of control systems and instrumentation, so that the theory and methods are applicable to other disciplines at the system level.
The course is aimed at providing a general understanding of the fundamental principles of control systems and instrumentation methods. The following topics will be covered in the course: system modeling, transient response, principles of feedback, root locus, frequency response methods, state-space models, introduction to digital control, instrumentation and measurement systems, electromagnetic compatibility, noise and interference.
At the end of the course, students should have gained an understanding of the concepts and methodologies for the complete process of modeling, analysis and design of a feedback control system, including instrumentation technologies for measuring controlled variables.

Co-requisite: ELEC3241 Signals and linear systems
Mutually exclusive with: ELEC2205
Assessment: 15% practical work, 85% examination

ELEC3247. Engineering electromagnetism (6 credits)

The objective of this course is to offer comprehensive understanding in electromagnetics including topics of Maxwell's Equations, property of matters, wave propagation, wave reflection and transmission as well as important electromagnetic theorems. With the knowledge on the topics, students can have the ability to understand the physics and details of other courses and technologies such as microwave engineering, optoelectronics, photonics etc.

Students will also learn some representing devices of electromagnetic such as waveguides and antennas. The course will focuses more on the dynamic field analysis.

Pre-requisite: ELEC2242 Introduction to electromagnetic waves and fields

Mutually exclusive with: ELEC2207
Assessment: 50% continuous assessment, 50% examination

ELEC3342. Digital system design (6 credits)

This course aims at providing students the fundamental understanding of digital system structures and system design techniques using discrete and programmable devices. Digital system design as a synthesis process using building block components, and the electrical characteristics of basic gate components are discussed. The main issues in system interconnection are treated with major emphasis on design considerations for high-speed digital systems. Use of Hardware Description Language (HDL) for design is introduced. The analysis and synthesis of digital system structure, especially those related to circuit timing, data transfer, and data clocking are discussed. Various testing schemes for logic and memory testing are introduced. Simple stuck-at fault detection techniques and modern Design for Test (DFT) techniques are discussed.

Specifically this course covers the following topics in digital system design: Digital system concepts and digital components; digital design using discrete and programmable devices; high speed digital system design considerations; Hardware Description Language (HDL); design of digital system structures; digital logic and memory testing; fault detection analysis and design; Design for Test (DFT) techniques.

Pre-requisite: ELEC2441 Computer organization and microprocessors
Mutually exclusive with: ELEC2302
Assessment: 50% continuous assessment; 50% examination

ELEC3346. Electronic circuits (6 credits)

This course aims to provide students with a basic understanding of analogue circuits and amplifiers based on bipolar junction transistor (BJT) and MOS field-effect transistors (MOSFET), as well as digital logic circuits.

The course begins with the operating principles and I-V characteristics of bipolar junction transistor (BJT). Next, it moves on to discuss amplifier operations and how voltage or/and current is/are amplified by using various transistor configurations. It covers transistor biasing techniques, DC analysis and small-signal equivalent circuits. These will be repeated for the MOS field-effect transisitor (MOSFET). Transistor as a switch and digital logic circuits will be introduced in the final part of the course. The electrical properties of different logic families will be studied.

Pre-requisite: ELEC2346 Electric circuit theory
Mutually exclusive with: ELEC2306
Assessment: 20% practical work, 20% continuous assessment, 60% examination

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ELEC3347. Electronic materials and quantum physics (6 credits)

This course deals with the fundamental aspects of electronic materials, including solid-state physics, material growth and processing, material properties and material properties at the nano-scale: quantum physics.

It begins with coverage of crystal structures and a study crystallography, followed by the physics and methods of crystal growth and ways of processing crystals for the formation of functional devices. In the next section, the properties of materials will be studied in detail. The optical properties of materials, including absorption and luminescence, will be covered. The dielectric properties of insulating materials, including the different mechanisms of polarization, will be taught. This is followed by understanding the electrical properties of semiconductors in terms of carrier transport. Towards the end of the course, an introduction to quantum mechanics will be given.

Mutually exclusive with: ELEC2305
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC3348. Electronic devices (6 credits)

This course aims to provide students with a basic understanding of the principles underlying the operation of common semiconductor devices: p-n junction diode, bipolar junction transistor (BJT) and metal-oxide-semiconductor field-effect transistor (MOSFET). The course begins with introducing the basics semiconductor physics and p-n junction theories using band diagrams. It then proceeds to teach the device structures and physical operations of bipolar junction transistor (BJT) and metal-oxide-semiconductor field-effect transistor (MOSFET), introducing device models as appropriate.

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

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ELEC3349. Optical devices (6 credits)

The course aims at providing detailed understanding about active and passive optical devices and optical systems. Students will learn optical components such as optical waveguides, fibers, variety of light sources (e.g. laser and light emitting diodes), passive and active components, wavelength division multiplexer, transmitters, receivers, photovoltaic devices and systems. Students will gain the knowledge in the physics, operation principles and the applications of optical components.

Pre-requisite: ELEC2346 Electric circuit theory or ELEC2347 Fundamentals of optics
Assessment: 20% continuous assessment, 80% examination

ELEC3441. Computer architecture (6 credits)

This course aims at providing detailed understanding about how modern high performance microprocessors are designed and the rationales behind their different design principles. The emphasis is on the relationship between the microarchitecture and the system software (e.g., operating system and compiler). Contemporary processors such as MIPS and Pentium are used as practical cases to illustrate the different design principles. Pipelining microarchitecture and some elementary concepts on instruction level parallelism (ILP) are discussed. Compiler support and optimizations for exploiting the parallel processing capability provided by the microarchitecture are discussed.

Specifically, the course covers the following topics in contemporary computer architecture design: Design and performance issues of a computer system; RISC vs CISC; design of control unit; design of ALU; instruction pipeline; memory system; input/output system; and parallel processors.

Pre-requisite: ELEC2441 Computer organization and microprocessors
Mutually exclusive with: COMP3231 Computer architecture, ELEC2401
Assessment: 60% continuous assessment, 40% examination

ELEC3442. Embedded systems (6 credits)

This course introduces the design concepts of modern embedded systems, with an emphasis on the integration of hardware and software. Topics include: hardware/software interface design and implementation, the role of operating system in embedded systems, embedded application development and the tradeoffs involving the use of hardware accelerators. A key component of the course is to design and implement a real-world embedded system using field-programmable gate array (FPGA) as a platform.

Upon completing this course, the student should be able to:

- Develop basic understanding of the role of embedded systems in contemporary electronic systems.
- Evaluate embedded systems in terms of performance, power and energy consumptions.
- Understand the fundamentals of hardware-software codesign in embedded system.
- Develop practical techniques in constructing embedded systems with hardware and software components addressing real-world challenges.

Pre-requisite: ELEC3342 Digital system design
Mutually exclusive with: ELEC3226
Assessment: 55% practical work, 45% continuous assessment

ELEC3443. Computer networks (6 credits)

This course aims at providing detailed understanding of the basic principles of computer and data communications, and the essential functions and protocols for co-ordinated exchange of data through computer networks. It covers data communication networks and facilities; network structures; protocols; local area networks; wide area networks; network trends; data security.

Mutually exclusive with: ELEC2402, ELEC2403, ELEC2701 & CSIS0234
Assessment: 20% continuous assessment, 80% examination

ELEC3541. Software engineering & operating systems (6 credits)

This course aims at providing students the fundamental knowledge of software engineering practices and system software for development and execution of computer software. The first part of this course presents software engineering methodologies for the development of quality, cost-effective, and maintainable software. Software is dealt with as an engineered product that requires planning, analysis, design, implementation, testing and maintenance. The object is to provide a concise presentation of each step in the engineering process. The second part of the course aims at providing fundamental concepts and ideas of operating systems, and the underlying principles of computer resource management by system software.

Specifically this course covers the following topics in Software Engineering and Operating Systems: software engineering process; principles that guide practice; requirements and modeling; software design concepts; software architectural and detail design methodologies; software testing strategies; software maintenance; software quality; software documentation.

Software development systems: assembler, linker and loader, compiler; basic operating system and process concepts; concurrent processes; processor management; primary and secondary memory management; file and database systems.

Mutually exclusive with: COMP3230 & COMP3297 or ELEC2501
Assessment: 15% practical work, 85% examination

ELEC3542. Advanced programming and application development (6 credits)

This course aims at introducing the principles of software development in portable and wearable devices. We will cover the issues and solutions when we want to develop a portable version of a desktop software. We will also study the new opportunities offered by portable/wearable devices, such as Internet of Things, location-aware services, push notification, and remote control, etc.

Specifically, the course covers the following topics: features and limitations of portable/wearable devices, event-driven programming paradigm, complexity and memory usage analysis, concepts of Internet of Things, network programming basics, database basics, cloud computing basics, security issues and concerns, application design and development, etc.

Pre-requisite: ELEC2543 Object-oriented programming and data structures, or COMP2119 or COMP2396
Assessment: 50% continuous assessment, 50% examination

ELEC3641. Human computer interaction (6 credits)

This course aims at providing fundamental knowledge on the principles of Human Computer Interaction (HCI) : Design and Programming, and serves as the first course to other more advanced computer courses. In order to bring out the essential principles, a simple processor is used for illustration and is studied in detail, and on top of it, more general systems are also introduced.

Specifically, the course covers the following topics: human factors of interactive systems, design principles of user-interface, user conceptual models and interface metaphors, information and interactivity structures, interaction devices, presentation styles, information visualization; general features and components of window programming toolkits, event handling and layout management; strategies for effective human-computer interaction, managing design process, evaluation of human-computer interaction.

Pre-requisite: ELEC2543 Object-oriented programming and data structures or COMP2396 Object-oriented programming and Java
Mutually exclusive with: ELEC2601
Assessment: 40% continuous assessment, 60% examination

ELEC3643. Systems and network programming (6 credits)

This course aims to provide students with solid background on systems programming, in particular, UNIX system programming, and working level network software development using Java or Unix system facilities. It covers both classical UNIX multiprogramming software development and object oriented system implementations for networked applications.

Specifically, the course covers the following topics: Unix system calls, file I/O, Unix system data; process control, signals; daemon processes; threading approaches; concurrency control; socket programming; I/O multiplexing; IPv4 and IPv6 interoperability; broadcasting; multicasting; concurrent network servers; the 3-tier model; middlewares and their classification; distributed objects; Java sockets; multicasting in Java; the Java distributed computing platform including the Remote Method Invocation (RMI), the Java Servlets; the JavaServer Pages (JSP); the Extensible Markup Language (XML); the Java peer-to-peer (P2P) technologies.

Pre-requisite: ELEC2543 Object-oriented programming and data structures or (COMP1119 Introduction to data structures and algorithms and COMP2396 Object-oriented programming and Java)
Mutually exclusive with: (ELEC3628 & COMP3402) or ELEC2603
Assessment: 40% continuous assessment, 60% examination

ELEC3840. Internship (6 credits)

Students are trained on-the-job under the supervision of a company from the industry. At the end of the training, every student is required to submit a training report to the Department for assessment.

Mutually exclusive with: ELEC1813, ELEC1811, ELEC1804
Assessment: 100% continuous assessment

ELEC3844. Engineering management and society (6 credits)

The aims of this course are to develop basic understanding of organization and management skills, professional ethics and legal foundation for the engineering discipline. Topics on engineering organization, project management and managerial skills, decision making processes, contingency and crisis management, leadership, corporate culture and philanthropy will be discussed. In order to provide a clear and right insight for engineering students to interact and contribute to the society, topics related to professional conduct, social responsibility, sustainability and safety issues, technology and environment, professional ethics, and professional societies are included. For the legal foundation, topics such as contract, intellectual property, tort, professional negligence and related law issues are discussed.

Mutually exclusive with: ELEC2814
Assessment: 30% continuous assessment, 70% examination

ELEC3845. Economics, finance and marketing for engineers (6 credits)

The aims of this course are to develop basic understanding of economics, finance and marketing for the engineering discipline. The syllabus includes macroeconomics, microeconomics, value chain, financial management, cost and profit, shares and bonds, accounting concepts and financial statements, cash flow, rate of return; risk management, investment portfolio, technical analysis; marketing management, marketing mix, marketing media, marketing plan, and business ethics.

Mutually exclusive with: ELEC2815
Assessment: 30% continuous assessment, 70% examination

ELEC3846. Numerical methods and optimization (6 credits)

This course aims at introducing numerical methods and optimization used for the solution of engineering problems. Specifically:

1. In the first part of the course, numerical algorithms to solve various mathematical problems are provided. Development of algorithms, their mathematical analysis, and an analysis of their errors and performance are discussed. The applications of numerical methods in solving equations, differentiation and integration, ordinary differential equations, and linear algebra, are illustrated.
2. In the second part of the course, essential concepts of optimization theory are introduced, and fundamental classes of optimization problems are analyzed. Theoretical results and practical algorithms for solving optimization problems are introduced and explained. Applications in engineering fields and other areas are illustrated.

At the end of this course, students who fulfill the requirements of this course will be able to:

1. demonstrate knowledge and understanding of the basic concepts of numerical methods and optimization;
2. apply theoretical results and practical algorithms for solving equations and optimization problems.

Mutually exclusive with: COMP3407, ELEC2816
Assessment: 20% continuous assessment, 80% examination

ELEC3847. Probability and statistics in engineering (6 credits)

The objective of the course is to introduce applied probability and statistics at the intermediate level. The concepts of random variables, mathematical expectation, functions of random variables, moment generating functions and characteristics functions, fundamental sampling distributions, sample estimation problems, hypothesis testing, and linear regression are discussed. Applications of the concepts to various disciplines in engineering are also illustrated. At the end of this course, students will be able to:

1. Gain understanding of concepts in applied probability and statistics;
2. Illustrate the applications of concepts to various disciplines in engineering;
3. Explore the foundations of analytical and critical thinking, academic research, and preparing students some mathematical techniques for conducting academic research;
4. Acquire learning strategies that will enhance their learning experience;
5. Explore some topics as a showcase over the course of the Engineering degree.

Mutually exclusive with: ELEC2817
Pre-requisite: MECH2407
Assessment: 30% continuous assessment, 70% examination

ELEC3848. Integrated design project (6 credits)

This course aims at providing senior undergraduate students in small teams an opportunity to apply and integrate their knowledge and skills in electrical and electronic engineering courses, as well as project management, to implement a practical system that requires knowledge and skills from different EEE disciplines (i.e., Computer Engineering, Electronic Engineering, and

Electrical Engineering). Typically, the system to be built has electrical components for interfacing with the real world (e.g., a smart plug that can measure and regulate power consumption as well as display measured data to user through an external user interface), electronic components that integrated the external interfaces with the processing and networking cores, and computing components that handle the data manipulations. Thus, by design, each project team should consist of students from electrical engineering, electronic engineering and computer engineering.

At the beginning of the course, students are guided to acquire skills in using hardware and software development tools through introductory lectures and laboratory exercises. Students then begin working on the project. Technical consultation sessions are conducted as supplementary to help students throughout the process.
Assessment and grading will be made according to the quality of design product, demonstration and documentations. Besides implementing the system to the required project specification, students are encouraged to extend the project with their own inputs.

Mutually exclusive with: ELEC2805, ELEC2807, ELEC2812, ELEC2813, ELEC2818
Assessment: 100% continuous assessment

ELEC4141. Electric railway systems (6 credits)

The aim of this course is to provide fundamental knowledge of electric power in railways, on system and component levels. It elaborates on the power supply systems, rolling-stocks, traction systems, supporting systems, automatic train operation, control, and protection systems. Magnetic levitation systems are discussed. Topics on high-speed rail networks, railway engineering management, health and safety are included.
At the end of this course, students who fulfill the requirements of this course will be able to:

1. describe and understand the construction and functions of electrical installations and the prerequisites that apply in the operation of installations;
2. explain different electrical installations that are parts of the operation of electric railway traffic with respect to both function and the essential connections with the parts of the installation;
3. understand the basic concepts of power supply systems for railways;
4. understand the rolling-stocks, traction systems and supporting systems of electric railway systems;
5. understand the automatic train operation, control, and protection systems;
6. have a general grasp on the basic concepts of magnetic levitation systems;
7. demonstrate knowledge, understanding of high-speed rail networks and railway engineering management, health and safety.

Pre-requisite: ELEC2147 Electrical energy technology
Mutually exclusive with: ELEC3111
Assessment: 25% continuous assessment, 75% examination

ELEC4142. Power system protection and switchgear (6 credits)

The aim of this course is to provide fundamental knowledge of electric power in power system protection and switchgear. It elaborates on protective relays, protection transformer, transmission line protection, rotating machine protection, substation protection. Principles of over-voltages and electrical breakdown are discussed. Circuit breaker technologies, switchgears and their protection schemes, and auto-recloser and sectionalizer are included.
At the end of this course, students who fulfill the requirements of this course will be able to:

1. grasp and understand the basic principles and functions of protection relays and switchgears;
2. have a general grasp on the basic concepts of protection transformer;
3. understand the basic concepts of over-current protection, distance protection, pilot protection of transmission lines;
4. understand the basic concepts of rotating machinery protection;
5. understand the basic concepts of substation protection;
6. have a general grasp on the basic concepts of electric arc and switching overvoltage;
7. understand the general principles of circuit breaker technologies;
8. have a general grasp on the switchgear technologies;
9. understand the basic concepts of auto-recloser and sectionalizer for power systems.

Pre-requisite: ELEC3141 Power transmission and distribution
Mutually exclusive with: ELEC3112
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC4144. Electric vehicle technology (6 credits)

This course aims at providing sound understanding of various electric vehicle (EV) technologies. The emphasis is on fiver key areas of EVs – System integration, propulsion systems, energy sources, auxiliaries and impacts.

Specifically, the course covers the following topics: system integration including battery EVs, hybrid EVs and fuel cell EVs; propulsion systems including single-motor and multiple-motor drives, geared and gearless in-wheel motors and hybrid powertrains; energy sources including batteries, fuel cells, ultracapacitors and ultrahigh-speed flywheels; auxiliaries including battery chargers and indicators, temperature control units, power steering units, auxiliary power supplies and regenerative braking units; impacts including power system, environment and economy.

Mutually exclusive with: ELEC3104
Assessment: 40% continuous assessment, 60% examination

ELEC4145. Building services- electrical services (6 credits)

The aim of this course is to provide fundamental knowledge of building services design and installation, on system and component levels. It elaborates on the Heating, Ventilation and Air-conditioning System, Plumbing & Drainage System, Fire Services System, Lighting Installation, Vertical Transportation System and Building Automation System. Various building services systems are discussed covered engineering fundamentals, system components, design and statutory requirements, system integration as well as practical familiarization of systems.

At the end of this course, students who fulfill the requirements of this course will be able to:

1. describe and understand the construction and functions of building services installation for building to operate;
2. explain different building services installation forming part of a building and its connection between each others;
3. understand the lighting installation;
4. understand the vertical transportation system;
5. understand the plumbing and drainage systems;
6. understand the fire services system;

7. understand the heating, ventilation and air-conditioning system;
8. understand the building automation system.

Mutually exclusive with: ELEC3105
Assessment: 20% continuous assessment, 80% examination

ELEC4146. Building services- electrical installations (6 credits)

To develop classmates' potential in selecting electrical equipment, designing electrical installation, and making them professional in achieving optimal benefits in building services without compromising safety.

At the end of this course, students who fulfill the requirements of this course will be able to:

1. describe and understand the electrical installation as a system; and the major components that build up the installations;
2. be aware of the potential hazards of electrical installations, yet be able to prevent those hazards;
3. select proper equipment and protective devices to facilitate expected functions of the electrical installations;
4. be competent in electrical safety and codes of practice;

Mutually exclusive with: ELEC3106
Assessment: 20% continuous assessment, 80% examination

ELEC4147. Power system analysis and control (6 credits)

The aim of this course is to provide fundamental knowledge of electric power in power system analysis and control. It elaborates on the power flow analysis, fault analysis, economic dispatch algorithms, and small/large disturbance stability. Power system component models and network matrices are included.

At the end of this course, students who fulfill the requirements of this course will be able to:

1. describe and understand the structure and functions of electrical power systems;
2. understand electrical power network modeling and algorithms for network matrices construction;
3. understand the basic concepts of steady-state analysis for power systems and some algorithms for power flow analysis;
4. have a general grasp on the basic concepts of power system operation and understand some algorithms for power system economic dispatch;
5. understand the basic concepts and methods of fault analysis for power systems;
6. understand the basic concepts and methods of stability analysis for power systems.

Pre-requisite: ELEC3141 Power transmission and distribution
Mutually exclusive with: ELEC3107
Assessment: 20% continuous assessment, 80% examination

ELEC4241. Communication systems (6 credits)

This course aims at providing detailed understanding of the basic principles of analogue and digital communication systems in the presence of noise with focus on basic issues relating to

system design. It covers spectral analysis; random signal theory; information theory; noise in analogue systems; digital transmission through AWGN channels; digital carrier-modulation schemes; DM and PCM, error control coding.

Pre-requisite: ELEC3242 Communications engineering
Mutually exclusive with: ELEC3201
Assessment: 10% practical work, 90% examination

ELEC4242. Robotics (6 credits)

The development of robotics has evolved from early programmable industrial arms or manipulators (consisting of a driven mechanical structure) to a diverse range of objects that may generally be referred to as robots. As a result, robotics has become a highly interdisciplinary subject involving different kinds of technologies.

The first part of the course is aimed at providing a general understanding of the fundamental principles of robot manipulators covering robot kinematics, robot dynamics and robot control. The second part of the course will venture into selected topics in robotics (such as robot vision, AI in robotics etc.) and then consider robot applications to different areas (such as humanoid robot, medical and surgical robots, etc.).

At the end of the course, students should have gained an understanding in the principles and mathematical techniques that underlie the traditional manipulator as a basic building block of different kinds of robots, and also an appreciation of how other technologies can be applied to enhance the capabilities and scope of applications of robots.

Pre-requisite: ELEC3241 Signals and linear systems
Mutually exclusive with: ELEC3222
Assessment: 20% continuous assessment, 80% examination

ELEC4243. Cellular radio and personal communications systems (6 credits)

This course is an introduction to cellular radio communications systems taught at a level appropriate for third-year undergraduates in electrical and electronic engineering. It is aimed at providing a general understanding of the basic theory and design of wireless communications.

The following topics will be covered in the course: cellular-systems concepts, advanced digital modulations, digital cellular technologies, code-division-multiple access, GSM system, IS-95 CDMA system, 3G mobile systems, TD-SCDMA system, and safety issues on non-ionizing radiation from wireless systems.

At the end of the course, students should have gained an understanding of the concepts of cellular radio communications systems and analyses the advantages and disadvantages of different mobile systems.

Pre-requisite: ELEC3242 Communications engineering
Mutually exclusive with: COMP3328, ELEC6071, ELEC3203
Assessment: 30% practical work, 70% examination

ELEC4244. Multimedia signals and applications (6 credits)

This course provides an introduction to the basic concept of multimedia applications with particular emphasis on media compression standards/formats for speech, audio, image and videos. Specifically, the course will cover basic concept and terminology in multimedia applications. Furthermore, the course will also discuss in detail about digital representations of important media such as speech, audio, images and videos. Finally, the course will include in-depth coverage of digital media formats, compression methods and standards.

The course is designed to achieve the following:

1. Enable the students to acquire fundamental knowledge/terminologies on essential multimedia components including image, video, audio and speech and their compression techniques/standards for supporting multimedia applications. It will also allow them to keep abreast with more recent development in multimedia compression standards and system development.

2. Enable the students to understand the following basic technical concept on multimedia:

1. multimedia, example systems, and common media components such as hypertext, image, videos, and audio,
2. some popular authoring tools,
3. common color systems used in images and videos and simple image/graphic data type and file formats,
4. videos, digital videos and HDTV,
5. digital audios such as sampling rate, and quantization techniques (e.g. companding, and prediction)
6. lossless compression principle and algorithms such as Huffman codes, dictionary-based codes (e.g. LZW), JPEG lossless image compression, and runlength code.
7. the principle/merits/demerits of image compression standards such as JPEG Baseline and related algorithms,
8. the principle of video compression using motion estimation/hybrid DCT/DPCM codec and simple motion estimation algorithm such as the logarithmic search,
9. the principle of MPEG-1/2 video compression algorithm,
10. speech production/speech analysis techniques using STFT and all-pole modeling/Principle of Multiband Excitation codec and Analysis/Synthesis codec and example coding standards.

3. Enable the students to appreciate the design and implementation issues in a selected multimedia application through the completion of an individual miniproject. The project should have sufficient coverage for the students to apply and integrate the knowledge they have learnt from lectures to develop practical multimedia applications and learn to use relevant state of the art engineering tools.

4. Enable the student to analyze the arithmetic complexity requirements, relative merits, design considerations and other relevant parameters etc. for these essential multimedia components through the tutorial questions and assessment by examination.

Pre-requisite: ELEC3241 Signal and linear systems
Mutually exclusive with: COMP3315, ELEC3224
Assessment: 30% continuous assessment, 70% examination

ELEC4245. Digital image processing (6 credits)

This course aims to help students gain a firm understanding in digital image processing and master its methods and techniques. It intends to build upon the knowledge students acquire in Signals and Linear Systems (ELEC3241) and extends it.

The course in general begins with the basics in 2D signals and systems, visual perception, image sensing and acquisition. It then proceeds to study various intensity transformations, histogram processing techniques, filters in both spatial and frequency domains, and how they can be used to enhance the quality of digital images. Next, it considers reconstruction and restoration of images due to degradations, how image quality is measured and color image processing. It then moves onto Image compression, which plays a pivotal role today's Internet and multimedia applications. A core area of this course is to learn how to segment features/patterns from images. This includes using various methods to extract point, line, edge and regions. The course concludes by considering some typical image processing applications.

Specifically, it covers the areas of image acquisition and imaging systems, 2D continuous-time and discrete-time signals and systems, time and frequency representations, sampling and quantization issues, image filtering, convolution and enhancement, image reconstruction and restoration, color image processing, image quality evaluation, image transform and compression, applications and computer implementations.

Pre-requisite: ELEC3241 Signal and linear systems
Mutually exclusive with: ELEC3505, ELEC3225
Assessment: 40% continuous assessment, 60% examination

ELEC4247. Information theory and coding (6 credits)

This course aims at providing the basic principles of information theory and coding techniques for compact data representation, error control and data secrecy. The fundamental concepts of information theory - entropy, mutual information, information channel, channel capacity, Shannon's theorems are introduced. Various techniques for lossless source coding are examined, including Huffman code, arithmetic code, dictionary code and transform coding. Analysis and design of error-control channel codes are considered, covering linear block code, cyclic code, BCH and RS codes, and convolution code. Finally, private-key and public-key encryption systems are studied.

Mutually exclusive with: ELEC3204, ELEC3227
Assessment: 30% continuous assessment, 70% examination

ELEC4248. Photonic systems technologies (6 credits)

The course aims at providing detailed understanding about the key technologies of photonic systems, especially in the application for communications. Students will learn optical components such as fibers, transmitters and receivers, passive and active components, wavelength-division multiplexer, optical amplifiers. Students will gain the knowledge in the operation principles and the applications of optical components and systems. With the knowledge, the requirement and knowhow to build an optical communication system from optical components are discussed. Some experiments will be conducted for gaining the practical knowledge.

Pre-requisite: ELEC2346 Electric circuit theory or ELEC3349 Optical devices
Mutually exclusive with: ELEC3223
Assessment: 30% continuous assessment, 10% practical work, 60% examination

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ELEC4249. Microwave engineering (6 credits)

This course focuses on the fundamental concepts necessary for real world designs of microwave circuits and components. It aims to establish necessary design methodologies and introduce essential tools for engineering development related but not limited to microwave engineering. Using Maxwell's equations as the basis, this course will introduce the transmission line theory, waveguides, network parameters, antenna theory, impedance matching methods, and filter design methodologies. Waveguide modes will be derived from wave equations to establish the waveguide concept. Important microwave circuit and components, such as couplers and filters, will be discussed based on learned technologies in the course. Antenna and microwave system analysis will be briefly discussed to establish a complete microwave transceiver system that could serve as the foundation of communication system applications.

Pre-requisite: ELEC2242 Introduction to electromagnetic waves and fields or ELEC3247 Engineering electromagnetism
Mutually exclusive with ELEC3221
Assessment: 30% continuous assessment, 30% practical work, 40% examination

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ELEC4250. Control systems (6 credits)

This course provides the students with a good understanding of feedback control systems. The fundamental concepts, mathematics and techniques for the analysis of control systems will be given. Both analogue and digital control systems will be covered as well as a basic understanding of fuzzy control systems. The course will also provide many examples of feedback control systems in different domains of engineering.

This course will cover many important topics in the field of control systems. By the end of this course, student should possess a firm grounding in the concepts and techniques of feedback control systems. The student should be able to apply the acquired knowledge for the analysis of control systems, as well as to carry out design of feedback systems.

Pre-requisite: ELEC3245 Control and instrumentation
Mutually exclusive with: ELEC3206
Assessment: 20% practical work, 10% continuous assessment, 70% examination

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ELEC4251. Microscopy (6 credits)

This is an advanced course that provides students with an in-depth knowledge of various optical and electronic microscopy technologies. The course will cover the essential theories of optical image formation, image analysis, experimental designs of microscopes. Discussion of their practical applications in biomedicine and basic science research will be covered. Selected technologies include phase-contrast microscopy, fluorescence microscopy, super-resolution (far-field) microscopy, scanning electron microscopy (SEM), transmission electron microscopy (TEM), scanning probe microscopy, e.g. atomic force microscopy (AFM).

Assessment: 20% practical work, 40% continuous assessment, 40% examination

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ELEC4343. Design of digital integrated circuits (6 credits)

The aim of this course is to design logic and memory circuits on silicon micro-chips fabricated by various IC technologies.

Specifically, the course covers the following topics: MOS processing : polysilicon gate, LOCOS isolation; MOSFET, as a switch in an inverter; NMOS logic : R-load, E-load, D-load,

and their comparisons; Layout design of NMOS circuits; Design rules, extraction of device parameters, isolation concerns; Design of memory circuits : ROM, EPROM, EEPROM, DRAM, SRAM; CMOS processing : different types of well, threshold control; Problems in CMOS circuits : field inversion, latchup, SOI; CMOS circuits : analysis, layout design; Effects of scaling on the performance of MOS circuits; Bipolar junction transistor, BiCMOS circuits.

Pre-requisite: ELEC3346 Electronic circuits
Mutually exclusive with: ELEC2303, ELEC3303
Assessment: 50% continuous assessment, 50% examination

ELEC4344. Advanced electronic circuits (6 credits)

The aim of this course is to provide students with more advanced knowledge on analogue electronic circuits like amplifiers, filters, diode circuits, oscillators, AD converters and DA converters.

Specifically, the course covers the following topics: s-domain analysis; low-frequency and high frequency response of single-stage BJT and MOSFET amplifiers, cascode configurations, cascade configurations; The BJT differential pair; small-signal operation: input differential resistance, differential voltage gain common-mode input resistance and gain, biasing in BJT integrated circuits :current source circuits, cascode configurations, MOS differential amplifiers, BiCMOS amplifiers, multistage amplifiers; Class A output stage; Class B output stage; Class AB output stage; biasing techniques of the class AB circuit; Basic feedback concepts; feedback amplifier configurations: shunt-shunt, shunt-series, series-shunt, series-series; loop-gain; stability problem; Op-amp realization of Butterworth and Chebyshev filter types; switched-capacitor filters; tuned amplifiers; Series voltage regulators; overcurrent protections; shunt voltage regulators; Sinusoidal oscillators; op amp-RC oscillator circuits; the Wien-Bridge oscillator, the phase-shift oscillator, the quadrature oscillator, the active-filter tuned oscillator; LC oscillators: Colpitts and Hartley oscillators; crystal oscillators; bistable and astable multivibrators; the 555 as an oscillator and as a monostable circuit; D/A converters: inverted ladder converter, current switching converter; A/D converters: the voltage-to-frequency converter, ramp-comparison technique, the counter-binary ramp converter, the dual ramp integrator converter, successive-comparison method.

Pre-requisite: ELEC3346 Electronic circuits
Mutually exclusive with: ELEC2301 and ELEC3341
Assessment: 20% practical work, 20% continuous assessment, 60% examination

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ELEC4442. Advanced networking technologies (6 credits)

This course takes a systematic approach to study the various components that form the infrastructure of the next generation Internet. Topics include optical switching technologies, survivable optical networks, IEEE 802.11, wireless mesh networks, mobile ad hoc networks, wireless sensor networks, high performance switches and routers, advanced topics on congestion and flow control, traffic management.

- To provide a comprehensive coverage of key technologies in optical and wireless networking;
- To study fundamental problems and approach in providing QoS in the next generation Internet.

Pre-requisite: ELEC3443 Computer networks or COMP3234 Computer and communication networks
Mutually exclusive with: ELEC3402
Assessment: 40% continuous assessment, 60% examination

ELEC4543. Fuzzy systems and neural networks (6 credits)

This course provides a general introduction to fuzzy logic and neural network. The fundamental concepts and techniques in the general field of fuzzy systems and neural networks will be given. The course will also provide examples on the application of fuzzy logic and neural network to a variety of engineering problems.

This course will cover two important topics in the field of Artificial Intelligence. By the end of this course, student should possess a firm grounding in the concepts and techniques of fuzzy logic and neural network. The student should be able to apply the acquired knowledge to the development of intelligent systems or to the exploration of research problems.

Mutually exclusive with: ELEC3503
Assessment: 30% continuous assessment, 70% examination

ELEC4640. Distributed computing systems (6 credits)

This course aims at providing detailed understanding about the concept and design of distributed computing systems. The emphasis is on distributed protocol design and analysis. Various existing distributed systems, such as the Internet, are discussed. Network programming is introduced for students to develop their own distributed applications.

Pre-requisite: (ELEC3541 Software engineering and operating systems or COMP3230 Principles of operating systems) and (ELEC3443 Computer networks or COMP3234 Computer and communication networks)

Mutually exclusive with: ELEC3622, ELEC3630
Assessment: 40% continuous assessment, 60% examination

ELEC4641. Computer network security (6 credits)

This course focuses on state-of-the-art computer network security technologies, which are crucial to the success of any electronic commerce systems. The course covers fundamental techniques of cryptography, security threats and their possible countermeasures, secure protocols, and other network security schemes (authentication, key management, firewalls, intrusion detection, etc.).

Pre-requisite:–ELEC3443 Computer networks or COMP3234 Computer and communication networks
Mutually exclusive with: COMP3327, ELEC3631
Assessment: 40% continuous assessment, 60% examination

ELEC4642. VLSI design principles (6 credits)

To give a detailed treatment on the principles and methods for designing large-scale digital integrated circuits.

The course content ranges from low level fabrics like MOSFET (metal-oxide-semiconductor field-effect transistor) basics, logic gate families, layout and fabrication practices, to higher level system knowledge like timing, memory, design optimization and tests; and eventually extends into basic analog circuit blocks like CMOS (complementary metal-oxide-semiconductor) transistor amplifiers and opamps etc.
The course also includes a Verilog design project that covers the typical VLSI design flow using the most popular electronic design automation (EDA) tools.

Mutually exclusive with: ELEC3612
Assessment: 50% continuous assessment, 50% examination

ELEC4649. Parallel computing (6 credits)

This course aims at providing detailed understanding about parallel computing architecture and parallel programming techniques. The course starts with a survey of multiprocessor architectures including multi-core processors, symmetric multiprocessors, high-performance interconnection networks, clusters, and computing Grids. This is followed by quantitative discussions about software development challenges such as synchronization issues, cache coherency, memory consistency, performance scaling, and high speed I/O. The final group of topics mainly focus on parallel programming. Specifically, parallel programming models such as PRAM, LogP, BSP, etc. are introduced. Using variants of the MPI language (e.g., OpenMP), different parallel programming techniques are discussed. Example algorithms including searching, sorting, matrix arithmetic, etc. are used.

Mutually exclusive with: ELEC3441, ELEC3629
Assessment: 40% continuous assessment, 60% examination

ELEC4745. Queueing theory (6 credits)

The objective of the course is to introduce the basic principles of queueing theory. The concepts of random processes, birth-death queueing systems, Markovian queues in equilibrium, and simulation techniques are discussed. Applications of these concepts are also illustrated.

At the end of this course, students will be able to:
1. Gain understanding of concepts in queueing theory;
2. Illustrate the applications of concepts to engineering;
3. Explore the foundations of analytical and critical thinking, academic research, and preparing students some mathematical techniques for conducting academic research;
4. Acquire learning strategies that will enhance their learning experience;
5. Explore some practical examples as a showcase over the course of the Engineering degree.

Pre-requisite: ELEC3847 Probability and statistics in engineering
Mutually exclusive with: ELEC3705
Assessment: 30% continuous assessment, 70% examination

ELEC4848. Senior design project (12 credits)

This course aims at providing the very fundamental training in conducting an individual design project prior to leaving the University.

The essence of the project is for student to re-enforce and consolidate all the learned engineering skill and theory in the school into a real-life practical technical project. The aims of the project are not limited to technical achievement, but also reflected on self-awareness, self-management and probing the limitation of oneself.

Depending on each project offered by teaching staff, students are usually required to individually carry out the Project Requirement and Design, Implementation and Evaluation, Report and Presentation on the selected project. Students are encouraged to explore and lean his/her own direction of the Project over the year during which project supervisor shall provide assistance and aids along each Project phase with the students.

Students are required to have meeting and discussion with his/her supervisors on a regular basis, usually every week or every fortnight. Mid-term Review will be held with both the supervisors and the 2nd examiner in order review the student progress. The final assessment will be based Project Report, Presentation and Demonstration.

Mutually exclusive with: ELEC3801, ELEC3802, ELEC3818
Assessment: 100% continuous assessment

List of Courses by Subject Groups

Note:

Each course shall be classified as either introductory level course or advanced level course, and be assigned a Level – One, Two, Three or Four, in which Level One and Level Two courses are introductory courses whereas advanced courses include Level Three and Four courses.

Courses with similar contents are flagged as "mutually exclusive". For each set of mutually exclusive courses, students are not allowed to take more than one course. Subject to approval, some MSc courses may also be taken as either Disciplinary Elective Courses in their respective subject groups, or as Elective Courses.

Group A: Electrical Energy

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2147	Electrical energy technology (core: EE)	6	-	-
3	ELEC3141	Power transmission and distribution (core: EE)	6	-	ELEC2147
3	ELEC3142	Electrical energy conversion (core: EE)	6	ELEC2147	-
3	ELEC3143	Power electronics (core: EE)	6	-	-
4	ELEC4141	Electric railway systems	6	ELEC2147	-
4	ELEC4142	Power system protection and switchgear	6	ELEC3141	-
4	ELEC4144	Electric vehicle technology	6	-	-
4	ELEC4145	Building services - electrical services	6	-	-
4	ELEC4146	Building services -	6	-	-

		electrical installations			
4	ELEC4147	Power system analysis and control	6	ELEC3141	-

Group B: Electronics and Optics

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2346	Electric circuit theory (core: CE, EE, ElecE)	6	-	-
2	ELEC2347	Fundamentals of optics	6	-	-
3	ELEC3342	Digital system design (core: CE)	6	ELEC2441	-
3	ELEC3346	Electronic circuits (core: ElecE)	6	ELEC2346	-
3	ELEC3347	Electronic materials and quantum physics	6		-
3	ELEC3348	Electronic devices (core: ElecE)	6	-	-
3	ELEC3349	Optical devices	6	ELEC2346 or ELEC2347	-
4	ELEC4248	Photonic systems technologies	6	ELEC2346 or ELEC3349	-
4	ELEC4251	Microscopy	6	-	-
4	ELEC4343	Design of digital integrated Circuits	6	ELEC3346	-
4	ELEC4344	Advanced electronic circuits	6	ELEC3346	-
4	ELEC4642	VLSI design principles	6	-	-

Group C: Signal Processing and Control Systems

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
3	ELEC3241	Signals and linear systems (core: ElecE, EE)	6	-	-
3	ELEC3244	Digital signal processing	6	ELEC3241	-
3	ELEC3245	Control and instrumentation	6	-	ELEC3241
4	ELEC4250	Control systems	6	ELEC3245	-
4	ELEC4242	Robotics	6	ELEC3241	-
4	ELEC4244	Multimedia signals and applications (mutually exclusive with COMP3315)	6	ELEC3241	-
4	ELEC4245	Digital image processing	6	ELEC3241	-

Group D: Communications and Networking

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2242	Introduction to electromagnetic waves and fields (core: ElecE)	6	-	-

3	ELEC3242	Communications engineering (core: ElecE)	6	-	ELEC3241
3	ELEC3247	Engineering electromagnetism	6	ELEC2242	-
3	ELEC3443	Computer networks (mutually exclusive with COMP3234)	6	-	-
4	ELEC4241	Communication systems	6	ELEC3242	-
4	ELEC4243	Cellular radio and personal communication systems	6	ELEC3242	-
4	ELEC4247	Information theory and coding	6	-	-
4	ELEC4249	Microwave engineering	6	ELEC2242 or ELEC3247	-
4	ELEC4442	Advanced networking technologies	6	ELEC3443 or COMP3234	-

Group E: Computer Systems

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2441	Computer organization and microprocessors (core: CE, ElecE, EE) (mutually exclusive with COMP2120)	6	-	-
2	ELEC2543	Object-Oriented programming and data structures (mutually exclusive with COMP2396) (core: ElecE)	6	ENGG1111	-
3	ELEC3441	Computer architecture (core: CE) (mutually exclusive with COMP3231)	6	ELEC2441	-
3	ELEC3442	Embedded systems (core: CE)	6	ELEC3342	-
3	ELEC3541	Software engineering and operating systems (mutually exclusive with COMP3230 and COMP3297) (core: ElecE)	6	-	-
3	ELEC3542	Advanced programming and application development	6	ELEC2543 or COMP2119 or COMP2396	-
3	ELEC3641	Human computer interaction	6	ELEC2543 or COMP2396	-
3	ELEC3643	Systems and network programming (mutually exclusive with COMP3402)	6	ELEC2543 or (COMP2119 & COMP2396)	-
4	ELEC4543	Fuzzy systems and neural networks	6	-	-
4	ELEC4640	Distributed computing systems	6	(ELEC3541 or COMP3230) & (ELEC3443 or COMP3234)	-
4	ELEC4641	Computer network security (mutually exclusive with COMP3327)	6	ELEC3443 or COMP3234	-

4	ELEC4649	Parallel computing	6	ELEC3441	-

Group F: Complementary Studies

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2840	Engineering training	6	-	-
2	ELEC3840	Internship	6	-	-
3	ELEC3844	Engineering management and society	6	-	-
3	ELEC3845	Economics, finance and marketing for engineers	6	-	-

Group G: Projects

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
3	ELEC3848	Integrated design project	6	-	-
4	ELEC4848	Senior design project	12	-	-

Group H: General Engineering

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ENGG1111	Computer programming and applications	6	-	-
1	ENGG1201	Engineering for sustainable development	6	-	-
1	ENGG1202	Introduction to computer science	6	-	-
1	ENGG1203	Introduction to electrical and electronic engineering	6	-	-
1	ENGG1204	Industrial management and logistics	6	-	-
1	ENGG1205	Introduction to mechanical engineering	6	-	-
1	ENGG1206	Introduction to biomedical engineering	6	-	-
1	ENGG1207	Foundations of biochemistry for medical engineering	6	-	-
1	PHYS1050	Physics for engineering students	6	-	-

Group I: Mathematics

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	MATH1851	Calculus and ordinary differential equation	6		
1	MATH1853	Linear algebra, probability & statistics	6		
2	COMP2121	Discrete mathematics	6		
2	MECH2407	Multivariable calculus and partial differential equations	6		
3	MECH3407	Advanced partial differential	6		

		equations & complex variables			
3	ELEC3846	Numerical methods and optimization (mutually exclusive with COMP3407)	6		
3	ELEC3847	Probability and statistics in engineering	6	MECH2407	
4	ELEC4745	Queueing theory	6	ELEC3847	

Group J: Software and IT Applications

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	COMP2119	Introduction to data structures and algorithms (core: CE)	6	COMP1117 or ENGG1111	COMP2123 (Pre- or Co-requisites)
2	COMP2123	Programming technologies and tools (core: CE)	6	COMP1117 or ENGG1111	-
2	COMP2396	Object-oriented programming and Java (mutually exclusive with ELEC2543)	6	COMP1117 or ENGG1111	-
3	COMP3230	Principles of operating systems (mutually exclusive with ELEC3541) (core: CE)	6	COMP2123 & (COMP2120 or ELEC2441)	-
3	COMP3234	Computer and communication networks (mutually exclusive with ELEC3443) (core: CE)	6	COMP2120 or ELEC2441	-
3	COMP3235	Compiling techniques	6	COMP2119; and COMP2123	-
3	COMP3250	Design and analysis of algorithms	6	COMP2119 or ELEC2543 (Pre- or Co-requisites)	-
3	COMP3258	Functional programming	6	COMP2121	
3	COMP3259	Principles of programming languages	6	COMP2119 & (COMP2120 or ELEC2441)	-
3	COMP3270	Artificial intelligence	6	COMP2119 or COMP2123	-
3	COMP3271	Computer graphics	6	COMP2119 or COMP2123	-
3	COMP3278	Introduction to database management systems	6	COMP2119 or ELEC2543	-
3	COMP3297	Introduction to software engineering (mutually exclusive with ELEC3541) (core: CE)	6	COMP2123	-
3	COMP3311	Legal aspects of computing	6	COMP2123	-
3	COMP3314	Machine learning	6	MATH1853; and COMP2119 or ELEC2543	-
3	COMP3315	Multimedia computing and applications (mutually exclusive with ELEC4244)	6	COMP2119	-
3	COMP3317	Computer vision	6	COMP2119 or ELEC2543	-
3	COMP3320	Electronic commerce	6	COMP3278	-

		technology			
3	COMP3322	Modern technologies on World Wide Web (mutually exclusive with COMP3325)	6	COMP1117 or ENGG1111	-
3	COMP3323	Advanced database systems	6	COMP3278	-
3	COMP3327	Computer and network security (mutually exclusive with ELEC4641)	6	COMP3230 & COMP3234	-
3	COMP3329	Computer game design and programming	6	COMP3271	-
3	COMP3330	Interactive mobile application design and programming	6	COMP1117 or ENGG1002 or ENGG1111 or ENGG1112 COMP2396	
3	COMP3351	Advanced algorithm analysis	6	COMP3250	-
3	COMP3402	System architecture and distributed computing (mutually exclusive with ELEC3643)	6	COMP2396	-
3	COMP3403	Implementation, testing and maintenance of software systems	6	COMP2396 (Pre- or Co-requisite)	-
3	COMP3404	Software quality and project management	6	COMP3297	-
3	COMP3407	Scientific computing (mutually exclusive with ELEC3846)	6	(COMP1117 or ENGG1111) and COMP2121	-

INDUSTRIAL ENGINEERING AND LOGISTICS MANAGEMENT

SYLLABUS

The syllabus applies to students admitted in the academic year 2016-17 and thereafter under the four-year curriculum.

Definition and Terminology

Each course offered by the Department of Industrial and Manufacturing Systems 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 Industrial and Manufacturing Systems Engineering for the fulfilment of the curriculum requirements of the degree of BEng in Industrial Engineering and Logistics Management that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

General Engineering Courses
Students are required to complete at least 36 credits of General Engineering Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses (84 credits), comprising 36 credits of introductory core courses and 48 credits of advanced core courses.

Discipline Elective Courses
Students are required to complete at least 36 credits of discipline elective courses offered by the Department of Industrial and Manufacturing Systems Engineering.

Elective Courses
Students are required to complete 12 credits of elective courses offered by either the Department of Industrial and Manufacturing Systems 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 "CAES9532 Technical English for Industrial and Manufacturing Systems 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 "IMSE4174 Project" to fulfil the capstone experience requirement for the degree of BEng in Industrial Engineering and Logistics Management.

Internship
Students are required to complete the 6-credit internship "IMSE3129 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 EN16 of the Regulations for the Degree of Bachelor of Engineering and UG9 of the Regulations for the First Degree Curricula.

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

The curriculum of BEng (Industrial Engineering and Logistics Management) 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
CAES9532	Technical English for Industrial and Manufacturing Systems 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1111/ ENGG1112	Computer programming and applications/ Computer programming and applications I	6
PHYS1050	Physics for engineering students	6
ENGG120X	Any two of the General Engineering Courses offered by the Dept. of IMSE or other Departments of the Faculty of Engineering+	12
Total for General Engineering Courses		36

+Choose two General Engineering Courses from the following list:

ENGG1201	Engineering for sustainable development
ENGG1202	Foundation of computer science
ENGG1203	Introduction to electrical and electronic engineering
ENGG1204	Industrial management and logistics
ENGG1205	Introduction to mechanical engineering
ENGG1206	Introduction to biomedical engineering
ENGG1207	Foundations of biochemistry for medical engineering

Discipline Core Courses (84 credits)

Introductory Courses (36 credits)

Course Code	Course	No. of credits
IMSE2102	Fundamentals of supply chain management	6
IMSE2109	Fundamentals of engineering design	6
IMSE2121	Engineering training	6
IMSE2132	Statistical analysis	6
IMSE2134	Operational research	6
IMSE2135	Mathematical optimisation	6
Total for Introductory Discipline Core Courses		36

Advanced Courses (48 credits)

Course Code	Course	No. of credits
IMSE3102	Strategic supply chain management	6
IMSE3115	Engineering economics and finance	6
IMSE3126	Engineers in society	6
IMSE3134	Innovation and entrepreneurship	6
IMSE3136	Operations planning and control	6
IMSE4122	Global logistics systems	6
IMSE4135	Systems integration	6
IMSE4136	Transportation and distribution planning	6
Total for Advanced Discipline Core Courses		48

Capstone Experience and Internship (18 credits)

Course Code	Course	No. of credits
IMSE4174	Project^{+}	12
IMSE3129	Internship*	6
Total for Capstone Experience and Internship		18

+Capstone Experience
*Internship

Discipline Elective Courses (36 credits)

Course Code	Course	No. of credits
IMSE2112	Engineering technology	6
IMSE2113	Information systems	6
IMSE2114	Product development	6
IMSE2117	Engineering systems analysis	6
IMSE3103	Systems automation	6
IMSE3106	Manufacturing technology	6
IMSE3107	Systems modelling and simulation	6
IMSE3109	Quality management	6
IMSE3110	Supply chain finance	6
IMSE3111	Intelligent optimisation	6
IMSE3116	Internet technology for e-commerce	6
IMSE3118	Industrial organisation and management	6
IMSE3120	Purchasing and supply management	6
IMSE3128	Human factors engineering	6

IMSE3137	Virtual reality for systems engineering	6
IMSE3138	Warehousing and terminal operations	6
IMSE4101	Computer integrated manufacturing	6
IMSE4102	Engineering project management	6
IMSE4110	Financial engineering	6
IMSE4119	Digital enterprises and e-commerce	6
IMSE4121	Strategic management of business and technology	6
IMSE4137	Operational risk management	6
IMSE4138	Asset and portfolio management	6
Complete six discipline elective courses for a total of 36 credits		36

Note: Course availability and electives are subject to change.

Elective Courses (12 credits)

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

Summary of curriculum structure of BEng (Industrial Engineering and Logistics Management)

Course Categories	No. of credits
UG5 Requirements	54
General Engineering Courses	36
Discipline Core Courses (Introductory)	36
Discipline Core Courses (Advanced)	48
Capstone Experience and Internship	18
Discipline Elective Courses	36
Elective Courses	12
Total	**240**

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and ordinary differential equations
MATH1853	Linear algebra, probability & statistics
ENGG1111/	Computer programming and applications/
ENGG1112	Computer programming and applications I
PHYS1050	Physics for engineering students
ENGG120X	Any two of the General Engineering Courses offered by IMSE or other Departments of the Faculty of Engineering

University Requirements (UG5) (24 credits)

CAES1000	Core University English
CC##XXXX	Three Common Core Curriculum Courses

SECOND YEAR

Introductory Core Courses (36 credits)

IMSE2102	Fundamentals of supply chain management
IMSE2109	Fundamentals of engineering design

IMSE2121	Engineering training
IMSE2132	Statistical analysis
IMSE2134	Operational research
IMSE2135	Mathematical optimisation

University Requirements (UG5) (18credits)
CC##XXXX Three Common Core Courses

Discipline Elective Courses (6 credits)

THIRD YEAR

Advanced Core Courses (30 credits)

IMSE3102	Strategic supply chain management
IMSE3115	Engineering economics and finance
IMSE3126	Engineers in society
IMSE3134	Innovation and entrepreneurship
IMSE3136	Operations planning and control

Capstone Experience (6 credits)
IMSE3129 Internship

University Requirements (UG5) (12 credits)

CAES9532	Technical English for Industrial and Manufacturing Systems Engineering
CENG9001	Practical Chinese for engineering students

Discipline Elective Courses (12 credits)

FOURTH YEAR

Advanced Core Courses (18 credits)

IMSE4122	Global logistics systems
IMSE4135	Systems integration
IMSE4136	Transportation and distribution planning

Discipline Elective Courses (18 credits)

Capstone Experience (12 credits)
IMSE4174 Project

Elective Courses (12 credits)

Minor in Industrial Engineering and Logistics Management
[not eligible for BEng(IELM) students]

Candidates who are interested in pursuing minor in Industrial Engineering and Logistics Management must satisfy the following prerequisite:

- Level 4 or above in Mathematics in the Hong Kong Diploma in Secondary Education (HKDSE) Examination

Candidates are required to complete a total of 36 credits of courses in the following manner:

Course Code	Course	Credits
(i) 12 credits of core courses		
IMSE2102	Fundamentals of supply chain management	6
IMSE4136	Transportation and distribution planning	6
(ii) 24 credits of elective courses selected from the following:		
IMSE2132	Statistical analysis	6
IMSE3102	Strategic supply chain management	6
IMSE3115	Engineering economics and finance	6
IMSE3106	Manufacturing technology	6
IMSE3107	Systems modelling and simulation	6
IMSE4119	Digital enterprises and e-commerce	6

COURSE DESCRIPTIONS

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

General Engineering Courses

ENGG1111	Computer programming and applications (6 credits) or
ENGG1112	Computer programming and applications I (6 credits)
MATH1851	Calculus and ordinary differential equations (6 credits)
MATH1853	Linear algebra, probability & statistics (6 credits)
PHYS1050	Physics for engineering students (6 credits)
ENGG1201	Engineering for sustainable development (6 credits)
ENGG1202	Foundation of computer science (6 credits)
ENGG1203	Introduction to electrical and electronic engineering (6 credits)
ENGG1204	Industrial management and logistics (6 credits)
ENGG1205	Introduction to mechanical engineering (6 credits)
ENGG1206	Introduction to biomedical engineering (6 credits)
ENGG1207	Foundations of biochemistry for medical engineering (6 credits)

Please refer to the General Engineering 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.

CAES9532. Technical English for Industrial and Manufacturing Systems Engineering (6 credits)

This 6-credit English-in-the-Discipline course will introduce IMSE students to professional and technical communication through report writing and oral presentation with a focus on the former. The course will provide an intensive English environment and engage students in activities which help them prepare for the completion of the assessments required by the disciplinary project-based courses as nominated by the Department of Industrial and Manufacturing Systems Engineering. Assessment is wholly by coursework.

Co-requisite: IMSE3134 Innovation and entrepreneurship
Adjunct course: IMSE3134 Innovation and entrepreneurship
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

IMSE2102. Fundamentals of supply chain management (6 credits)

Definition, importance and objectives of logistics; the roles of logistics in supply chain management; business of production; business environment; transport fundamentals and transport decisions; storage and handling systems and decisions; inventory policies; forecasting logistics requirements; facility location analysis; network planning process; purchasing scope and objectives; purchasing structure and organisation; purchasing variables – price, time and quality; buying commodities; buying capital goods; buying services; purchasing systems.

Assessment: 20% continuous assessment, 80% examination

IMSE2109. Fundamentals of engineering design (6 credits)

Visualization of technical information; application of CAD software to prepare product design models and drawings; principles of engineering graphics: orthographic projections, isometric views, auxiliary views, sectioning, dimensioning and tolerancing; assembly modelling and drawing; design of components; general principles of product and tool design.

Assessment: 100% continuous assessment

IMSE2112. Engineering technology (6 credits)

Kinematics and dynamics of rigid bodies, centre of percussion, design for reduction of impact stress; analysis, simulation and applications of 4-bar mechanisms, velocity diagram and instantaneous centre of rotation; Geneva mechanism, gear train and motion transmission; analysis and applications of simple harmonic motion, damping of vibrations; fundamental electrical circuit analysis; alternating current electricity, AC circuits sand phasors.

Assessment: 20% continuous assessment, 80% examination

IMSE2113. Information systems (6 credits)

Information systems; the strategic role of information technology; data communications and networking; online databases and their applications; development and implementation of information systems.

Prerequisite: ENGG1111 Computer programming and applications or
ENGG1112 Computer programming and applications I
Assessment: 60% continuous assessment, 40% examination

IMSE2114. Product development (6 credits)

Organisation and management, performance measurement; market research, product design specification, product safety, product and the environment, concept generation and selection, design review and improvements; product appraisal from functional, ergonomic and aesthetic, manufacturing and economical aspects; design theory and methodology, information / literature search.

Assessment: 40% continuous assessment, 60% examination

IMSE2117. Engineering systems analysis (6 credits)

Fundamental and elements of engineering system; system analysis and design principles; structured system analysis and design method (SSADM), object-oriented analysis and design (OOAD); applications of SSADM and OOAD for engineering system development.

Assessment: 20% continuous assessment, 80% examination

IMSE2121. Engineering training (6 credits)

Metal work, manufacturing practice, practical networking, computing practice, design practice, plastic processing, metrology, CNC programming and CAD/CAM, electronics, work study.

Assessment: 100% practical work

IMSE2132. Statistical analysis (6 credits)

Discrete and continuous random variables; some important probability distributions; joint probability distributions; mathematical expectation; random sampling and sampling distributions; point estimation of parameters, confidence interval; tests of hypotheses; analysis of variance; linear regression; logistic regression and classification problems.

Prerequisite: MATH1851 Calculus and ordinary differential equations or
MATH1853 Linear algebra, probability & statistics
Assessment: 30% continuous assessment, 70% examination

IMSE2134. Operational research (6 credits)

Formulation of linear programming; Geometry of linear programming; Simplex method; Sensitivity analysis; Duality theory; Formulation of integer programming; Branch-and-bound; Network flow; Application of queueing models; Poisson process; Birth-and-death process; M/M/1 queue; M/M/k queue

Prerequisite: MATH1851 Calculus and ordinary differential equations or
MATH1853 Linear algebra, probability & statistics
Assessment: 30% continuous assessment and 70% examination

IMSE2135. Mathematical optimisation (6 credits)

Multivariable functions, partial derivatives and multiple integrals; multivariable unconstrained optimisation; optimisation problems with equality and inequality constraints; nonlinear optimization; gradient methods and Newton-Raphson method; industrial applications of optimisation techniques.

Prerequisite: MATH1851 Calculus and ordinary differential equations
Assessment: 30% continuous assessment, 70% examination

IMSE3102. Strategic supply chain management (6 credits)

Supply chain overview; operating objectives; barriers to internal integration; supply chain performance cycles; logistics positioning; supply chain environmental assessment; time-based supply chains; information flow; alternative supply chain strategies; supply chain integration theory; logistics location structure; warehouse location patterns; transportation economies; inventory economies; least total cost design; formulating supply chain strategy; planning and design supply chain methodology; supply chain administration and dimensions of change management.

Prerequisite: IMSE2102 Fundamentals of supply chain management
Assessment: 20% continuous assessment, 80% examination

IMSE3103. Systems automation (6 credits)

Introduction to robotics and automation, fundamental of robotics; basic components of robotic systems; robot applications including industrial robots, services robots, space robots, and medical robots; robot intelligence, integration of robotics systems for automation, applications of automation in manufacturing, logistics, and smart city; Global trend and development in robotics and systems automation.

Prerequisite: MATH1851 Calculus and ordinary differential equations
Assessment: 30% continuous assessment, 70% examination

IMSE3106. Manufacturing technology (6 credits)

Introduction to manufacturing, safety in manufacturing, manufacturing and the environment; metrology, measuring standards, limits and fits, geometrical tolerances, limit gauging, surface texture; casting processes, pattern and gating, permanent and non-permanent moulds; forming processes, principles of bulk deformation and sheet metal working; joining processes, fastening, liquid and solid states welding, powder metallurgy; machining processes, cutting and grinding operations, non-traditional machining, cutting conditions; plastics materials and processing.

Assessment: 40% continuous assessment and 60% examination

IMSE3107. Systems modelling and simulation (6 credits)

Basic concepts of modelling and simulation; discrete-event simulation techniques; introduction to computer-aided simulation and the use of simulation packages; methodology of simulation study of industrial systems; model development for industrial systems, analysis of systems; model validation and verification; analysis of simulation results, case studies of industrial and manufacturing systems using discrete event simulations.

Assessment: 60% continuous assessment, 40% examination

IMSE3109. Quality management (6 credits)

Total quality management; management tools for quality; benchmarking; ISO9000 series; national quality awards; design of industrial experiments; statistical process control; control charts; acceptance sampling; business process reengineering; customer services quality; Six Sigma; DMAIC process; Poka-yoke; failure mode and effect analysis; reliability engineering.

Assessment: 30% continuous assessment, 70% examination

IMSE3110. Supply chain finance (6 credits)

Financial markets; derivatives for risk transfer in supply chain, forward, futures, options, swap; binomial model and Black-Scholes model for evaluating options; risk measures, value-at-risk (VaR), returns and utility functions. Managing supply chain risks: financial and nonfinancial risks; uncertain customer demand, material price, exchange rates; logistics financing and risks; development of risk hedging models: price models, demand models, optimal hedging policies. Strengthening of financial and risk protection capabilities of supply chain members: financing for optimising members' working capital.

Assessment: 40% continuous assessment and 60% examination

IMSE3111. Intelligent optimisation (6 credits)

Evolutionary computation overview; Genetic algorithms; Particle swarm optimisation; data warehousing; data mining overview; probabilistic approach to data mining; data compression approach; Data mining with big data; fuzzy information and fuzzy system; fuzzy modeling; fuzzy optimisation; Fuzzy evaluation; Decision table overview; Decision table structure; Limited-entry decision table.

Assessment: 30% continuous assessment and 70% examination

IMSE3115. Engineering economics and finance (6 credits)

Cost accounting - procedures; direct costs, absorption costing; marginal costing. Planning and control – activity-based costing systems; standard costing systems; capital expenditure and investment; health, safety and environmental aspects of company activities; contemporary issues in management accounting; financial accounting - accounting rules; basic financial accounts; manufacturing accounts; company account; financial performance – ratio analysis; interpretation of accounting data.

Assessment: 30% continuous assessment, 70% examination

IMSE3116. Internet technology for e-commerce (6 credits)

Overview of e-Business and e-Commerce; Electronic Business Solutions (EBS) and technology; roles and applications of e-business solutions; design and development of e-business systems: adoption and implementation: internet programming, web-based system development, online database design and implementation.

Prerequisite: ENNG1111 Computer programing and applications or
ENNG1112 Computer programing and applications I
Assessment: 60% continuous assessment and 40% examination

IMSE3118. Industrial organisation and management (6 credits)

Managing and managers; evolution of management theory; planning - decision making; strategic management; strategy implementation, strategic management; organising - organisational design and structure; power and the distribution of authority; managing organisational change and innovation; leading – motivation, leadership, teams and teamwork; controlling, principles of effective control, operations control.

Prerequisite: IMSE2102 Fundamentals of supply chain management
Assessment: 40% continuous assessment, 60% examination

IMSE3120. Purchasing and supply management (6 credits)

Introduction of purchasing function/process; quality management for goods and service; sourcing and market analysis; make-or-buy decisions and subcontracting ; negotiation; controlling price and costs; vendor selection; commodity buying; service buying; capital buying; strategic purchasing; e-procurement and public procurement

Assessment: 40% continuous assessment, 60% examination

IMSE3126. Engineers in society (6 credits)

Responsibilities of professional engineers in society; role of ethics in engineering; engineering health and safety; accident prevention and management; environmental considerations; the fundamentals of the Hong Kong legal system; legal issues and the laws relevant to engineering practice; meeting with professionals from industry for sharing knowledge about engineering ethics and responsibility.

Assessment: 30% continuous assessment, 70% examination

IMSE3128. Human factors engineering (6 credits)

Human-organization interaction; human-technology interface usability and design; workplace safety and health; applied anthropometry and biomechanics; physical work and manual material handling; time and motion study; workplace and environmental design, illumination, noise, thermal; information processing; display and control; skills and learning; job design and shift work.

Assessment: 40% continuous assessment, 60% examination

IMSE3129 Internship (6 credits)

An internship in an appropriate industry six to twelve weeks duration. All Year 3 students must undergo a 6 to 12-week Internship in the summer immediately after the second semester of Level 3 studies ends. Most students undergo Internships in services or manufacturing companies in Hong Kong or China. The content of such on-the-job training may include engineering design and modification, installation, repairing, computation, programming, site inspection, measurement, quality assurance, warehouse management, etc. In some companies, the training programmes are project-orientated and often predetermined. The Internship is an important part of this 4-year BEng programme, as it gives students an opportunity to gain practical experience in industry and to develop their professional skills.

At the end of the training period, all the sponsoring organisations will complete an appraisal form on the trainees' performance. Students must submit a report after the training, and assessments are based on both the training logbook and performance appraisal.

Assessment: 100% practical work

IMSE3134. Innovation and entrepreneurship

The course is designed to apply industrial engineering principles and methodologies in an integrated manner for formulating strategies for innovation and entrepreneurship. The main element of the course is a group project on developing a conceptual product, or a service, or a system with innovative ideas and designing a start-up business plan. This project serves as a vehicle for integrated applications of various topics, including product and system design methodologies, project management, product life-cycle management, manufacturing and business logistics, cost accounting, scheduling, process planning and workflow, human factors, distribution and marketing.

The students will learn about entrepreneurship in the new world economy, general characteristics of entrepreneurs, marketing of products and services, business plan, venture capital, environmental and contingency factors, time management, communication, systematic problem solving, group work, negotiating and assertiveness, coping with pressure, and leadership.

Pre-requisite: IMSE2109 Fundamentals of engineering design
Co-requisite: CAES9532 Technical English for Industrial and Manufacturing Systems Engineering
Adjunct course: CAES9532 Technical English for Industrial and Manufacturing Systems Engineering
Assessment: 100% continuous assessment

IMSE3136. Operations planning and control (6 credits)

The use of operations planning and control systems in forecasting, scheduling and inventory control; functions and organisation of production and inventory control systems; demand forecasting;

deterministic and stochastic inventory control problems; aggregate production planning; master production scheduling; requirements and capacity planning systems; operations scheduling and control of production systems; Just-In-Time techniques; balancing of assembly lines; information reporting and processing; supply chain management.

Prerequisite: IMSE2134 Operational research
Assessment: 20% continuous assessment, 80% examination

IMSE3137. Virtual reality for systems engineering (6 credits)

Fundamental of virtual reality, concepts of virtual, augmented and mixed reality, visualization and interacting with complex information and systems with virtual reality, applications of virtual reality technology in engineering systems design and analysis, immersive and interactive virtual environments; innovation and consciousness with virtual reality system development and deployment, ethical issues and social impacts of adopting virtual reality in system development. Designing and building virtual systems with immersive virtual reality systems including CAVE-like environment and VR headsets.

Assessment: 60% continuous assessment, 40% examination

IMSE3138. Warehousing and terminal operations (6 credits)

Introduction to warehousing; material handling technologies, MH principles, container and unitizing equipment, storage and retrieval equipment, AS/RS, material transport equipment, automatic data collection and communication equipment, packaging; warehouse management system, receiving, cycle counting, order processing, picking, replenishment, shipping; warehouse planning and design: simulation model and software; design procedures.

Introduction to container terminal and air cargo terminal, basic operation flow at ship, quay, container yard, gate and CFS, container handling equipment and operation modes organization structure of a terminal and it various functions, container ship structure and generations, terminal management system, terminal planning and design methodology and analysis tools.

Prerequisite: IMSE2102 Fundamentals of supply chain management
Assessment: 30% continuous assessment, 70% examination

IMSE4101. Computer integrated manufacturing (6 credits)

Overview of Computer Integrated Manufacturing (CIM) system and CAD/CAM functions; geometric modelling in CAD - principles of surface and solid modelling; CNC applications in CAM; computer aided process planning, automated process planning; rapid prototyping (3D printing) and virtual manufacturing; CAD and CAM integration.

Prerequisite: IMSE2109 Fundamentals of engineering design
Assessment: 40% continuous assessment, 60% examination

IMSE4102. Engineering project management (6 credits)

Fundamentals of engineering project management; project environment; project evaluation; risk management process; project selection and proposal preparation; project scheduling and contingency setting and control; control of variation and claims; project management methodologies and techniques,

change management; multi-criteria decision making process; analytic hierarchy process; PERT/GANTT techniques for project control and resources allocation; simulation of critical paths; case studies.

Assessment: 30% continuous assessment, 70% examination

IMSE4110. Financial engineering (6 credits)

Financial markets and financial securities, portfolio management and investment strategies; international finance, foreign exchange markets; project evaluation and financing, present value, cost of capital, cost-benefit ratio and internal rates of return; financial instruments, forwards, futures; swaps, options and hedging strategies; foreign trade and investment in China.

Prerequisite: IMSE3115 Engineering economics and finance
Assessment: 30% continuous assessment, 70% examination

IMSE4119. Digital enterprises and e-commerce (6 credits)

Enterprise resource management; EDI applications; data mining and warehousing; virtual enterprises; advanced Internet and web applications in product development, industrial applications of virtual reality; digital design and manufacturing technology: 3D printing, virtual prototyping and virtual manufacturing; electronic product and component cataloguing; cryptographic systems and digital watermarking; capability maturity model; social accountability and responsibility standards; E-commerce business models; technological, business planning and social issues of E-commerce; order taking and processing; mobile technology and electronic payment systems, smart cards, RFID and NFC.

Prerequisite: IMSE2113 Information systems or
ENGG1111 Computer programming and applications or
ENGG1112 Computer programming and applications I
Assessment: 50% continuous assessment, 50% examination

IMSE4121. Strategic management of business and technology (6 credits)

Analysis of the external environment and industry clusters for local industries – threats and opportunities from government policies as well as the legal, economic, social and technological environment; competitive forces from industry rivals, customers and other sources; analysis of internal weaknesses and strengths – resources, competences and success factors; mission and strategic intent; strategic directions and methods – conditions and implications; implementing and evaluating strategic changes; management for technology innovation.

Prerequisite: IMSE2102 Fundamentals of supply chain management
Assessment: 30% continuous assessment, 70% examination

IMSE4122. Global logistics systems (6 credits)

Global operations and logistics strategies, strategic changes required by globalisation, the strategic framework for integrating global operations, the role of logistics in global operations and marketing strategies; global operations and logistics planning, supplier network development, physical distribution, global logistics network design, global supply chain management, foreign exchange risk

management in global operations; operations analysis of global supply chains, information management for global logistics, performance measurement and evaluation in global logistics.

Prerequisite: IMSE2102 Fundamentals of supply chain management
Assessment: 20% continuous assessment, 80% examination

IMSE4135. Systems integration (6 credits)

Student-centred learning on system integration and analysis and evaluation of system performance. The module is based on case studies and covers the application of various techniques as follows:

Business analysis and decision making process; industrial modelling and simulation; project management, strategic management; industry analysis; value chain analysis and critical success factors.

Facility location analysis; locational economics; network planning process; warehouse design and management; supply and inventory management; supply chain performance analysis; alternative supply chain strategies; systems modelling and simulation; customer-supplier relationship; regional and international transportation strategies.

Assessment: 100% continuous assessment

IMSE4136. Transportation and distribution planning (6 credits)

The evolution of transportation management; traffic management; transportation alternatives and technologies; transportation infrastructure; transportation performance analysis; total transportation cost analysis; fleet development and management; fleet performance indicators; routing and scheduling; shipment planning; containerisation-alternatives and selection criteria; mode selection criteria; transportation management and information systems requirements; international transportation strategies; implementation organisational issues.

Prerequisite: IMSE2134 Operational Research
Assessment: 30% continuous assessment, 70% examination

IMSE4137. Operational risk management (6 credits)

Basics of risk management, risk and return, lifecycle of risk management, operational risk management (ORM) components; risk management framework: standards, management environment, management processes; operational risk assessment: assessment, identification, scale of assessment; risk reporting: risk indicators, risk map. Risk management strategies: risk avoidance, mitigation, transfer and acceptance; applications: supply chain management, product development, environment, health and safety risks; crisis management.

Assessment: 30% continuous assessment, 70% examination

IMSE4138. Asset and portfolio management (6 credits)

Statistics of asset and portfolio management: univariate statistics, multivariate statistics, modelling the market; portfolio selection theories: mean-variance analysis, asset pricing theory; factor model: arbitrage pricing theory, factor model estimation, principal component analysis; asset price dynamics; portfolio management strategies: tracking error, information ratio, passive and active strategies;

portfolio monitor and adjustment; rebalancing; basic machine learning algorithms.

Assessment: 30% continuous assessment, 70% examination

IMSE4174. Project (12 credits)

A dissertation or report on a topic consisting of design, experimental or analytical investigation in the field of industrial engineering and technology management; logistics engineering and supply chain management.

Assessment: 100% continuous assessment

MECHANICAL ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2016-17 and thereafter under the four-year curriculum.

Definition and Terminology

Each course offered by the Department of Mechanical 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 Mechanical Engineering for the fulfillment of the curriculum requirements of the degree of BEng in Mechanical Engineering that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

General Engineering Courses
Students are required to complete at least 36 credits of General Engineering Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses (78 credits), comprising 36 credits of introductory core courses and 42 credits of advanced core courses.

Discipline Elective Courses
Students are required to complete at least 42 credits of discipline elective courses offered by the Department of Mechanical Engineering.

Elective Courses
Students are required to complete 12 credits of elective courses offered by either the Department of Mechanical Engineering, or other departments within or outside the Faculty of Engineering.

University Requirements
Students are required to complete:

a) Two English language courses, “CAES1000 Core University English” and “CAES9544 Technical English for mechanical engineering”, for a total of 12 credits;
b) One Chinese language enhancement course “CENG9001 Practical Chinese for engineering students”, for a total of 6 credits; 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.

Capstone Experience
Students are required to complete the 12-credit MECH4429 “Integrated capstone experience” to fulfill the capstone experience requirement for the degree of BEng in Mechanical Engineering.

Engineering Training
Students are required to complete the 6-credit MECH2418 “Engineering Training” which normally takes place in the summer semester after their second year of study.

Degree Classification

The degree of Bachelor of Engineering shall be awarded in five divisions in accordance with EN16 of the Regulations for the Degree of Bachelor of Engineering and UG9 of the Regulations for the First Degree Curricula.

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

The curriculum of BEng in Mechanical 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
CAES9544	Technical English for mechanical 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1111/ ENGG1112	Computer programming and applications/ Computer programming and applications I	6
PHYS1050	Physics for engineering students	6
ENGG1205	Introduction to mechanical engineering	6
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering+	6
Total for General Engineering Courses		36

+Choose one General Engineering Course from the following list:

ENGG1201	Engineering for sustainable development
ENGG1202	Introduction to computer science
ENGG1203	Introduction to electrical and electronic engineering
ENGG1204	Industrial management and logistics
ENGG1206	Introduction to biomedical engineering
ENGG1207	Foundations of biochemistry for medical engineering

Discipline Core Courses (78 credits)

Introductory Courses (36 credits)

Course Code	Course	No. of credits
MECH2404	Drawing and elements of design and manufacture	6
MECH2406	Fundamentals of electrical engineering	6
MECH2407	Multivariable calculus and partial differential equations	6
MECH2413	Engineering mechanics	6

MECH2414	Thermofluids	6
MECH2419	Properties of materials	6
Total for Introductory Discipline Core Courses		36

Advanced Courses (42 credits)

Course Code	Course	No. of credits
MECH3402	Engineering thermodynamics	6
MECH3407	Advanced partial differential equation and complex variables	6
MECH3408	Mechanics of fluids	6
MECH3409	Mechanics of solids	6
MECH3418	Dynamics and control	6
MECH3427	Design and manufacture	6
MECH4410	Engineering & technology management	6
Total for Advanced Discipline Core Courses		42

Capstone Experience and Engineering Training (18 credits)

Course Code	Course	No. of credits
MECH2418	Engineering training* (Summer semester)	6
MECH4429	Integrated capstone experience+	12
Total for Capstone Experience and Engineering Training		18

+Capstone Experience
*Training

Discipline Elective Courses (42 credits)

Course Code	Course	No. of credits
MECH3406	Electrical and electronic engineering	6
MECH3416	Fundamentals of aeronautical engineering	6
MECH3417	Industrial training* (Summer semester)	6
MECH3420	Air pollution control	6
MECH3422	Building services engineering I	6
MECH3423	Building services engineering II	6
MECH3428	Research experience for undergraduates	6
MECH4404	Automatic control	6
MECH4407	CAD/CAM	6
MECH4409	Energy conversion systems	6
MECH4411	Heat transfer	6
MECH4412	Product design and development	6
MECH4414	Materials for engineering applications	6
MECH4415	Applied stress and strength analysis	6
MECH4421	Viscous flow	6
MECH4423	Building energy management and control systems	6
MECH4428	Sound and vibration	6
MEDE4602	Molecular and cellular biomechanics	6
MEDE4603	Transport phenomena in biological systems	6
MEDE4604	Cell and tissue engineering	6
MEDE4605	Biomaterials design and applications	6
CIME2101	Water and air quality: concepts and measurement	6
CIVL3111	Municipal and industrial waste treatment	6
CIVL3115	Solid and hazardous waste management	6
CIVL3122	Wind engineering	6

Total for Discipline Elective Courses	42

* Industrial training course normally takes place in the summer semester after the third year of study

Elective Courses (12 credits)

Up to 12 credits of courses offered by either the Department of Mechanical Engineering, or other departments within or outside the Faculty of Engineering.

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

Summary of curriculum structure of BEng in Mechanical Engineering

Course Categories	**No. of credits**
UG5 Requirements	54
General Engineering Courses	36
Discipline Core Courses (Introductory)	36
Discipline Core Courses (Advanced)	42
Capstone Experience and Engineering Training	18
Discipline Elective Courses	42
Elective Courses	12
Total	**240**

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and ordinary differential equations
MATH1853	Linear algebra, probability & statistics
ENGG1111/	Computer programming and applications/
ENGG1112	Computer programming and applications I
PHYS1050	Physics for engineering students
ENGG1205	Introduction to mechanical engineering
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering

University Requirements (UG5) (24 credits)

CAES1000	Core University English
CC##XXXX	Three Common Core Courses

SECOND YEAR

Introductory Core Courses (36 credits)

MECH2404	Drawing and elements of design and manufacture
MECH2406	Fundamentals of electrical engineering
MECH2407	Multivariable calculus and partial differential equations
MECH2413	Engineering mechanics
MECH2414	Thermofluids
MECH2419	Properties of materials

University Requirements (UG5) (18 credits)

CC##XXXX	Three Common Core Courses

Training (6 credits)
MECH2418 Engineering training (Summer semester)

THIRD YEAR

Advanced Core Courses (36 credits)
MECH3402 Engineering thermodynamics
MECH3407 Advanced partial differential equation and complex variables
MECH3408 Mechanics of fluids
MECH3409 Mechanics of solids
MECH3418 Dynamics and control
MECH3427 Design and manufacture

University Requirements (UG5) (6 credits)
CENG9001 Practical Chinese for engineering students

Discipline Elective Courses (18 credits)

FOURTH YEAR

Advanced Core Courses (6 credits)
MECH4410 Engineering & technology management

University Requirements (UG5) (6 credits)
CAES9544 Technical English for mechanical engineering

Discipline Elective Courses (24 credits)

Capstone Experience (12 credits)
MECH4429 Integrated capstone experience

Elective Courses (12 credits)

MINOR IN MECHANICAL ENGINEERING
[not eligible for students of BEng(ME)]

Candidates from other departments in the Faculty of Engineering or from other faculties who have keen interest in Mechanical Engineering with good background in mathematics may pursue Minor in Mechanical Engineering.

Minor in Mechanical Engineering

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

(a) Introductory courses (18 credits)

Students must complete 18 credits of Introductory core courses to be chosen from the following list:

Course Code	Course Title	No. of credits
MECH2404	Drawing and elements of design and manufacture	6
MECH2406	Fundamentals of electrical engineering	6
MECH2413	Engineering mechanics	6
MECH2414	Thermofluids	6

MECH2419	Properties of materials	6
Total for Introductory Discipline Core Engineering 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 Title	No. of credits
MECH3402	Engineering thermodynamics	6
MECH3408	Mechanics of fluids	6
MECH3409	Mechanics of solids	6
MECH3416	Fundamentals of aeronautical engineering	6
MECH3418	Dynamics and control	6
MECH3420	Air pollution control	6
MECH3427	Design and manufacture	6
MECH4404	Automatic control	6
MECH4407	CAD/CAM	6
MECH4409	Energy conversion systems	6
MECH4411	Heat transfer	6
MECH4412	Product design and development	6
MECH4414	Materials of engineering applications	6
MECH4415	Applied stress and strength analysis	6
MECH4421	Viscous flow	6
MECH4423	Building energy management and control systems	6
MECH4428	Sound and vibration	6
Total for Discipline Elective Courses		30

COURSE DESCRIPTIONS

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

COURSE DESCRIPTIONS

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

General Engineering Courses

ENGG1111 Computer programming and applications (6 credits)
ENGG1112 Computer programming and applications I (6 credits)
MATH1851 Calculus and ordinary differential equations (6 credits)
MATH1853 Linear algebra, probability & statistics (6 credits)
PHYS1050 Physics for engineering students (6 credits)
MECH2407 Multivariable calculus and partial differential equations (6 credits)
ENGG1201 Engineering for sustainable development (6 credits)
ENGG1202 Introduction to computer science (6 credits)
ENGG1203 Introduction to electrical and electronic engineering (6 credits)
ENGG1204 Industrial management and logistics (6 credits)
ENGG1205 Introduction to mechanical engineering (6 credits)
ENGG1206 Introduction to biomedical engineering (6 credits)
ENGG1207 Foundations of biochemistry for medical engineering (6 credits)

Please refer to the General Engineering 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.

CAES9544. Technical English for mechanical engineering (6 credits)

This 6-credit English-in-the-Discipline course will introduce ME and BEng(EngSc) Materials Engineering students to professional and technical communication in the context of technical project report writing and oral presentation. The course will provide an intensive English environment and engage students in activities which help them prepare for the completion of the assessments required by their capstone experience courses. Assessment is wholly by coursework.

Co-requisite: MECH4429

MECH4429 Integrated capstone experience (for BEng in Mechanical Engineering students)
MECH4429 Integrated capstone experience OR MECH3427 Design and manufacture (for BEng(EngSc) Materials Engineering students)

Assessment: 100% continuous assessment

University Common Core Curriculum

Successful completion of 36 credits of courses in the University 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

MECH2404. Drawing and elements of design and manufacture (6 credits)

This course covers the basic knowledge of engineering drawing techniques and the basic concepts in product design. It introduces standard engineering drawing methods, including orthographic and pictorial projections, dimensioning and tolerancing, limits and fits. Features, functionality and representation method for screws, fasteners, cam and gear will also be covered. This course also covers computer aided drafting with 3D CAD modeling for facilitating the production of illustrations and animations in written reports and oral presentation. To help students understand the importance of design for manufacture, the working principles of basic manufacturing processes are covered in this course. This course has the objectives: (1) provide students with an ability to communicate engineering information using standard engineering drawing methods and computer-aided design tools; (2) introduce basic manufacturing processes with emphasis on design for manufacturability; and (3) help students understand how typical products are designed and manufactured so that they can be better prepared to undertake the practical engineering training course.

Topics include: engineering drawing techniques; orthographic and pictorial projections; dimensioning and tolerancing; limits and fits; screw fasteners; cam; gears; computer aided drafting with 3D CAD modeling; product design; manufacturing processes.

Assessment: 100% continuous assessment

MECH2406. Fundamentals of electrical engineering (6 credits)

Basic circuit principles; steady-state A.C. circuit theory; magnetic circuits; transformers; direct-current motors; three-phase power system; induction motors; step motors.

This course aims to: (1) provide students with fundamental concepts for analysing D.C. and A.C. circuits; (2) furnish students with knowledge of the operation of transformers and D.C. motors; (3) provide students with an understanding of three-phase power system; and (4) provide students with knowledge of the principles of operation and application of A.C. motors and step motors.

Topics include: basic circuit principles; steady-state A.C. circuit theory; magnetic circuits; transformers; direct-current motors; three-phase power system; induction motors; step motors.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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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

MECH2413. Engineering mechanics (6 credits)

This course aims to (1) present a comprehensive study of the fundamental concepts and methods used in the analysis of stress and strain in structural and machine components, and to develop logical methods for the design of engineering components, structures and machines; (2) develop a thorough understanding of the static deformation of simple non-rigid bodies, and of the stress and strain produced in such bodies due to various loading conditions; (3) introduce the basic principles of kinematics and kinetics for particles and rigid bodies, and (4) consolidate the knowledge of dynamics (e.g. by studying space applications).

Topics include: stress and strain; bending of beams; deflection of beams; thin-walled pressure vessels; kinematics of particles and rigid bodies; kinetics and principle of momentum and energy; application of dynamics principles (e.g. space applications); particles and vehicles with mass variation; velocity-dependent resistance and the action of central forces.

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

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MECH2414. Thermofluids (6 credits)

Thermofluids is a branch of science and engineering, covering topics in thermodynamics and fluid mechanics. These topics form the basic foundations that govern processes in engineering applications. This course is an introduction to the thermofluids and how the principles can be applied to understand/design thermal and fluid flow processes. The specific course objectives are: (1) understand and apply thermodynamic principles to engineering applications; (2) understand basic concepts and fundamental equations in fluid mechanics, and develop skills to solve practical flow problems; and (3) form a foundation for subsequent studies in engineering thermodynamics, building services, material science, heat transfer, marine engineering, environmental engineering, power engineering, energy conversion, energy system and other areas. At the end of this course, students who fulfill the requirements of this course will be able to: (1) identify, formulate and solve thermofluids engineering problems; and (2) design and conduct experiments in thermofluids engineering, as well as to analyse and interpret data.

Topics include: concepts and definitions; properties of pure substance; heat and work; first law of thermodynamics; second law of thermodynamics; entropy; basic concepts on fluids and flows; dimensional analysis; similarity and modelling; momentum theorems and pipe flow analysis.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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MECH2418. Engineering training (Summer semester) (6 credits)

This course aims to provide students with hands-on training and practical experience in engineering basics, design and manufacturing practices.

Topics include: automation & instrumentation; benchwork & machining practice; CAD/CAM; electrical & electronic engineering practice; and seminars on safety, against corruption, engineering profession and other contemporary issues.

Assessment: 100% practical work

MECH2419. Properties of materials (6 credits)

In this course, students will be introduced to the underlying scientific principles of the mechanical engineering behaviour of metals, and in particular to emphasise the effects of stress and heat via their influence on the microstructure of the materials. The behaviour of materials in service conditions including stress and corrosion effects will be highlighted. The course concerns those principles governing the crystalline state, which is appropriate to metals and ceramics, as well as the amorphous and semi-crystalline states, which are relevant to polymers.

Topics include: elements of atomic structure and bonding; crystal structure; structure of polymers; solidification and phase diagrams; defects and plastic deformation in the crystalline state; TTT diagrams and heat treatment of steels; metallurgy of fatigue; corrosion resistance and surface treatment; mechanical properties of plastics.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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MECH3402. Engineering thermodynamics (6 credits)

Engineering Thermodynamics is a branch of science and engineering, covering topics in power cycles, air-conditioning, heat transfer, and combustion. The course objectives are to: (1) provide students with fundamental principles of the latest technologies of thermodynamics from a mechanical engineering

perspective, and (2) enable students to apply and practice the knowledge in relevant industry and profession, such as power generation, automotive, and building services, etc. At the end of this course, students who fulfill the course requirements will be able to: (1) apply knowledge of mathematics, science, and engineering appropriate to thermodynamics, (2) identify, formulate, and solve engineering thermodynamics problems, and (3) design and conduct experiments in engineering thermodynamics, as well as to analyse and interpret data.

Topics include: IC engines; steam and gas power plants; refrigeration; jet propulsion; gas mixture; psychrometry and air-conditioning; introduction to heat transfer and combustion.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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MECH3406. Electrical and electronic engineering (6 credits)

This course aims to: (1) provide students with knowledge of solid-state electronic devices, linear circuits, digital circuits and techniques of analog / digital conversion; and (2) furnish students with knowledge of solid-state controllers for D.C. and A.C. motors.

Topics include: bipolar junction transistors; field-effect transistors; combinational logic circuits; sequential logic circuits; analog electronics; digital-to-analog and analog-to-digital converters; solid-state controller for D.C. motors; solid-state controller for A.C. motors.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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MECH3407. Advanced partial differential equation and complex variables (6 credits)

This course intends to convey mathematical techniques commonly used in disciplines relevant to mechanical engineering, e.g. heat conduction, vibration, probability, statistics, and numerical analysis. The course objectives are: (1) introduce the concepts and applications of complex variables; (2) illustrate the ideas of Fourier series and Fourier transforms; (3) obtain analytical solutions of the classical, second order partial differential equations by separation of variables, with applications of engineering interests, e.g. heat conduction and wave propagation; (4) present elementary theory of probability and statistics; and (5) discuss simple techniques in numerical analysis, e.g. solving nonlinear algebraic equations, numerical integration (quadrature), and initial value problems.

Topics include: complex variables; Fourier series and Fourier transforms; partial differential equations; introduction to probability and statistics; elementary numerical analysis.

Assessment: 20% continuous assessment, 80% examination

MECH3408. Mechanics of fluids (6 credits)

This course aims to: (1) provide students with an understanding of the fundamentals of the following areas of fluid mechanics: kinematics, Navier-Stokes equations, differential analysis of flows in channels and pipes, boundary layer flows, potential flows, dimensional analysis, and (2) equip students with capability of applying basic fluid mechanics principles in engineering designs.

Topics include: Navier-Stokes equations; pipe and channel viscous flows; lubrication; two-dimensional potential flows; boundary layer flows; dimensional analysis.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

MECH3409. Mechanics of solids (6 credits)

The aims of this course are: (1) to introduce the theory of elasticity for stress/strain analysis and high-light the limitations of the elementary strength of materials approach; and (2) to introduce alternate approaches for stress/strain analysis based on the numerical techniques.

Topics include: two-dimensional theory of elasticity; thermal stress and rotating disks; material failure and yielding; introduction to the finite element method; buckling; energy methods; bending of circular plate.

Assessment: 10% practical work, 15% continuous assessment, 75% examination

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MECH3416. Fundamentals of aeronautical engineering (6 credits)

Aviation is a rapidly expanding sector in developing economies like those in Asia. Aeronautical engineering is the foundation of aviation as a mode of transport. Together with space flight, aeronautics has been a driving force behind many of the modern technological development in the past century or so. This course aims to provide students with a solid foundation in the most important aspects of aircraft design and operation. The underlying science is common with many technological branches in general mechanical engineering, but it also has distinctive features that make aeronautics more challenging and interesting. For example, flow around aircraft is compressible with possible presence of shock waves while ordinary flows in engineering is low-speed and incompressible. The engine has similar thermodynamic cycles like that found in a gas turbine power plant but its main output is not derived from the turbine. Materials used in aircraft design must have the lowest possible weight for a given strength requirement. Specifically, the course will cover the following topics: aerodynamics and propulsion, materials and structures; safety and some aspects of operation and maintenance of aircrafts.

Topics include: history of aeronautical science; wing aerodynamics; propulsion; flight mechanics; systems and airframe structures; fatigue-crack growth; crack monitoring; damage tolerance; metallic materials; composites; fibre-reinforced laminates; high-temperature alloys for turbines; creep damage.

This course involves training in industry for a nominal period of at least six weeks during the summer vacation of the third year of study.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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MECH3417. Industrial training (Summer semester) (6 credits)

This course aims to provide students with on-the-job training in local or non-local companies so that they can: (1) integrate theory learning with practical applications; (2) understand real-life organizational structure and business operation; (3) learn how to build human relations with seniors and co-workers; and (4) enrich personal resume for becoming engineering professional.

This course involves training in industry for a nominal period of at least six weeks during the summer vacation of the third year of study.

Assessment: 100% practical work

MECH3418. Dynamics and control (6 credits)

This course aims to provide the students with a comprehensive knowledge in advanced areas of rigid-body dynamics, theory of vibration for different types of mechanical system, dynamic system analysis

techniques, basic closed-loop control system design techniques, with application to mechanical and other control systems.

Topics include: advanced rotational motion; balancing of rotating and reciprocating masses; damped/undamped vibration; forced vibration of single degree of freedom systems; modelling of physical systems; time response analysis of dynamical systems; feedback control systems; control system design and applications; stability; root locus method.

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

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MECH3420. Air pollution control (6 credits)

This course aims to: (1) provide students with a basic understanding of the principles and techniques related to the formation, dispersion and control of various air pollutants formed from anthropogenic pollution sources; and (2) enable students to assess common air pollution source emissions and suggest remedial solutions to polluting sources.

Topics include: micrometeorology; air dispersion; combustion fundamentals; pollutant formation mechanism and control technologies; abatement of volatile organic compounds using incineration techniques; particulate and aerosol abatement technology; particle technology, log-normal distribution; settling chamber; cyclone; electrostatic precipitator; bag filter.

Assessment: 20% continuous assessment, 80% examination

MECH3422. Building services engineering I (6 credits)

Building services engineering is very important to modern societies and urban cities. Building services systems are essential installations to provide the basic functionality for occupants. This course will develop students in the basic concepts and design principles of plumbing and drainage systems including practical considerations and code requirements. It will also introduce and explain the electrical services, lighting, lifts, escalators and security systems which are critical for making buildings comfortable, convenient and safe. This course aims to: (1) introduce the engineering concepts, design procedures, practical applications and related codes and regulations of the plumbing and drainage, electrical services, lighting, lifts, escalators and security systems, (2) develop a basic understanding of the objectives, methods and codes/standards for effective design, operation and management of these systems, and (3) enable students to design and analyse these systems for modern buildings complying with local statutory regulations and achieving effective and efficient design solutions.

Topics include: characteristics and design of plumbing and drainage systems including practical considerations and code requirements; planning and design of electrical services systems in buildings; basic concepts, design principles and energy management of lighting systems; design of lifts, escalators and security systems.

Assessment: 15% practical work, 20% continuous assessment, 65% examination

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MECH3423. Building services engineering II (6 credits)

Building services engineering is very important to modern societies and urban cities. This course will introduce and explain the heating, ventilating and air-conditioning (HVAC) systems which are the most important engineering systems in many types of buildings. It will also develop students in the basic concepts of fire safety, the legislative requirements and the design of most commonly installed fire service systems. This course aims to: (1) introduce the fundamental principles, engineering concepts, design

procedures, practical applications and related codes/standards of HVAC and fire services systems; (2) develop a basic understanding of the objectives, characteristics, methods for effective design, operation and management of these systems, and (3) enable students to design and analyse these systems for modern buildings complying with local statutory regulations and achieving effective and efficient design solutions.

Topics include: fundamentals of heating; ventilating and air-conditioning (HVAC) engineering including psychrometry; thermal comfort; load and energy calculations; design and analysis of HVAC systems and components; fire safety and protection concepts; fire extinguishing, detection and alarm systems; smoke management and control systems; code requirements and fire risk management; fire engineering approach.

Assessment: 15% practical work, 20% continuous assessment, 65% examination

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MECH3427. Design and manufacture (6 credits)

The main focus of this course is on design and manufacture of engineering components and sub-systems. This course aims to: (1) provide a background for students to understand the basic procedures for designing mechanical components and sub-systems; and (2) enable students to understand the principles for material selection and design for manufacturing and assembly.

Topics include: material selection; joining and fastening; jigs and fixtures design; power transmission system design; CNC machining; rapid prototyping.

Assessment: 100% continuous assessment

MECH3428. Research experience for undergraduates (6 credits)

This course involves undertaking a dissertation or report on a topic consisting of design, experimental or analytical investigation by individual students. The course objectives are to: (1) simulate a realistic working experience for students; (2) provide them an experience of applying engineering principles, engineering economics, business or management skills; and (3) train students to work independently to obtain an effective and acceptable solution to industry-related or research-type problems.

Assessment: 100% practical work

MECH4404. Automatic control (6 credits)

This course aims to provide the students with a comprehensive knowledge of continuous-time and discrete-time linear control systems, with particular reference to the modelling, analysis and design of mechanical and related control systems using both conventional and modern approaches.

Topics include: control of mechanical and electrical systems; frequency domain analysis; Nyquist stability criterion; linear control system design; computer control systems; state-space analysis of multivariable linear system; controllability and observability; stability analysis; state feedback.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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MECH4407. CAD/CAM (6 credits)

This course aims to: (1) provide students with a basic understanding of the working principles and applications of computer-aided design and manufacture (CAD/CAM) technologies; and (2) enable students practice CAD/CAM tools and techniques.

Topics include: basic data structuring techniques; transformation techniques; mathematical bases for surface modeling; principles of solid modeling and applications; numerical control; computer-aided production technologies; computer-integrated manufacturing.

Assessment: 30% continuous assessment, 70% examination

MECH4409. Energy conversion systems (6 credits)

This course aims to: (1) provide students with basic knowledge on energetics and development of conventional and non-conventional energy sources; and (2) develop in-depth understanding of the operation of modern power plants and an overview of energy conversion technologies.

Topics include: energy calculations; solar thermal power plant; energy storage solar photovoltaic systems; wind energy systems; nuclear energy and power plants; nuclear waste management; urban waste.

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

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MECH4410. Engineering & technology management (6 credits)

The objectives of this course are to: (1) master the fundamental concepts of engineering management necessary to bridge the gap between management and technology; (2) provide students with an opportunity to enhance their understanding with hands-on-skill to problem solving for decision making in different technical operations; and (3) introduce managerial models that implement qualitative as well as quantitative analyses to assist students to improve their ability and skills to analyze decision making problems.

Topics include: introduction to engineering management; functions of technology management including planning and forecasting, decision making and analysis, organizing, leading and motivation, and controlling; managing technology including research and development, engineering design, production activity and operations, marketing and service activities; project management; engineering economics including present worth analysis; annual equivalent worth analysis; rate of return analysis; project cash flow analysis; quantitative analysis for management including inventory control, linear programming; queuing theory.

Assessment: 20% continuous assessment, 80% examination

MECH4411. Heat transfer (6 credits)

This course is on the fundamental principles of heat transfer, covering heat conduction, heat convection and heat exchangers. The course objectives are: (1) to provide an understanding of fundamental principles of heat transfer; and (2) to enable students to use the fundamental principles for conducting thermal analysis and design of engineering problems. At the end of this course, students who fulfill the requirements of this course will be able to: (1) demonstrate an understanding of the principles that govern heat transfer processes; (2) analyze heat-transfer problems quantitatively; and (3) identify relevant engineering solutions in thermal systems.

Topics include: Fourier’s law; heat-conduction equation; thermal conductivity; conduction; fins; basic convection principles; laminar and turbulent heat transfer in tubes and over plates; Reynolds analogy; types of heat exchangers; overall heat-transfer coefficient; log mean temperature difference; effectiveness-NTU method; heat exchanger design.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

MECH4412. Product design and development (6 credits)

This course aims to: (1) provide the general principles and techniques related to electromechanical product design and development; and (2) enable students to practice both conventional and computer-aided product design and development methods.

Topics include: product design and manufacturing process; methods and tools used for designing and developing electromechanical products; tooling design; design for manufacture and assembly; product costing; value engineering.

Assessment: 40% continuous assessment, 60% examination

MECH4414. Materials for engineering applications (6 credits)

Challenging engineering environments demand special material properties if design requirements are to be met. This course is to introduce the very wide range of engineering materials which have been tailored to meet some of these requirements. Examples range from high temperature materials, materials for high specific strengths, resistance to static and dynamic loadings, plus some materials selection criteria.

Topics include: materials for high strength/weight ratio; high temperature service; resistance to corrosion resistance and protection; advanced alloys; composite and ceramic materials; problem-based learning module.

Assessment: 15% continuous assessment, 85% examination

MECH4415. Applied stress and strength analysis (6 credits)

The aims of this course are to: (1) formulate three-dimensional theory of elasticity and introduce the theory of plasticity; (2) introduce analytical and numerical methods for solving practical engineering problems; and (3) introduce theories of fracture and fatigue and their applications to practical engineering problems.

Topics include: theory of elasticity; plastic analysis; finite element methods for two- and three-dimensional continua; rectangular plate bending; fracture mechanics.

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

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MECH4421. Viscous flow (6 credits)

This course aims to: (1) elucidate the advanced dynamics of liquids and gases, including steady and unsteady solutions of the Navier-Stokes equations, (2) perform a study on the properties, mass flux and momentum flux of a boundary layer, (3) explain the basic mechanics of a compressible fluid flow and applications to aerodynamics, (4) discuss the ideas of surface tension and stability in simple multiphase flows; To derive the Plateau-Rayleigh instability as the basic governing model for the linear stability of droplet formation, and (5) understand the complex flow patterns behind bluff bodies, mechanisms associated with vortex shedding and drag force; To characterize the low Reynolds number flow around a sphere and to measure viscosity using the Stokes' drag formula, and (6) introduce elementary concepts of turbulence.

Topics include: continuity and Navier-Stokes equations; Laminar boundary layers; Surface tension; Elementary concepts of compressible flows and shock waves; stability theory; flow behind bluff bodies; low Reynolds number flows and turbulent flows.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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MECH4423. Building energy management and control systems (6 credits)

The objectives of this course are to: (1) introduce students to the basic concepts of computer-based integrated monitoring, control and energy management for building services installations; (2) enable students to understand the principles of design and operation of building energy management and control systems (EMCS) and their applications to modern buildings; and (3) enable students to understand modern methods of performance analysis of building services systems using building EMCS.

Topics include: concepts of distributed computer-based monitoring and control; hardware and software development; communication protocols; application to maintenance, energy management and control; system design and performance evaluation; computer simulation and emulation techniques; analysis of dynamic building services systems.

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

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MECH4428. Sound and vibration (6 credits)

This course aims to achieve two purposes. In the first, it is a further study of basic physical science of waves, fluid and structural dynamics. The second aim is the application of the knowledge to solving practical problems of vibration analysis and noise control; noise pollution being one of the four major environmental pollutions, namely water, air, noise and solid waste. Specifically, the following three aspects are covered in the course: (i) fundamentals of vibration and its analysis, (ii) hearing mechanisms, environmental noise sources and their mitigation, (iii) mechanisms of sound generation, propagation and control.

Topics include: fundamentals of single- and multiple degree of freedom systems; vibration modes and finite element analyses; sound radiation by vibration and flow; human hearing; sound and vibration measurements; wave propagation and duct acoustics; sound absorption and reflection; vibration isolation and noise abatement methods.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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MECH4429. Integrated capstone experience (12 credits)

This is a compulsory, capstone experience course in the final year of the BEng in Mechanical Engineering degree programme. Students are required to undertake a group design project that runs from September to April of the following year. The project topics are stipulated either by teachers or by industrial sponsors. Each project group has two teachers acting as supervisors and an additional teacher serving as moderator. During the course of the project, supervisors communicate with the students and the concerned project sponsor to monitor the project progress. At the completion of the project, each project student presents his/her achievements to the supervisors, moderator and sponsor via a written report and an oral presentation. This course aims to: (1) provide a problem-based learning experience for students to learn how to apply scientific knowledge and team-work approach to tackle design/engineering problems systematically, and (2) strengthen students' inter-personal and communication skills through interaction with teammates, supervisors and sponsors.

Typical project activities include: problem identification & definition; research into information pertaining to the problem, design & analysis; materials sourcing; communication; conducting experiments/making prototypes for verification and demonstration of results; writing reports and giving oral presentations.

Assessment: 100% practical work

MEDE4602. Molecular and cellular biomechanics
MEDE4603. Transport phenomena in biological systems
MEDE4604. Cell and tissue engineering
MEDE4605. Biomaterials design and applications

For course descriptions, please refer to the syllabus of the Medical Engineering programme.

CIME2101. Water and air quality: concepts and measurement
CIVL3111. Municipal and industrial waste treatment
CIVL3115. Solid and hazardous waste management
CIVL3122. Wind engineering

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

MEDICAL ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2016-17 and thereafter under the four-year curriculum.

Definition and Terminology

Each course offered by the Medical Engineering Programme (the Programme) 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 Programme for the fulfillment of the curriculum requirements of the degree of BEng (Medical Engineering) that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

General Engineering Courses
Students are required to successfully complete at least 36 credits of General Engineering Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses (90 credits), comprising 36 credits of introductory core courses and 54 credits of advanced core courses.

Discipline Elective Courses
Students are required to complete at least 30 credits of discipline elective courses in either Track I "Biomechanics, biomaterials and tissue engineering" or Track II "Biomedical signals, systems and imaging", or a combination of both tracks.

Elective Courses
Students are required to complete 12 credits of elective courses offered by other departments within or outside the Faculty of Engineering.

University Requirements
Students are required to complete:

a) Two English language courses, including the "CAES1000 Core University English" and the "CAES9531 Technical English for Medical Engineering", for a total of 12 credits;
b) One Chinese language enhancement course "CENG9001 Practical Chinese for engineering students", for a total of 6 credits; 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.

Capstone Experience
Students are required to complete the 12-credit "MEDE4010 Final year project" to fulfill the capstone experience requirement for the degree of BEng in Medical Engineering.

Internship
Students are required to complete a 6-credit internship "MEDE3020 Professional training (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 EN16 of Regulations for the Degree of Bachelor of Engineering and UG9 of the regulations for the First Degree Curricula.

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

The curriculum of BEng (Medical 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
CAES9531	Technical English for Medical 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1111/ ENGG1112	Computer programming and applications/ Computer programming and applications I	6
PHYS1050	Physics for engineering students	6
ENGG1206	Introduction to biomedical engineering	6
ENGG1207	Foundations of biochemistry for medical engineering	6
Total for General Engineering Courses		36

Discipline Core Courses (90 credits)

Introductory Courses (36 credits)

Course Code	Course	No. of credits
MECH2407	Multivariable calculus and partial differential equations	6
MEDE2020	Engineering training	6
MEDE2301	Life sciences I (Biochemistry)	6
MEDE2302	Life sciences II (Cell Biology & Physiology)	6
MEDE2500	Biomedical signals and linear systems	6
MEDE2810	Engineering management and society	6
Total for Introductory Discipline Core Courses		36

Advanced Courses (54 credits)

Course Code	Course	No. of credits
MEDE2600	Biomechanics for medical engineering	6
MEDE3010	Integrated project	6
MEDE3301	Life sciences III (Physiology)	6
MEDE3500	Electromagnetics in biomedicine	6
MEDE3501	Medical imaging	6
MEDE3504	Medical engineering laboratory	6
MEDE3600	Biomaterials science and engineering	6
MEDE3602	Thermofluids for medical engineering	6
MEDE3603	Statistics and mathematical analysis for medical engineering	6
Total for Advanced Discipline Core Courses		54

Capstone Experience and Internship (18 credits)

Course Code	Course	No. of credits
MEDE4010	Final year project[+]	12
MEDE3020	Professional training (Internship)*	6
Total for Capstone Experience and Internship Courses		18

+Capstone Experience
*Internship

Discipline Elective Courses (30 credits)

30 credits of courses taken from either Track I or Track II, or a combination of both tracks below:

Track I: Biomechanics, biomaterials and tissue engineering

Course Code	Course	No. of credits
ELEC3845	Economics, finance and marketing for engineers	6
MEDE4500	Biomedical instrumentation and systems	6
MEDE4602	Molecular and cellular biomechanics	6
MEDE4603	Transport phenomena in biological systems	6
MEDE4604	Cell and tissue engineering	6
MEDE4605	Biomaterials design and applications	6

Track II: Biomedical signals, systems and imaging

Course Code	Course	No. of credits
ELEC3245	Control and instrumentation	6
ELEC3845	Economics, finance and marketing for engineers	6
MEDE4500	Biomedical instrumentation and systems	6
MEDE4501	Biophotonics	6
MEDE4502	Magnetic resonance imaging: principles, technology and applications	6
MEDE4503	Biomedical ultrasonics: principles and applications	6
MEDE4504	Biomedical signals processing and modeling in medical applications	6

Elective Courses (12 credits)

At least 12 credits of elective courses offered by other departments within or outside the Faculty of Engineering

Summary of curriculum structure of BEng (Medical Engineering)

Course Categories	No. of credits
UG5 Requirements	54
General Engineering Courses	36
Discipline Core Courses (Introductory)	36
Discipline Core Courses (Advanced)	54
Capstone Experience and Internship Courses	18
Discipline Elective Courses	30
Elective Courses	12
Total	**240**

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and ordinary differential equations
MATH1853	Linear algebra, probability and statistics
ENGG1111/	Computer programming and applications
ENGG1112	Computer programming and applications I
PHYS1050	Physics for engineering students
ENGG1206	Introduction to biomedical engineering
ENGG1207	Foundations of biochemistry for medical engineering

UG5 Requirements (24 credits)

CAES1000	Core University English
CC##XXXX	Three Common Core Courses

SECOND YEAR

Introductory Core Courses (42 credits)

MECH2407	Multivariable calculus and partial differential equations
MEDE2020	Engineering training
MEDE2301	Life sciences I (Biochemistry)
MEDE2302	Life sciences II (Cell Biology & Physiology)
MEDE2500	Biomedical signals and linear systems
MEDE2600	Biomechanics for medical engineering
MEDE2810	Engineering management and society

UG5 Requirements (18 credits)

CC##XXXX	Three Common Core Courses

THIRD YEAR

Advanced Core Courses (48 credits)

MEDE3010	Integrated project
MEDE3301	Life sciences III (Physiology)
MEDE3500	Electromagnetics in biomedicine
MEDE3501	Medical imaging
MEDE3504	Medical engineering laboratory
MEDE3600	Biomaterials science and engineering
MEDE3602	Thermofluids for medical engineering
MEDE3603	Statistics and mathematical analysis for medical engineering

Training (6 credits)

MEDE3020 Professional training (Internship)

UG5 Requirements (12 credits)

CAES9531 Technical English for Medical Engineering
CENG9001 Practical Chinese for engineering students

FOURTH YEAR

Advanced Core Course (12 credits)

MEDE4010 Final year project

Discipline Elective Courses (30 credits)

At least 30 credits must be selected from either Track I or Track II, or a combination of both tracks:

Track I: Biomechanics, biomaterials and tissue engineering

ELEC3845 Economics, finance and marketing for engineers
MEDE4500 Biomedical instrumentation and systems
MEDE4602 Molecular and cellular biomechanics
MEDE4603 Transport phenomena in biological systems
MEDE4604 Cell and tissue engineering
MEDE4605 Biomaterials design and applications

Track II: Biomedical signals, systems and imaging

ELEC3245 Control and instrumentation
ELEC3845 Economics, finance and marketing for engineers
MEDE4500 Biomedical instrumentation and systems
MEDE4501 Biophotonics
MEDE4502 Magnetic resonance imaging: principles, technology and applications
MEDE4503 Biomedical ultrasonic: principles and applications
MEDE4504 Biomedical signals processing and modeling in medical applications

Elective Courses (12 credits)

COURSE DESCRIPTIONS

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

General Engineering Courses

ENGG1111 Computer programming and applications (6 credits)
ENGG1112 Computer programming and applications I (6 credits)
ENGG1206 Introduction to biomedical engineering (6 credits)
ENGG1207 Foundations of biochemistry for medical engineering (6 credits)
MATH1851 Calculus and ordinary differential equations (6 credits)
MATH1853 Linear algebra, probability and statistics (6 credits)
MECH2407 Multivariable calculus and partial differential equations (6 credits)
PHYS1050 Physics for engineering students (6 credits)

Please refer to the General Engineering 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 degree of BEng for details.

CAES9531 Technical English for Medical Engineering (6 credits)

The course aims to develop medical engineering students' ability to write and speak in their discipline. The course will focus on developing students' ability to write a technical report and give a technical presentation on a medical device they have developed. The English course will run alongside the MEDE3010 Integrated project course. This course requires students to develop a portable medical device, such as electrocardiogram (ECG) recording device or pulse oximeters, from scratch, use the device to gain data, and use the obtained data to gain insights into human physiology. The students then need to write a report and give a presentation which explains a mixture of medical and engineering information. This English course will focus on the English language skills needed to complete these assignments. Students will be assessed using the report and the presentation they produce for the Medical Engineering course as well as a final written test and an out of class learning component.

Co-requisite: MEDE3010
Assessment: 100% continuous assessment

MEDE2020 Engineering training (6 credits)

Knowledge and practical use of hardware and software tools for soldering, wire-wrapping, PCB design and production, virtual instrumentation hard design and production, software programming of LabView, mechanical component design and modeling, CAD/CAM, metrology, computational fluid dynamics.

Assessment: 100% practical work

MEDE2301 Life sciences I (Biochemistry) (6 credits)

This course presents an overview and an understanding of the basic mechanisms underlying life processes. Topics include chemistry of life – pH, water, etc; fundamental bioenergetics; biomolecules and their functions; intermediary metabolism; enzymes and coenzymes; nucleic acids and genetic information.

Assessment: 40% continuous assessment, 60% examination

MEDE2302 Life sciences II (Cell Biology & Physiology) (6 credits)

This course aims to provide a basic understand of the structure and function of cells and tissues within our body, including the structures and functions of the cell; the general organisation of epithelium and glands; the different types and functions of the connective tissues; the general organisation of the nervous tissues, muscle and skin tissues, bone marrow and lymphatic tissues. The second part of the course will provide the students with integrated knowledge of human physiology and pathophysiology that is relevant to medical engineering in such areas as organization of the body, homeostasis and excitable tissues; the cardiovascular system; the renal system, and some common disorders of the cardiovascular and renal systems.

Assessment: 30% continuous assessment, 70% examination

MEDE2500 Biomedical signals and linear systems (6 credits)

Signals and linear system theory is fundamental to all engineering discipline, especially in the field of electrical, computer and medical engineering. This is a first course in signals and linear systems for engineering students without any pre-requisite knowledge in signal theory or signal processing other than some knowledge in fundamental calculus and use of complex numbers. The course uses simple real life examples of signals and systems to illustrate how signal theory can be used in practical application, and will including an introduction to MATLAB as a tool for signal analysis and system modelling.

This course aims to help students gain a firm understanding of the fundamentals of signal and linear systems concepts and theory using adequate mathematical and computing techniques to tackle simple signal processing problems. It serves as a pre-requisite course for many other courses including Digital Signal Processing, Control and Instrumentation, Communication Systems, and Digital Image Processing.

Specifically, the course covers the following topics: time-domain signal representation, periodic and aperiodic signals; spectral representation of signals, Fourier series and Fourier transform; system responses and linear system modelling; sampling, aliasing and analog-to-digital conversion; z-transform and concepts of poles and zeros; convolution; FIR filters and digital filtering; IIR filters and frequency response of digital filters; continuous-time systems and Fourier transform properties; application examples of signal analysis and processing.

At the end of the course, students should have a clear understanding of the fundamentals of signals and system theory to enable them to perform simple signal analysis and processing using both analytical method as well as using computing tools, link the mathematical representation of signals to some very simple real life signals and vice versa, and appreciate the applications of linear systems theory in solving some simple real life problems. In addition, students should be aware of the complexity of real life problems and the need to continue investigation in practice after graduation.

Assessment: 30% continuous assessment, 70% examination

MEDE2810 Engineering management and society (6 credits)

The aims are to develop basic understanding of organization and management skills, professional ethics and legal foundation for the engineering discipline. Topics on engineering organization, project management and managerial skills, decision making processes, contingency and crisis management, leadership, corporate culture and philanthropy will be discussed. In order to provide a clear and right insight for engineering students to interact and contribute to the society, topics related to professional conduct, social responsibility, sustainability and safety issues, technology and environment, professional ethics are included. For the legal foundation, topics such as contract, intellectual property, tort, professional negligence and related law issues are discussed.

Mutually exclusive with ELEC3844 & MEDE2814
Assessment: 30% continuous assessment, 70% examination

MEDE2600 Biomechanics for medical engineering (6 credits)

Stress and strain; bending and deflection of beams; structural failure and viscoelasticity; Kinematics of particles, momentum and energy principles; free vibration and kinematics of mechanisms; human gait and motion; bone fracture & fixation.

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

MEDE3010 Integrated project (6 credits)

This project is broadly centered around the topic of biomedical circuits. Its overall aim is to provide biomedical engineering students with a hands-on opportunity to develop a practical and functional biomedical device, such as an electrocardiogram (ECG) system or pulse oximeter based on simple electronic circuits from scratch and thereby learn more about the technical details of such devices. Upon completing this course, the student should be able to explain to others the practical importance and technical details of electronic circuits used for physiological measurements; (e.g. bio-potentials or blood oxygenation) to develop a standalone medical device package using basic electronic parts such as op-amp chips, resistors, and capacitors. Understand how proper design of circuits can play an important role in assisting medical diagnoses accordingly.

Assessment: 100% practical work

MEDE3301 Life sciences III (Physiology) (6 credits)

To provide the students with integrated knowledge of human physiology and pathophysiology that is relevant to medical engineering in such areas as (1) blood, blood clotting and immune response, (2) breathing and gas transport, (3) generation and transmission of nerve impulses, muscle contraction, bone, (4) the brain and its functions, autonomic system and reflexes, and (5) some disorders of the above.

Assessment: 30% continuous assessment, 70% examination

MEDE3500 Electromagnetics in biomedicine (6 credits)

The aim of this course is provide students with knowledge of electromagnetics and its applications in biomedicine. Fundamental physics and mathematics in electricity and magnetism are discussed. Vector analysis is included. Topics on electricity include electric field, Gauss's law, divergence theorem, electric potential, capacitor, dielectrics, Poisson's and Laplace's equations, and work and electrostatic energy. Topics on magnetism include magnetic field, Ampere's circuital law, Stokes theorem, magnetic flux, magnetic materials, and Faraday's law. Finally, Maxwell equations and particle accelerators for biomedical treatment are explained. Applications of electromagnetics in biomedicine are emphasized and integrated throughout the course.

Assessment: 10% practical work, 15% continuous assessment, 75% examination

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MEDE3501 Medical imaging (6 credits)

Medical imaging is an indispensible technology in modern healthcare and biomedical research. It provides in vivo anatomical, physiological and functional information of the human body in normal, developing and pathological states. The rapid development in this field not only leads to better disease diagnosis and more accurate treatment efficacy assessment, but also paves the way for better understanding of living biological systems.

This course will focus mainly on the principles of conventional (X-ray and Ultrasound) and modern (Computerized Tomography – CT; Magnetic Resonance Imaging – MRI; Nuclear Imaging and Optical Imaging) imaging techniques applied to biological systems and in medical diagnoses and the interpretations of these images.

At the end of the course, students should gain a clear understanding in the physics, working principles and mathematics involved in the various imaging modalities covered. They should also be able to appreciate the interdisciplinary nature of the subject and learn the latest development or advancement in the field of medical imaging.

Pre-requisites: MEDE2500 or MEDE2201 or MEDE2203 or ELEC3241
Assessment: 20% practical work, 10% continuous assessment, 70% examination

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MEDE3504 Medical engineering laboratory (6 credits)

This course aims to provide the opportunity for students to have hands-on experience and develop fundamental experimental skills required in biomedical engineering. The course emphasizes biomedical engineering principles and experimental designs applied in human physiology, from cellular to tissue and organ levels. The course is comprised of four major lab modules: electrophysiology, characterization of cells and tissues, micromechanics of small objects, and biomedical imaging systems. State-of-the-art biomedical designs in these four areas will also be addressed.

Assessment: 80% practical work, 20% continuous assessment

MEDE3600 Biomaterials science and engineering (6 credits)
(renamed from Biomaterials I from 2015-16)

Bonds and crystal structure; defects in crystalline solids; diffusion; solidification; phase diagram; strength of materials; plastic deformation; recrystallization; grain growth; fracture of materials; fatigue life and fatigue crack growth; creep; corrosion; structure and properties of polymers; analytical and testing techniques; definitions in biomaterials science and engineering; history of biomaterials; structure and properties of biological materials; materials in biomedical applications.

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

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MEDE3602 Thermofluids for medical engineering (6 credits)

Concepts and definitions in engineering thermodynamics; thermodynamic properties; first law of thermodynamics; basic concepts in fluid mechanics for medical engineering; dimensional analysis and similarity; introduction to mass transport; introduction to diffusion.

Assessment: 10% practical work, 10% continuous assessment, 80% examination

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MEDE3603 Statistics and mathematical analysis for medical engineering (6 credits)

The ability to understand the fundamentals of biostatistics and to employ appropriate and quantitative statistical methods to analyze data generated from biomedical studies of different designs is a necessary requirement for biomedical engineering students. This is particularly important in their senior years when they are conducting their final year projects with first hand data to analyze. This course introduces the principles, concepts and methodologies of statistical planning and analysis for biomedical studies. Firstly, basic principles including probability, sampling distributions, hypothesis testing, statistical errors and power will be briefly reviewed using examples extracted from biomedical studies. Secondly, commonly used statistical tests, both parametric and non-parametric, including those for comparison studies such as the analysis of variance (ANOVA) and association studies such as regression and correlation, will be introduced. Thirdly, practical data management and statistical analyses for biomedical data will be conducted through learning the statistical software SPSS. Finally, some special

topics useful for biomedical studies such as sample size planning, power analysis, sensitivity and specificity of diagnostic and screening tests, will be covered. Mathematical description and computational modeling of physiological systems has been a vastly growing field. The second part of the course thus introduces quantitative, engineering approaches to human physiology. Three major physiologic systems of the human body (nervous, circulatory, and skeletal) will be studied to exemplify the quantitative nature of human physiology. Well-established mathematical models, including the Hodgkin Huxley model, the cable equation, pressure-volume relationship, and the Hill model, will be elucidated. We will familiarize the students with the MATLAB programming tool to set up and solve governing (linear system and differential) equations and to analyze the output in response to input variables. At the end of the course, the students should have fundamental knowledge and natural mathematical/computational capability to investigate biomedical engineering problems beyond the physiologic systems studied in this course.

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

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MEDE3020 Professional Training (6 credits)

This course aims to provide our students with on-the-job training in local or non-local companies or organizations so that they can integrate theory learning with practical applications; understand real-life organizational structure and business operation; learn how to build human relations with seniors and co-workers; and enrich personal resume for becoming engineering professional.

Assessment: 100% continuous assessment

MEDE4010 Final year project (12 credits)

This course is a core course for all final year medical engineering students. It requires students to apply the knowledge they acquired throughout their academic studies to solving real-life medical engineering problems. Students are provided with an opportunity to pursue their own research interest under the supervision of teachers from both Engineering & Medicine. At the end of the course, students are required to present a dissertation or report on a topic consisting of design, experimental or analytical investigations. They will develop the ability to formulate and solve problems in medical engineering.

Assessment: 100% continuous assessment

MEDE4500 Biomedical instrumentation and systems (6 credits)

This course introduces the essential principles of biomedical instrumentation and systems used for both diagnostic and therapeutic purposes from the level of human body, organs, cells, down to the molecular level. Their applications encompass a wide range of areas, ranging from healthcare, clinical applications to basic life science research. Examples include ECG, EEG; blood pressure sensors; DNA microarray; flow cytometry, cardiac pacemakers, defibrillators and laser surgery.

Assessment: 20% practical work, 40% continuous assessment, 40% examination

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MEDE4501 Biophotonics (6 credits)

This is an introductory course in biophotonics covering: (1) The essential concepts of (i) basic ray optics, (ii) wave optics, e.g. interference and diffraction, and (iii) photon optics, e.g. laser principles. (2) Interaction of light with biological cells/tissues and its significances and implications in optical bioimaging and other optical diagnostic and therapeutic applications. (3) State-of-the-art biophotonic instrumentations and technologies: optical bioimaging and microscopy (optical coherence tomography

(OCT), fluorescence microscopy, multiphoton and other nonlinear optical microscopy), lab-on-chip biosenors, laser therapy, optical-fiber-based micro-endoscopy.

Assessment: 30% practical work, 30% continuous assessment, 40% examination

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MEDE4502 Magnetic resonance imaging: principles, technology and applications (6 credits)

Magnetic Resonance Imaging (MRI); Nuclear Magnetic Resonance (NMR); MRI instrumentation; Pulse sequence; Signal processing and image reconstruction in MRI; Advanced MRI techniques; MRI applications.

Mutually exclusive with ELEC6067
Pre-requisite: MEDE3501
Assessment: 25% continuous assessment, 75% examination

MEDE4503 Biomedical ultrasonics: principles and applications (6 credits)

Ultrasound biophysics, scanning modes, data acquisition schemes, transducer basics; applications of ultrasound including imaging, flow analysis, microscopy, therapy.

Mutually exclusive with ELEC6079
Assessment: 30% practical work, 30% continuous assessment, 40% examination

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MEDE4504 Biomedical signals processing and modeling in medical applications (6 credits)

Fundamentals of biomedical signals (physiological origins, characteristics, and acquisition); modelling and analyses of biomedical signals (linear and nonlinear modelling, digital filtering, spectral analysis, time-frequency analysis, multi-variate biomedical signal processing, etc); pattern classification and diagnostic decision; practical and clinical applications of biomedical signals; project development.

Mutually exclusive with ELEC6081
Pre-requisite: MEDE2500
Assessment: 25% practical work, 15% continuous assessment, 60% examination

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MEDE4602 Molecular and cellular biomechanics (6 credits)

The focus of this course is on the physics of molecular biology and the mechanics of the cell. Topics include: (1) Biopolymer (actin filaments, microtubules, DNA etc.) conformations and dynamics (random walk model of polymers, worm-like chain model, persistence length, entropic driven elasticity); (2) Basic statistical mechanics and thermodynamics of solutions (entropy of mixing, Osmotic pressure); (3) Mechanics of the cell (membrane elasticity, cell shape, cell adhesion); and (4) Introduction to intermolecular interactions (electrostatic force, van der Waals force).

Assessment: 40% continuous assessment, 60% examination

MEDE4603 Transport phenomena in biological systems (6 credits)

Basic equations of fluid mechanics; fluid flow in the circulation and tissues; transport in porous media; mass transport in biological systems; kinetics; heat conduction; heat convection; heat exchangers.

Pre-requisite: MEDE2005 or MEDE3602
Assessment: 40% continuous assessment, 60% examination

MEDE4604 Cell and tissue engineering (6 credits)

This course firstly introduces the nature on cell and tissue organization, tissue dynamic processes including development, homeostatis and wound healing. Second, it reviews in detail the basic components of engineered tissues including cells, scaffolds and signals. For cells, important cellular-fate processes such as attachment, migration, proliferation, differentiation and apoptosis, and the cell culture technology will be reviewed before focusing on stem cells and their relevance in tissue engineering. For scaffolds, the analogous role of scaffolds and extracellular matrix of native tissues will be compared and the technological advancement in scaffold design and fabrication will be highlighted. On signals, different types of cell-regulating signals including soluble biofactors, insoluble matrix factors and cell-cell interactions and biophysical signals such as topological and mechanical signals will be introduced before an integrative summary on the application of these signals in designing stem cell niche can be made. Apart from employing these signals extrinsically, direct genetic manipulation of cells can also achieve the purpose of modifying cellular functions. The basic understanding and technological achievement of gene transfer and delivery and its applications in tissue engineering will be covered.

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

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MEDE4605 Biomaterials design and applications (6 credits)
(course code and title revised from MEDE4601 Biomaterials II from 2015-16)

Processing, structures and properties of biomaterials; tissue response to implants; biomaterial degradation; *in vitro* and *in vivo* assessment of biomaterials; implant failure; hard tissue repair; soft tissue repair; blood interfacing implants; drug delivery, nanotechnology in medicine; tissue engineering; prosthetic medical device classification; prosthetic medical device evaluation; prosthetic medical device regulation; medical device standards; ethical issues.

Pre-requisite: MEDE3600
Assessment: 30% continuous assessment, 70% examination

ELEC3245 Control and instrumentation (6 credits)
ELEC3845 Economics, finance and marketing for engineers (6 credits)

Please refer to the syllabus of the Computer Engineering/Electrical Engineering/Electronic Engineering programme for course description.