

# **REGULATIONS FOR THE DEGREE OF BACHELOR OF ENGINEERING (BEng)**

*These regulations apply to students admitted to the BEng curriculum in the academic year 2010-11 and thereafter.*

*(See also General Regulations and Regulations for First Degree Curricula)*

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## **EN 1 Admission to the Degree**

To be eligible for admission to the degree of BEng, a candidate shall

- (a) comply with the General Regulations;
  - (b) comply with the Regulations for First Degree Curricula;
  - (c) satisfy all the requirements of the curriculum in accordance with these regulations and the syllabuses.
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## **EN 2 Period of Study**

The curriculum for the BEng degree shall normally require six semesters of full-time study, extending over not fewer than three 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 five academic years.

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## **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;
  - (b) take not fewer than 180 credits of courses, in the manner specified in these regulations and syllabuses; candidates are also required to pass all core courses as specified in the syllabuses and satisfactorily complete prerequisite courses in order to enrol in a succeeding course;
  - (c) satisfy all the requirements prescribed for the minor programme option, if he/she pursues the minor programme; and
  - (d) satisfy all the requirements prescribed for the double-degree curriculum option, if he/she pursues the double-degree curriculum.
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**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 216 credits. Students making up for failed credits can be permitted by the Faculty to take up to 360 credits.

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**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.

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## **EN 7 Assessment and Grades**

Candidates shall be assessed for each of the courses which they have registered for, 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(a) of the Regulations for the First Degree Curricula.

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

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

- i) 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
  - ii) re-submitting failed coursework, without having to repeat the same course of instruction; or
  - iii) repeating the failed course by undergoing instruction and satisfying the assessments; or
  - iv) for elective courses, taking another course in lieu and satisfying the assessment requirements.
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**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.

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**EN 11** Unless otherwise permitted by the Board of the Faculty, a candidate will be recommended for discontinuation 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;
  - (b) he/she fails to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters; or
  - (c) he/she has exceeded the maximum period of registration specified in EN2.
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## **EN 12 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.

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### **EN 13     Advanced Standing**

Advanced standing may be granted to candidates in recognition of studies completed successfully in an approved institution of higher education elsewhere 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 two years of study at this University shall be required before the candidate is considered for the award of the degree; and
- (b) a minimum of 120 credits shall be accumulated through study in 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.

Advanced credits granted shall not be included in the calculation of the GPA but will be recorded on the transcript of the candidate..

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### **EN 14     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 180 credits, comprising
    - i) introductory courses;
    - ii) advanced courses;
    - iii) project courses;
    - iv) training courses;
    - v) internship courses;
    - vi) Chinese and English language enhancement courses;
    - vii) Common Core courses;
    - viii) all required courses as prescribed in respective curriculum; and
    - ix) Faculty elective courses.
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**EN 15**     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  
Pass

A pass list of successful candidates shall be posted on Faculty notice boards.

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**EN 16**     The classification of honours shall be determined by the Board of the Faculty at its full discretion by taking into consideration the overall performance of candidates, or specifications in the syllabuses of respective programmes, and other relevant factors as appropriate.

## **SYLLABUSES FOR THE DEGREE OF BACHELOR OF ENGINEERING**

General Engineering courses (applicable to candidates admitted in the academic year 2010-2011 and thereafter)

General Engineering courses include

ENGG1002	Computer programming and applications (6 credits)
ENGG1003	Mathematics I (6 credits)
ENGG1004	Mathematics IA (3 credits)
ENGG1005	Mathematics IB (3 credits)
ENGG1006	Engineering for sustainable development (6 credits)
ENGG1007	Foundations of computer science (6 credits)
ENGG1009	Industrial management and logistics (6 credits)
ENGG1010	Foundations of engineering mechanics (6 credits)
ENGG1011	Introduction to biomedical engineering (6 credits)
ENGG1015	Introduction to electrical and electronic engineering (6 credits)
ENGG1016	Computer programming and applications I (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:

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### **ENGG1002 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

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### **ENGG1003 Mathematics I (6 credits)**

Linear algebra, advanced calculus, vector analysis, ordinary differential equations, Laplace transforms.

Prerequisite : HKALE Pure Mathematics

Assessment: 10% continuous assessment, 90% examination

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### **ENGG1004 Mathematics IA (3 credits)**

Linear algebra, advanced calculus, ordinary differential equations.

Assessment: 10% continuous assessment, 90% examination

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### **ENGG1005 Mathematics IB (3 credits)**

Vector spaces, vector analysis, Laplace transforms.

Assessment: 10% continuous assessment, 90% examination

**ENGG1006    Engineering for sustainable development (6 credits)**

Natural and human-made environment; urban resource consumption and environmental pollution; past and present civil engineering wonders; modern engineering systems; role of civil engineers in a changing world; sustainable cities and the future.

Assessment: 50% continuous assessment, 50% examination

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**ENGG1007    Foundations of computer science (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.

Assessment: 50% continuous assessment, 50% examination.

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**ENGG1009    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

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**ENGG1010    Foundations of engineering mechanics (6 credits)**

Force systems and equilibrium; first and second moments of mass and area; introduction to stress and strain; torsion of circular shafts; introduction to mechanisms and kinematics; rigid body dynamics; hydrostatics; fluid in motion.

Assessment: 10% continuous assessment, 90% examination

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**ENGG1011    Introduction to biomedical engineering (6 credits)**

This course is an overview of the essential areas in biomedical engineering including technologies and application in life sciences and medicine. The course is broadly divided into 4 areas: biomechanics and biomaterial; cell and tissue engineering; biomedical instrumentations and sensors; 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: 20% practical work, 40% continuous assessment, 40% examination

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**ENGG1015    Introduction to electrical and electronic engineering (6 credits)**

[for students admitted in 2010-11 and thereafter]

*This course provides an overview of the general 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. Finally, the socio-economical impact of electrical and electronic technologies will be introduced.*

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

## **ENGG1016 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.

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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 the following two language enhancement courses in their first year of study:

**CAES1515 Professional and technical oral communication for engineers**

**CENG1001 Practical Chinese language course for engineering students<sup>1</sup>**

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### **COURSE DESCRIPTIONS**

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#### **CAES1515. Professional and technical oral communication for engineers (3 credits)**

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: 100% continuous assessment

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#### **CENG1001. Practical Chinese language course for engineering students (3 credits)**

The course is designed to introduce practical Chinese writing skills; letter-writing; official, business and personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; characteristics of the written language used in China, Hong Kong, Taiwan and Singapore; the art of public speaking; different scripts of Chinese characters; the engineering profession and Chinese culture.

Assessment: 50% continuous assessment, 50% examination.

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<sup>1</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

Minor Option (applicable to candidates admitted in the academic year 2005-2006 and thereafter)

Candidates are given an option to pursue a minor in a discipline outside their own degree curriculum, subject to approval of the Head of Department concerned. 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 complementary studies and elective requirements of the BEng curriculum, subject to the approval of the Board of the Faculty of Engineering.

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Double-Degrees in BEng/BBA Option (applicable to candidates admitted in the academic year 2007-2008 and thereafter)

Candidates are given an option to pursue the double-degrees 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-degrees curriculum requirements may also be considered as equivalent courses that satisfy the complementary studies and 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 4<sup>th</sup> year, candidates must (1) fulfil the requirements of the BEng curriculum; and (2) pass the 54 credits of courses, as listed below, as required by the Faculty of Business and Economics during their study for BEng<sup>2</sup>:

<b>Course Code</b>	<b>Course</b>	<b>Credits</b>
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information systems	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6
	Electives (Any 2 courses in Finance, HRM or Marketing major as specified below)	12
	<b>Total</b>	<b>54</b>

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<sup>2</sup> Students pursuing double-degrees in BEng/BBA are required to take “CAES1907 Business Communication” in lieu of the following English enhancement courses during their first year of study as required by respective BEng curricula: CAES1503, CAES1505, CAES1507, CAES1509, CAES1511 or CAES1513.

Elective courses for BEng/BBA (Human Resource Management)

Course Code	Course	Credits
BUSI0029	Human resource management and business strategy	6
BUSI0034	Human resource: theory and practice	6
BUSI1005	Organizational behaviour	6
BUSI2003	Leadership	6

Elective courses for BEng/BBA (Marketing)

Course Code	Course	Credits
BUSI0004	Advertising management	6
BUSI0031	Marketing research	6
BUSI0050	Consumer behaviour	6
BUSI0038	Services marketing	6
BUSI0071	Strategic marketing management	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 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 4<sup>th</sup> year in accordance with the Regulations and Syllabuses for the Degree of BBA in Conjunction with the Degree of BEng.

*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-degrees in BEng/BBA option.*



# **CIVIL ENGINEERING**

## **SYLLABUS**

This syllabus applies to students admitted in the academic year 2011-12 and thereafter.

### Curriculum

The curriculum comprises 180 credits of courses as follows:

(a) General Engineering Courses

Students are required to successfully complete at least 24 credits of General Engineering courses.

(b) Core Engineering Courses

Students are required to successfully complete ALL core engineering courses (84 credits), comprising of 18 credits of introductory core courses and 66 credits of advanced core courses.

(c) Advanced Elective Courses in Civil Engineering

Students are required to take 36 credits of advanced elective courses in civil engineering offered by the Department of Civil Engineering.

(d) Elective Course(s)

Students are required to take 9 credits of advanced elective course(s) offered by either the Department of Civil Engineering or other department(s) within or outside of the Faculty of Engineering.

(e) University Requirements

(i) Students are required to successfully complete two English language courses to accumulate up to a maximum of 6 credits.

(ii) Students are required to successfully complete one Chinese language course (3 credits)<sup>1</sup>.

(iii) Students are required to successfully complete 12 credits of courses in the Common Core Curriculum, selecting no more than one course from each Area of Inquiry.

(f) Internship

Students are required to successfully complete an Internship (6 credits). The training normally takes place after the second year of study.

To complete the curriculum, a candidate is required to gain not fewer than 180 credits from the above listed courses.

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<sup>1</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

## Degree Classification

The best 180 credits including the courses below shall be taken into account:

- (a) 12 credits from University Common Core Curriculum.
  - (b) At least 24 credits from General Engineering Courses, including
    - (i) ENGG1002 Computer programming and applications; or ENGG1016 Computer programming and applications I; AND
    - (ii) ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB; AND
    - (iii) ENGG1006 Engineering for sustainable development; AND
    - (iv) ENGG1010 Foundations of engineering mechanics
  - (c) All core engineering courses, including both introductory and advanced courses;
  - (d) At least 45 credits advanced courses from
    - (i) civil engineering elective courses; AND
    - (ii) elective courses;
  - (e) Language Enhancement Courses, i.e. CAES1505 Professional and technical written communication for engineers<sup>2</sup>, CAES1515 Professional and technical oral communication for engineers and CENG1001 Practical Chinese language course for engineering students<sup>1</sup>.
  - (f) Internship (6 credits)
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An example of the programme structure is as follows:

(a) First Year

General Engineering Courses

Computer programming and applications or Computer programming and applications I	6
Engineering for sustainable development	6
Foundations of engineering mechanics	6
Mathematics I or <i>both</i> Mathematics IA and Mathematics IB	6

University Requirements

Practical Chinese language course for engineering students	3
Professional and technical oral communication for engineers	3
Professional and technical written communication for engineers	3
Course in the Common Core Curriculum	6

Introductory Core Engineering Courses

Environmental engineering and fluid mechanics	6
Engineering mechanics and materials	6
Surveying and drawing	6

Total credits	57
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<sup>2</sup> Students pursuing the double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1505

(b) Second Year

Course in the Common Core Curriculum	6
<u>Advanced Core Engineering Courses</u>	
Engineering design and communication	6
Engineering geology and rock mechanics	6
Engineering mathematics II	6
Hydraulics and hydrology	6
Principles of civil engineering management	6
Soil mechanics	6
Theory and design of structures I	6
Theory and design of structures II	6
Transportation engineering	6
Total credits	60
Summer Semester	
Internship	6
Total credits	6

(c) Third Year

<u>Advanced courses</u>	
Civil engineering advanced elective courses	36
Elective course(s)	9
Project	12
Total credits	57

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## COURSE DESCRIPTIONS

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

### Level One

#### General Engineering Courses

<b>ENGG1002.</b>	<b>Computer programming and applications (6 credits)</b>
<b>ENGG1003.</b>	<b>Mathematics I (6 credits)</b>
<b>ENGG1004.</b>	<b>Mathematics IA (3 credits)</b>
<b>ENGG1005.</b>	<b>Mathematics IB (3 credit- units)</b>
<b>ENGG1006.</b>	<b>Engineering for sustainable development (6 credits)</b>
<b>ENGG1010.</b>	<b>Foundations of engineering mechanics (6 credits)</b>
<b>ENGG1016.</b>	<b>Computer programming and applications I (6 credits)</b>

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

## **University Requirements on Language Enhancement Courses**

### **CAES1505. Professional and technical written communication for engineers (3 credits)**

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using written English. Topics include accessing, abstracting, analysing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; small-scale project design and implementation.

Assessment: 100% Continuous assessment

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### **CAES1515. Professional and technical oral communication for engineers (3 credits)**

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: 100% Continuous assessment.

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### **CENG1001. Practical Chinese language course for engineering students (3 credits)**

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

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## **University Common Core Curriculum**

12 credits of courses in the University Common Core Curriculum, selecting no more than one course from each Area of Inquiry:

- Scientific and Technology Literacy
  - Humanities
  - Global Issues
  - China: Culture, State and Society
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## **Introductory Core Engineering Courses**

### **CIVL1012. Environmental engineering and fluid mechanics (6 credits)**

Man and the environment; water quality, resources and treatment; wastewater characteristics and treatment; solid waste, air and noise pollution control; environmental impact assessment; flow measurements; dimensional analysis and scale models; flow of an ideal fluid; flow in pipes.

Assessment: 20% practical work, 80% examination

**CIVL1013. Engineering mechanics and materials (6 credits)**

Engineering Mechanics: Bending moment, shear and axial force diagrams; Beam theory for bending and shear; shear centre; deflections of beams; analysis of stress and strain; energy methods.

Materials: Major applications and required properties of construction materials; structural steel; concrete pulverized fuel ash; fibre-reinforced cementitious materials; brickwork and masonry; timber; bituminous materials. Crystalline structure; elastic and plastic deformations; phase diagrams; alloying; material forming and heat treatment; corrosion.

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

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**CIVL1014. Surveying and drawing (6 credits)**

Engineering drawing; fundamental geometrical projections; general civil engineering drawings; detailing for reinforced concrete and steel structures.

Basic principles of plane surveying; differential and trigonometrical levelling; distance and angle measurements; tachometry; horizontal control; traverse; triangulation and trilateration; theory of errors; network adjustment.

Assessment: 100% Continuous assessment

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**Advanced Core Engineering Courses**

**CIVL1010. Theory and design of structures I (6 credits)**

Statically determinate structures; beams and frames; trusses; elementary arch and cable analysis; masonry structures; influence lines; deflection of simple structures.

Structural forms and concepts; philosophy of design; loading; codes of practice; design of simple sections and members.

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

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**CIVL1011. Transportation engineering (6 credits)**

Transportation and its context; basic characteristics of different transportation modes; urban transportation planning and land use/transportation studies; highway alignment and geometric design; transportation surveys.

Assessment: 20% Continuous assessment, 80% examination

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**Level Two**

**Advanced Core Engineering Courses**

**CIVL2001. Engineering design and communication (6 credits)**

Planning and design of civil engineering projects; open-ended schematic design of multi-disciplinary projects; project appraisal and feasibility study; environmental impact assessment; project implementation.

Communication and presentation of information related to project work.

Assessment: 100% Continuous assessment

**CIVL2002. Engineering geology and rock mechanics (6 credits)**

Minerals and rocks; introduction to stratigraphy; structural geology; earthquakes; surface processes; groundwater; geological maps; geology of Hong Kong; stereonet; rock slopes; behaviour and properties of rocks as an engineering material; rock discontinuities; rock stresses; failure of rock and strength theory; tunnels and underground excavations in rocks; rock foundation; rock testing techniques; applications of rock mechanics in engineering practice; fieldwork and case studies.

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

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**CIVL2003. Engineering mathematics II (6 credits)**

Complex variables; Fourier analysis & partial differential equations; introduction to probability & statistics.

Prerequisite: ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB

Assessment: 20% Continuous assessment, 80% examination

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**CIVL2004. Hydraulics and hydrology (6 credits)**

Governing equations of motion; laminar and turbulent flow; boundary layer theory; flow in open channels; hydraulic machinery; basic concepts of the hydrological cycle; precipitation; evaporation and evapo-transpiration; infiltration; methods of estimating runoff; probability concepts in hydrology.

Pre-requisite: CIVL1012 Environmental engineering and fluid mechanics

Assessment: 15% practical work, 15% Continuous assessment; 70% examination

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**CIVL2006. Soil mechanics (6 credits)**

Basic characteristics of soils; soil classification; seepage; effective stress; soil compaction; soil testing techniques; consolidation theory and settlement analysis; shear strength and failure criteria; applications of soil mechanics in engineering practice: lateral pressures and retaining structures, bearing capacity of foundations, slopes and embankments.

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

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**CIVL2007. Theory and design of structures II (6 credits)**

Method of consistent deformation, slope-deflection method, and moment distribution method for indeterminate structures.

RC short columns, bending moment and shear force envelopes, RC continuous one-way slabs, concept of T-beams, and reinforcement curtailment. Steel flexural members (lateral torsional buckling), tension members and compression members.

Prerequisite: CIVL1010 Theory and design of structures I

Assessment: 30% Continuous assessment, 70% examination

**CIVL2008. Principles of civil engineering management (6 credits)\***

Engineers in society; organization of firm and site; engineering economics; site planning; estimating; human resources management; project management; basic legal systems and contracts; dispute resolution techniques; quality management; safety management; general planning and control systems.

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.

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**Internship**

**CIVL2009. Internship (6 credits)**

To complete a period of training in industry not less than a total of four weeks during the summer semester, subject to satisfactory performance in training and the submission of a satisfactory training report.

Assessment: 100% Continuous assessment

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**Advanced Elective Course**

**CIVL2010. Experiential Learning (6 credits)**

To complete a period of training in industry, workshop training, study tour, or leadership programme, approved by the Head of Department, not less than a total of four weeks during the summer semester, subject to satisfactory performance in these activities and the submission of a satisfactory completion report.

Assessment: 100% continuous assessment

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**Level Three**

**Advanced Core Engineering Course**

**CIVL3013. Project (12 credits)**

A dissertation or report on a topic consisting of design, experimental or analytical investigation.

Assessment: 100% Continuous assessment

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**Advanced Elective Courses in Civil Engineering**

**CIVL3001. Advanced engineering mechanics (6 credits)**

Three-dimensional analysis of stress and strain; examples in two- and three-dimensional problems; equilibrium and principle of virtual work; linear system and matrix methods; finite element procedure and formulation; plane stress/strain triangular elements; triangular element for heat conduction and steady state field problems.

Assessment: 30% Continuous assessment, 70% examination

**CIVL3003. Construction project management (6 credits)**

Construction planning and programming methods; critical paths and resource scheduling; work study and productivity; financial planning and control; cash flow management; civil engineering contracts and contract administration; managing design and other consultancy services; value management; ethics and professionalism.

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3006. Engineering hydraulics (6 credits)**

Non-uniform open channel flow; gradually & rapidly varied flow, applications to hydraulic structures & storm water drainage design; hydraulics of alluvial channels; turbulent mixing and transport.

Prerequisite: CIVL2004 Hydraulics and hydrology

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

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**CIVL3007. Environmental impact assessment of civil engineering projects (6 credits)**

Environmental protection legislation; environmental impact assessment process; environmental impact prediction and evaluation during construction and operation of projects; mitigation measures; modelling; environmental monitoring and auditing; environmental management issues; case studies.

Prerequisite: CIVL1012 Environmental engineering and fluid mechanics

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3008. Foundation engineering (6 credits)**

Ground investigation; bearing capacity, shallow and deep foundations, foundation settlements; foundation failure and remediation; case studies.

Prerequisite: CIVL2006 Soil mechanics

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3010. Management and communication skills for engineers (3 credits)**

Leadership; team building; problem solving and decision making; verbal communication; business development skills; interviews and business writing.

Assessment: 100% Continuous assessment

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**CIVL3011. Municipal and industrial wastewater treatment (6 credits)**

Municipal wastewater flows and characteristics; sewerage systems; municipal wastewater treatment; industrial wastewater characteristics; physical, chemical and biological treatment of industrial wastewater.

Prerequisite: CIVL1012 Environmental engineering and fluid mechanics

Assessment: 20% practical work, 80% examination



**CIVL3012. Prestressed concrete structures (6 credits)**

Fundamental principles of prestressing; materials and systems for prestressed concrete; loss of prestress; design of simple and composite beams; secondary moment; concordant cable; linear transformation; design and construction of concrete bridges.

Prerequisite: CIVL2007 Theory and design of structures II  
Assessment: 30% Continuous assessment, 70% examination

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**CIVL3014. Slope engineering (6 credits)**

Landslide hazards, slope stability analyses; landslide investigation; uncertainties in slope stability analysis; landslip preventive measures; case studies.

Prerequisite: CIVL2002 Engineering geology and rock mechanics and CIVL2006 Soil mechanics  
Assessment: 20% Continuous assessment, 80% examination

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**CIVL3015. Solid and hazardous waste management (6 credits)**

Sources, control, characteristics, collection, transport, recovery, treatment and disposal of solid and hazardous wastes.

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3016. Steel structures (6 credits)**

Plastic analysis, design of steel structures, design of composite structures.

Prerequisite: CIVL2007 Theory and design of structures II  
Assessment: 20% Continuous assessment, 80% examination

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**CIVL3018. Theory and design of structures III (6 credits)**

Matrix method; differential settlements; temperature; shrinkage and other effects; torsion structures; stability.

Design of reinforced concrete structures: building frames, shearwalls and water retaining structures.

Prerequisite: CIVL2007 Theory and design of structures II  
Assessment: 30% Continuous assessment, 70% examination

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**CIVL3019. Traffic engineering (6 credits)**

Highway traffic system; characteristics of traffic; theories of traffic flow; traffic surveys; traffic management; intersections and interchanges; design of signal systems.

Assessment: 30% Continuous assessment, 70% examination

**CIVL3020. Transportation infrastructure engineering (6 credits)**

This course will serve as an introduction to the theory and practice of transportation infrastructure planning and design. Topics may vary from year to year but will usually include highway engineering, railway engineering and airport engineering.

Prerequisite: CIVL1011 Transportation engineering

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3021. Water resources engineering (6 credits)**

Sources of water; collection and treatment; transmission and distribution; wastewater collection, treatment and disposal; water related disasters; hydropower; irrigation; case studies.

Prerequisite: CIVL1012 Environmental engineering and fluid mechanics

Assessment: 20% practical work, 80% examination

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**CIVL3022. Wind engineering (6 credits)**

Wind characteristics; topographical effects on wind patterns; wind flow around buildings and structures; wind loading.

Assessment: 20% Continuous assessment, 80% examination

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**CIVL3025. Law for civil engineers (6 credits)**

Introduction to legal system; local & PRC legislation and regulations; contractual rights; obligations and remedies; law of tort; company law; land law; litigation; dispute resolution approaches; evidence; insurance law.

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3026. Engineering practice in Mainland China (6 credits)**

Engineering code of practice and work procedure; site investigation; foundation design and construction; loading and structural design practice; introduction to seismic design; design of bridges and highway structures; acceptance criteria; site supervision system.

Prerequisite: CENG1001 Practical Chinese language course for engineering students or CENG1004 Practical Chinese language course for civil engineering (law) students or CUND0002 Practical Chinese language and Hong Kong society and CIVL2007 Theory and design of structures II

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3027. Professional practice in the built environment (6 credits)**

Statutory control of building safety, health and environment in Hong Kong; buildings ordinance and regulations; general and structural planning of buildings; professional communication skills, conduct, responsibility, liability, risk and indemnity.

Assessment: 30% Continuous assessment, 70% examination

**CIVL3028. Structural dynamics and earthquake engineering (6 credits)**

Earthquake hazard and ground shaking, site (soil) effects, seismic design spectra, earthquake loadings, dynamic earthquake response, design codes, performance-based design, vibration control.

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3029. Numerical analysis in geotechnical engineering (6 credits)**

Introduction to finite difference and finite element methods; general numerical considerations for geotechnical problems; elementary constitutive models for soils; application to one-dimensional consolidation, seepage and excavation problems.

Prerequisite: CIVL2006 Soil mechanics

Assessment: 35% Continuous assessment, 65% examination

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**CIVL3030. Structural fire engineering (6 credits)**

Fire behaviour, fire curve, fire development, fire safety, fire type, design principles for structures in fire, prescriptive and performance-based approaches, materials behaviour in fire condition, temperature prediction of fire compartment, temperature prediction of steel, concrete and composites members, design of steel and reinforced concrete structures in fire, practical design case study.

Prerequisite: CIVL2007 Theory and design of structures II

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3031. Earth retaining system (6 credits)**

Lateral earth pressure; retaining walls, braced-cut; anchors, soil nails and rock bolts; reinforced earth structure; basement.

Assessment: 30% Continuous assessment, 70% examination

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**CIVL3032. Geotechnical testing, instrumentation and monitoring (6 credits)**

Single and multistage triaxial tests; principles of common laboratory transducers; basic instrument response; sampling and digitization; observational method; field instrumentation and construction monitoring; case histories.

Prerequisite: CIVL2006 Soil mechanics

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

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**CIVL3033. Ground improvement (6 credits)**

Ground modification techniques; deep compaction and vibro-compaction; vertical drains and electro-osmosis; grouting; soil and rock anchors; soil reinforcement; embankments; control of ground water.

Prerequisite: CIVL2006 Soil mechanics

Assessment: 20% Continuous assessment, 80% examination

### **CIVL3034. Environmental Geotechnology (6 credits)**

Introduction to environmental geotechnology; municipal waste management; environmental site assessment; contaminant transport in the subsurface; interactions between chemicals and geomaterials; hazardous waste remediation technologies.

Prerequisite: CIVL2006 Soil mechanics

Assessment: 30% Continuous assessment, 70% examination

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For the double degree in BEng/BBA, students may take business elective courses in HRM or Marketing major offered by the Faculty of Business and Economics to satisfy up to a maximum of 12 credits of Civil Engineering elective courses.

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### **Advanced Elective Course**

#### **Elective Course (9 credits)**

Students are expected to select 9 credits of Advanced courses offered by either the Department of Civil Engineering or other department(s) within or outside of the Faculty of Engineering.

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### **Minor Programmes (not applicable to candidates from the Department of Civil Engineering)**

In the 2011-12 academic year, candidates from other departments in the Faculty of Engineering or from other faculties may pursue a Minor in Environmental Engineering or Minor in Geotechnical Engineering.

#### **Minor in Environmental Engineering**

Candidates are required to complete a total of 36 credits of courses comprising:

(a) Introductory courses (12 credits)

Students are required to complete ENGG1006 Engineering for sustainable development\* (6 credits)  
AND CIVL1012 Environmental engineering and fluid mechanics (6 credits).

\* Students opting for the Minor cannot use the course ENGG1006 Engineering for sustainable development as satisfying the requirements of the General Engineering Course.

(b) Advanced Elective courses (24 credits)

Students must complete 24 credits of advanced elective courses to be chosen from the following list:

- CIVL2004 Hydraulics and hydrology (6 credits)
- CIVL3006 Engineering hydraulics (6 credits)
- CIVL3007 Environmental impact assessment of civil engineering projects (6 credits)
- CIVL3011 Municipal and industrial wastewater treatment (6 credits)
- CIVL3015 Solid and hazardous waste management (6 credits)
- CIVL3021 Water resources engineering (6 credits)
- CIVL3022 Wind engineering (6 credits)

## Minor in Geotechnical Engineering

Candidates are required to complete a total of 36 credits of courses comprising:

- (a) Introductory courses (12 credits)

Students are required to complete ENGG1003 Mathematics I (6 credits) AND CIVL2006 Soil Mechanics (6 credits).

- (b) Advanced Elective courses (24 credits)

Students must complete 24 credits of advanced elective courses to be chosen from the following list:

- CIVL2002 Engineering geology and rock mechanics (6 credits)
- CIVL3008 Foundation engineering (6 credits)
- CIVL3014 Slope engineering (6 credits)
- CIVL3029 Numerical analysis in geotechnical engineering (6 credits)
- CIVL3031 Earth retaining system (6 credits)
- CIVL3032 Geotechnical testing, instrumentation and monitoring (6 credits)
- CIVL3033 Ground improvement (6 credits)
- CIVL3034 Environmental Geotechnology (6 credits)

## Double-Degrees in BEng/BBA Option

Candidates pursuing studies for the double-degrees in BEng/BBA are required to satisfy all the requirements of the above BEng curriculum and pass 54 credits of courses as listed below:

Course Code	Course	Credits
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information system	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6
	Business Electives (Any 2 courses in Finance, HRM or Marketing major)	12
	<b>Total</b>	<b>54</b>

Candidates pursuing the double-degrees in BEng/BBA are granted exemptions from the following courses:

Courses in the BEng curriculum to be exempted	Business courses to be completed
CAES1505 Professional and technical written communication for engineers (3 credits)	CAES1907 Business communication (3 credits)
CIVL2008 Principles of civil engineering management (6 credits)	BUSI1007 Principles of management
One Advanced Elective Course in Civil Engineering (6 credits)	BUSI1003 Introduction to management information system or other equivalent Business course as approved by the Department of Civil Engineering and the Faculty
One Advanced Elective Course (6 credits)	One 6-credit Business Elective course

# **CIVIL ENGINEERING (ENVIRONMENTAL ENGINEERING)**

## **SYLLABUS**

This syllabus applies to students admitted in the academic year 2011-12 and thereafter.

### Curriculum

The curriculum comprises 180 credits of courses as follows:

- (a) General Engineering Courses  
Students are required to successfully complete at least 24 credits of General Engineering courses.
- (b) Core Engineering Courses  
Students are required to successfully complete ALL core engineering courses (90 credits), comprising of 18 credits of introductory core courses and 72 credits of advanced core courses.
- (c) Advanced Elective Courses in Environmental Engineering  
Students are required to take 30 credits of advanced elective courses in environmental engineering offered by the Department of Civil Engineering.
- (d) Elective Course(s)  
Students are required to take 9 credits of advanced elective course(s) offered by either the Department of Civil Engineering or other department(s) within or outside of the Faculty of Engineering.
- (e) University Requirements
  - (i) Students are required to successfully complete two English language courses to accumulate up to a maximum of 6 credits.
  - (ii) Students are required to successfully complete one Chinese language course<sup>3</sup> (3 credits).
  - (iii) Students are required to successfully complete 12 credits of courses in the Common Core Curriculum, selecting no more than one course from each Area of Inquiry.
- (f) Internship  
Students are required to successfully complete an Internship (6 credits). The training normally takes place after the second year of study.

To complete the curriculum, a candidate is required to gain not fewer than 180 credits from the above listed courses.

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### Degree Classification

The best 180 credits including the courses below shall be taken into account:

- (a) 12 credits from University Common Core Curriculum.
- (b) At least 24 credits from General Engineering Courses, including
  - (i) ENGG1002 Computer programming and applications or ENGG1016 Computer programming and applications I; AND
  - (ii) ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB; AND
  - (iii) ENGG1006 Engineering for sustainable development; AND
  - (iv) ENGG1010 Foundations of engineering mechanics

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<sup>3</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

- (c) All core engineering courses, including introductory and advanced courses;
  - (d) At least 39 credits advanced courses from
    - (i) environmental engineering elective courses; AND
    - (ii) elective courses
  - (e) Language Enhancement Courses i.e. CAES1505 Professional and technical written communication for engineers<sup>4</sup>, CAES1515 Professional and technical oral communication for engineers and CENG1001 Practical Chinese language course for engineering students<sup>1</sup>.
  - (f) Internship (6 credits)
- 

An example of the programme structure is as follows:

(a) First Year

General Engineering Courses

Computer programming and applications or Computer programming and applications I	6
Engineering for sustainable development	6
Foundations of engineering mechanics	6
Mathematics I or <i>both Mathematics IA and Mathematics IB</i>	6

University Requirements

Practical Chinese language course for engineering students	3
Professional and technical oral communication for engineers	3
Professional and technical written communication for engineers	3
Course in University Common Core curriculum	6

Introductory Core Engineering Courses

Environmental engineering and fluid mechanics	6
Engineering mechanics and materials	6
Surveying & drawing	6
 Total credits	 57

(b) Second Year

Course in the University Common Core curriculum	6
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Advanced Core Engineering Courses

Engineering design and communication	6
Engineering geology and rock mechanics	6
Engineering mathematics II	6
Hydraulics and hydrology	6
Principles of civil engineering management	6
Soil mechanics	6
Theory and design of structures I	6
Theory and design of structures II	6
Water and air quality: concepts and measurement	6

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<sup>4</sup> Students pursuing the double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1505

Total credits	60
Summer Semester	
Internship	6
Total credits	6

(c) Third Year

Advanced Courses

Elective courses	9
Environmental engineering advanced elective courses	30
Project	12
Transportation engineering	6
Total credits	57

## COURSE DESCRIPTIONS

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

### Level One

#### General Engineering Courses

<b>ENGG1002.</b>	<b>Computer programming and applications (6 credits)</b>
<b>ENGG1003.</b>	<b>Mathematics I (6 credits)</b>
<b>ENGG1004.</b>	<b>Mathematics IA (3 credits)</b>
<b>ENGG1005.</b>	<b>Mathematics IB (3 credits)</b>
<b>ENGG1006.</b>	<b>Engineering for sustainable development (6 credits)</b>
<b>ENGG1010.</b>	<b>Foundations of engineering mechanics (6 credits)</b>
<b>ENGG1016.</b>	<b>Computer programming and applications I (6 credits)</b>

For course descriptions, please refer to the General Engineering Courses in the syllabus for the degree of BEng for details.

#### University Requirements on Language Enhancement Courses

<b>CAES1505.</b>	<b>Professional and technical written communication for engineers (3 credits)</b>
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For course descriptions, please refer to the syllabuses of the Civil Engineering programme.

<b>CAES1515.</b>	<b>Professional and technical oral communication for engineers (3 credit units)</b>
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This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering



theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: 100% Continuous assessment.

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### **CENG1001. Practical Chinese language course for engineering students (3 credits)**

For course descriptions, please refer to the University Language Enhancement Courses in the syllabus for the degree of BEng for details.

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### **University Common Core Curriculum**

12 credits of courses in the University Common Core curriculum, selecting no more than one course from each Area of Inquiry:

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

### **Introductory Core Engineering Courses**

**CIVL1012. Environmental engineering and fluid mechanics (6 credits)**

**CIVL1013. Engineering mechanics and materials (6 credits)**

**CIVL1014. Surveying and drawing (6 credits)**

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

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### **Advanced Core Engineering Courses**

**CIVL1010. Theory and design of structures I (6 credits)**

**CIVL1011. Transportation engineering (6 credits)**

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

### **Level Two**

### **Advanced Core Engineering Courses**

**CIVL2001. Engineering design and communication (6 credits)**

**CIVL2002. Engineering geology and rock mechanics (6 credits)**

**CIVL2003. Engineering mathematics II (6 credits)**

**CIVL2004. Hydraulics and hydrology (6 credits)**

**CIVL2006. Soil mechanics (6 credits)**

**CIVL2007. Theory and design of structures II (6 credits)**

**CIVL2008. Principles of civil engineering management (6 credits)**

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

**CIME2001. Water and air quality: concepts and measurement (6 credits)**

Water quality and pollution; standard methods of water and wastewater examination; air quality and air pollution control principles; measurement techniques in air pollution.

Prerequisite: CIVL1005 Environmental engineering (for students of the Department of Civil Engineering only)

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

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**Internship**

**CIVL2009. Internship (6 credits)**

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

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**Advanced Elective Course**

**CIVL2010. Experiential Learning (6 credits)**

To complete a period of training in industry, workshop training, study tour, or leadership programme, approved by the Head of Department, not less than a total of four weeks during the summer semester, subject to satisfactory performance in these activities and the submission of a satisfactory completion report.

Assessment: 100% continuous assessment

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**Level Three**

**Advanced Core Engineering Course**

**CIVL3013. Project (12 credits)**

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

**Advanced Elective Courses in Environmental Engineering**

- CIVL3003. Construction project management (6 credits)**
- CIVL3006. Engineering hydraulics (6 credits)**
- CIVL3007. Environmental impact assessment of civil engineering projects (6 credits)**
- CIVL3008. Foundation engineering (6 credits)**
- CIVL3010. Management and communication skills for engineers (3 credits)**
- CIVL3011. Municipal and industrial wastewater treatment (6 credits)**
- CIVL3015. Solid and hazardous waste management (6 credits)**
- CIVL3018. Theory and design of structures III (6 credits)**
- CIVL3021. Water resources engineering (6 credits)**
- CIVL3022. Wind engineering (6 credits)**

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

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For double-degrees in BEng/BBA, students may take business elective courses in HRM or Marketing major offered by the Faculty of Business and Economics up to a maximum of 12 credits to satisfy the requirements of advanced elective courses in environmental engineering.

### **Advanced Elective Course (9 credits)**

Students are expected to select 9 credits of Advanced courses offered by either the Department of Civil Engineering or other department(s) within or outside of the Faculty of Engineering.

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### **Minor Programmes (not applicable to candidates from the Department of Civil Engineering)**

In the 2011-12 academic year, candidates from other departments in the Faculty of Engineering or from other faculties may pursue a Minor in Environmental Engineering or Minor in Geotechnical Engineering.

#### **Minor in Environmental Engineering**

Candidates are required to complete a total of 36 credits of courses comprising:

- (a) Introductory courses (12 credits)

Students are required to complete ENGG1006 Engineering for sustainable development\* (6 credits) AND CIVL1012 Environmental engineering and fluid mechanics (6 credits).

\*Students opting for the Minor cannot use the course ENGG1006 Engineering for sustainable development as satisfying the requirements of the General Engineering Course.

- (b) Advanced Elective courses (24 credits)

Students must complete 24 credits of advanced elective courses to be chosen from the following list:

CIVL2004 Hydraulics and hydrology (6 credits)  
CIVL3006 Engineering hydraulics (6 credits)  
CIVL3007 Environmental impact assessment of civil engineering projects (6 credits)  
CIVL3011 Municipal and industrial wastewater treatment (6 credits)  
CIVL3015 Solid and hazardous waste management (6 credits)  
CIVL3021 Water resources engineering (6 credits)  
CIVL3022 Wind engineering (6 credits)

#### **Minor in Geotechnical Engineering**

Candidates are required to complete a total of 36 credits of courses comprising:

- (a) Introductory courses (12 credits)

Students are required to complete ENGG1003 Mathematics I (6 credits) AND CIVL2006 Soil Mechanics (6 credits).

- (b) Advanced Elective courses (24 credits)

Students must complete 24 credits of advanced elective courses to be chosen from the following list:

CIVL2002 Engineering geology and rock mechanics (6 credits)  
CIVL3008 Foundation engineering (6 credits)  
CIVL3014 Slope engineering (6 credits)  
CIVL3029 Numerical analysis in geotechnical engineering (6 credits)  
CIVL3031 Earth retaining system (6 credits)  
CIVL3032 Geotechnical testing, instrumentation and monitoring (6 credits)

CIVL3033 Ground improvement (6 credits)  
 CIVL3034 Environmental Geotechnology (6 credits)

### Double-Degrees in BEng/BBA Option

Candidates pursuing studies for the double-degrees in BEng/BBA are required to satisfy all the requirements of the above BEng curriculum and pass 54 credits of courses as listed below:

Course Code	Course	Credits
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information system	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6
	Business Electives (Any 2 courses in Finance, HRM or Marketing major)	12
	<b>Total</b>	<b>54</b>

Candidates pursuing the double-degrees in BEng/BBA are granted exemptions from the following courses:

Courses in the BEng curriculum to be exempted	Business courses to be completed
CAES1505 Professional and technical written communication for engineers (3 credits)	CAES1907 Business communication (3 credits)
CIVL2008 Principles of civil engineering management (6 credits)	BUSI1007 Principles of management
One Advanced Elective Course in Environmental Engineering (6 credits)	BUSI1003 Introduction to management information system or other equivalent Business course as approved by the Department of Civil Engineering and the Faculty
One Advanced Elective Course in Environmental Engineering (6 credits)	One 6-credit Business Electives course

## COMPUTER SCIENCE

### SYLLABUS (For intakes of 2010 and 2011)

The curriculum comprises 180 credits of courses as follows:

- 75-78 credits of core courses [see table for list of courses];
- 30 credits of discipline electives;
- Industrial training (6 credits)
- UG5 requirements (21 credits) [see table for list of courses];
- 6 credits of complementary studies courses [see table for list of courses];
- 39-42 credits of free electives.

To complete the degree requirement, candidates must pass all the courses specified in the curriculum. In addition, candidates must satisfy any other requirements as stipulated by the University and Faculty of Engineering.

Candidates pursuing the BEng(CompSc) degree may pursue a **minor** offered by other departments in the Faculty of Engineering or by other faculties in accordance with the regulations of the University and the syllabus for the degree of BEng.

Candidates may also opt for a **second major** offered by other faculties in accordance with the regulations of the University.

Courses taken for minor or second major may be used to satisfy the requirements of free electives.

	<b>Introductory</b> <sup>(Note 1)</sup>	<b>Advanced</b> <sup>(Note 1)</sup>
<b>Core courses</b> (75-78 credits)	<ul style="list-style-type: none"> <li>• ENGG1003 Mathematics I (6 credits) / ENGG1004 Mathematics IA (3 credits)</li> <li>• One General Engineering course<sup>(Note 2)</sup></li> <li>• ENGG1007 Foundations of computer science</li> <li>• ENGG1002 Computer programming and applications</li> <li>• CSIS1122 Computer programming II</li> <li>• CSIS1120 Computer organization</li> <li>• CSIS1119 Introduction to data structures and algorithms</li> </ul> <p>(sub-total: 39-42 credits)</p>	<ul style="list-style-type: none"> <li>• CSIS0230 Principles of operating systems</li> <li>• CSIS0234 Computer and communication networks</li> <li>• CSIS0250 Design and analysis of algorithms</li> <li>• CSIS0278 Introduction to database management systems</li> <li>• CSIS0801 Final year project (12 credits)</li> </ul> <p>(sub-total: 36 credits)</p>
<b>Discipline Electives</b> (30 credits)	<ul style="list-style-type: none"> <li>• At least 30 credits of electives in computer science, excluding Research internship</li> </ul>	
<b>Training</b> (6 credits)	<ul style="list-style-type: none"> <li>• CSIS1412 Industrial training</li> </ul>	
<b>UG5 Requirements</b> (21 credits)	<ul style="list-style-type: none"> <li>• CAES1515 Professional and technical oral communication for engineers</li> <li>• CAES1503 English for computer science<sup>(Note 3)</sup></li> <li>• CENG1001 Practical Chinese language course for engineering students<sup>(Note 4)</sup></li> </ul> <p>(sub-total: 9 credits)</p> <ul style="list-style-type: none"> <li>• Two University Common Core Courses (selecting no more than one course from each Area of Inquiry)</li> </ul> <p>(sub-total: 12 credits)</p>	
<b>Complementary Studies</b> (6 credits)	<ul style="list-style-type: none"> <li>• ELEC2803 Engineering and society</li> <li>• ELEC2802 Engineering organization and management / ELEC2804 Engineering economics and finance / CSIS0311 Legal aspects of computing<sup>(Note 5)</sup> <sup>(Note 6)</sup></li> </ul>	
<b>Free Electives</b> (39-42 credits)		

Note 1 Introductory core courses and courses for the UG5 Requirements are normally taken in Year 1, and advanced core courses are normally taken in Year 2/3.

Note 2 One course to be chosen from the following list of General Engineering Courses:

ENGG1006	Engineering for sustainable development
ENGG1009	Industrial management and logistics
ENGG1010	Foundations of engineering mechanics
ENGG1011	Introduction to biomedical engineering
ENGG1015	Introduction to electrical and electronic engineering

Refer to the syllabus for the degree of BEng for details.

Note 3 Students pursuing the double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1503.

Note 4 Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

Note 5 When used to fulfill the Complementary Studies requirement, “Legal aspects of computing” (6 credits) can also be used to fulfill 3 credits of free elective.

Note 6 ELEC2802 Engineering organization and management, ELEC2803 Engineering and society, and ELEC2804 Engineering economics and finance will not be offered from 2011/12. To satisfy the Complementary Studies requirement, students are required to complete ELEC2814 Engineering management and society, which is a 6-credit course.

The degree classification shall be based on the best 180 credits according to the curriculum :

- (a) all the core courses (75-78 credits);
- (b) Industrial training (6 credits);
- (c) all the courses in the category of the UG5 Requirements (21 credits);
- (d) Complementary Studies courses (6 credits); and
- (e) the remaining courses with the best results, including at least 30 credits of discipline electives.

### **Second Major in Computer Science (2010/2011)**

Computer science is a young but fast growing discipline. Its importance is evident in the profound impact that the use of computers has on our everyday life. Computer science education is now as indispensable as any of the traditional programmes in any established world-renowned university. This Major in Computer Science provides students with a substantial foundation in key computer science subject areas and modern software technologies. On completion of this 2<sup>nd</sup> Major, students will be well-equipped with both basic and advanced knowledge in computer science, which aims to better prepare students to launch their career in the IT industry and/or to pursue postgraduate studies in Computer Science in the future.

- Minimum Entry Requirement:
1. Grade E or above in AL Pure Mathematics or Applied Mathematics; or
  2. Grade D or above in AS Mathematics & Statistics or Applied Mathematics; or
  3. Grade C or above in HKCEE Additional Mathematics; or

4. Grade C or above in HKCEE Mathematics and grade E or above in Additional Mathematics.

Minimum Credit Requirement: 72 credits (36 credits of core courses, 36 credits of electives)\*  
*\*no capstone requirement*

Impermissible Combination: Minor in Computer Science

**Required courses (72 credits)**

		<b>Credits</b>
<b>1. Core courses (36 credits)</b>		
CSIS1117	Computer Programming I	6
CSIS1118	Foundations of Computer Science <sup>(Note 1)</sup>	6
CSIS1122	Computer Programming II	6
CSIS1119	Introduction to Data Structures and Algorithms	6
CSIS1120	Computer Organization	6
CSIS0278	Introduction to Database Management Systems	6
<b>2. Electives (36 credits) <sup>(Note 2)</sup></b>		
CSIS0230	Principles of Operating Systems	6
CSIS0234	Computer and communication networks	6
CSIS0250	Design and Analysis of Algorithms	6
CSIS0270	Artificial Intelligence	6
CSIS0271	Computer Graphics	6
CSIS0293	Introduction to Theory of Computation	6
CSIS0297	Introduction to Software Engineering	6
CSIS0311	Legal Aspects of Computing	6
CSIS0315	Multimedia Computing and Applications	6
CSIS0317	Computer Vision	6
CSIS0320	Electronic Commerce Technology	6
CSIS0322	Internet and the World Wide Web	6
CSIS0327	Computer and Network Security	6
CSIS0396	Object-oriented Programming and Java	6

Note 1 Students whose first major is Mathematics may be granted waiver of CSIS1118, upon application, on the condition that students are required to complete one more elective in Computer Science as replacement. Students who have completed MATH2600 Discrete mathematics are deemed to have completed CSIS1118, they are not permitted to take CSIS1118 and are required to complete one more elective in Computer Science.

Note 2 Students may apply to enroll in other CSIS courses not listed above, subject to the approval of the Head of Department of Computer Science.

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**Minor in Computer Science (2010/2011) <sup>(Note 1)</sup>**

**Introduction**

The Department of Computer Science has a long tradition of offering IT courses to students of other departments. To declare a “Minor in Computer Science”, students are required to pass 2 core courses

and at least 4 elective courses in computer science. All these courses are of 6 credits. They will be taught in a single semester with 3 hours of lectures per week. Assessment of each course is based on a three-hour written examination and continuous assessment.

Students are also welcome to take any of the following courses as free electives.

**Core Courses:**

- CSIS1117 Computer programming I <sup>(Note 2)</sup>
- CSIS1122 Computer programming II [for intake of 2006 and thereafter]

**Elective Courses:** <sup>(Note 3)</sup>

- CSIS1119 Introduction to data structures and algorithms
- CSIS0250 Design and analysis of algorithms
- CSIS0270 Artificial intelligence
- CSIS0271 Computer graphics
- CSIS0278 Introduction to database management systems
- CSIS0293 Introduction to theory of computation
- CSIS0297 Introduction to software engineering
- CSIS0311 Legal aspects of computing
- CSIS0315 Multimedia computing and applications
- CSIS0317 Computer vision
- CSIS0320 Electronic commerce technology
- CSIS0322 Internet and the World Wide Web
- CSIS0396 Object-oriented programming and Java

Note 1 This minor option is not available for BEng(CE) and BEng(CompSc) students.

Note 2 BEng students who have completed ENGG1002 Computer programming and applications are deemed to have completed CSIS1117 Computer programming I, they are required to complete one more elective in Computer Science as replacement (i.e. a total of 30 credits).

Note 3 Students may apply to enrol in other CSIS courses not listed above, subject to the approval of the Head of Department of Computer Science.

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## COURSE DESCRIPTIONS

### **ENGG1002. 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



**ENGG1003. Mathematics I (6 credits)**

Linear algebra, advanced calculus, vector analysis, ordinary differential equations, Laplace transforms.

Prerequisite : HKALE Pure Mathematics

Assessment: 10% continuous assessment, 90% examination

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**ENGG1004. Mathematics IA (3 credits)**

Linear algebra, advanced calculus, ordinary differential equations.

Assessment: 10% continuous assessment, 90% examination

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**ENGG1007. Foundations of computer science (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.

Assessment: 50% continuous assessment, 50% examination

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**CAES1503. English for computer science (3 credits)**

*(course code revised from ECEN1503 from 2010-11)*

The course is designed to enable 1<sup>st</sup> year computer science majors to acquire technical and professional communication skills. The focus is on developing students' understanding and use of language in spoken and written communication. Topics include: using appropriate language in professional writings; conducting effective interviews; making appropriate grammatical and lexical choices; writing effectively with a focus on content, form and language. Students engage in both individual and group work to write a professional resume and business letters, conduct workplace interviews and write a technical proposal.

Assessment: 100% continuous assessment

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**ECEN1504. Professional and technical communication for computer science (3 credits)**

The course is designed to enable computer science majors to acquire professional and technical communication skills. The focus is on understanding and using professional and technical language. Topics include: producing and asking questions to elicit information; conducting effective interviews; organising and analysing information; writing effective technical reports with a focus on coherence and cohesion; and increasing technical vocabulary. Students are required to design and conduct authentic oral interviews and, produce written technical reports and vocabulary journals.

Assessment: 100% continuous assessment

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**CAES1515. Professional and technical oral communication for engineers (3 credits)**

*(course code revised from ECEN1515 from 2010-11)*

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**CENG1001. Practical Chinese language course for engineering students (3 credits)**

Refer to the University Language Enhancement Course in the syllabus for the degree of BEng for details.

**CSIS1117. Computer programming 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.

Assessment: 50% continuous assessment, 50% examination

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**CSIS1118. Foundations of computer science (6 credits)**

*(renamed from Mathematical foundations of computer science from 2009-10)*

OR

**CSIS1121. 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.

Assessment: 50% continuous assessment, 50% examination

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**CSIS1119. 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 ELEC1501 or ENGG1002

Pre-/Co-requisite: CSIS1122

Assessment: 40% continuous assessment, 60% examination

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**CSIS1120. Computer organization (6 credits)**

*(renamed from Machine organization and assembly language programming from 2010-11)*

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 ELEC1501 or ENGG1002

Assessment: 50% continuous assessment, 50% examination

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**CSIS1122. Computer programming II (6 credits) [for intake of 2006 and thereafter]**

This is the second programming course following ENGG1002/CSIS1117. The goal of this course is to strengthen students' programming skills, in particular, on implementing basic data structures and algorithms. Students will also learn various tools for developing programs in the UNIX/Linux environment.

Prerequisite: CSIS1117 or ELEC1501 or ENGG1002

Assessment: 50% continuous assessment, 50% examination

**CSIS1410. Industrial training (3 credits) [for intakes of 2009 and before]**

OR

**CSIS1412. Industrial training (6 credit) [for intakes of 2010 and thereafter]**

Industrial Training 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 training provides students with practical, real-world experience and represents a valuable complement to their academic training.

Assessment: 100% continuous assessment

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**CSIS0218. Discrete event simulation (6 credits)**

Topics include: Monte Carlo methods, discrete event simulation, elements of simulation models, data collection and analysis, simulation language for modelling, random number generation, queuing models, and output analysis.

Prerequisite: CSIS1119 or CSIS1122 or ELEC1501 or ELEC1502 or ELEC1503

Assessment: 40% continuous assessment, 60% examination

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**CSIS0230. 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: CSIS1119 (for intake of 2007 and before) or CSIS1122 (for intake of 2008 and thereafter); and CSIS1120 or ELEC1401

Assessment: 50% continuous assessment, 50% examination

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**CSIS0231. 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

Assessment: 40% continuous assessment, 60% examination

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**CSIS0234. 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: CSIS1120 or ELEC1401

Assessment: 50% continuous assessment, 50% examination

**CSIS0235. 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: CSIS0259

Assessment: 50% continuous assessment, 50% examination

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**CSIS0247. Topics in computer systems (6 credits)**

Topics in computer hardware and/or software systems that are of current interest.

Assessment: 50% continuous assessment, 50% examination

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**CSIS0250. 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 highly non-trivial 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 ELEC1501 or ELEC1502 or ELEC1503

Assessment: 50% continuous assessment, 50% examination

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**CSIS0259. 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; and CSIS1120 or ELEC1401

Assessment: 40% continuous assessment, 60% examination

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**CSIS0262. Topics in computer applications (6 credits)**

Some specialized application areas of computers.

Assessment: 50% continuous assessment, 50% examination

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**CSIS0270. 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. This course may not be taken with BUSI0088.

Prerequisite: CSIS1119 or CSIS1122

Assessment: 50% continuous assessment, 50% examination

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**CSIS0271. 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 CSIS1122

Assessment: 50% continuous assessment, 50% examination

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**CSIS0278. 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. This course may not be taken with BUSI0052.

Prerequisite: CSIS1119 or ELEC1501 or ELEC1502 or ELEC1503

Assessment: 50% continuous assessment, 50% examination

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**CSIS0293. Introduction to theory of computation (6 credits)**

This course focuses on three traditional areas of the theory of computation: automata, computability and complexity. Topics include finite state automata and regular languages; pushdown automata and context free languages; Turing machines and random access machines; time complexity; space complexity; intractable problems; reduction and completeness; relationship among complexity classes; approximation algorithms and nonapproximability.

Prerequisite: CSIS1119

Assessment: 50% continuous assessment, 50% examination

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**CSIS0297. 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: CSIS1117 or CSIS0396 or ELEC1501 (for intake of 2005 or before)

Prerequisite: CSIS1122 (for intake of 2006 and thereafter)

Assessment: 50% continuous assessment, 50% examination

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**CSIS0311. 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 and databases; intellectual property issues on the Internet; data privacy; computer-related crimes.

This course may not be taken with LLAW3065.

Assessment: 30% continuous assessment, 70% examination

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**CSIS0314. Pattern classification and machine learning (6 credits)**

This is an introduction course on the subjects of statistical pattern classification and machine learning. Topics include: introduction to pattern classification problems; performance evaluation; Bayesian decision theory; feature extraction techniques; parametric models; maximum-likelihood parameter estimation; maximum-discriminant decision rules; minimum classification error training; clustering

techniques; decision trees and their learning techniques.

Prerequisite: CSIS1119 or ELEC1501 or ELEC1502 or ELEC1503

Assessment: 50% continuous assessment, 50% examination

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**CSIS0315. 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. This course may not be taken with BUSI0068.

Prerequisite: CSIS1119

Assessment: 50% continuous assessment, 50% examination

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**CSIS0317. 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 ELEC1501 or ELEC1502 or ELEC1503

Assessment: 50% continuous assessment, 50% examination

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**CSIS0320. 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

Assessment: 30% continuous assessment, 70% examination

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**CSIS0322. Internet and the World Wide Web (6 credits)**

Introduction and history; networks, internetworking, and network protocols; TCP/IP and related protocols; client-server model and programming; distributed applications; Domain Name System; Internet applications: TELNET, mail, FTP, etc.; Internet security; intranet and extranet; virtual private networks; World Wide Web; Web addressing; HTTP; HTML, XML, style sheets, etc.; programming the Web: CGI, Java, JavaScript, etc.; Web servers; Web security; Web searching; push technology; other topics of current interest.

This course may not be taken with BUSI0063.

Prerequisite: CSIS1117 or ELEC1501 or ENGG1002

Assessment: 50% continuous assessment, 50% examination

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**CSIS0323. 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

Assessment: 50% continuous assessment, 50% examination

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### **CSIS0324. Topics in theoretical computer science (6 credits)**

Topics of current interest in theoretical computer science not covered by other undergraduate courses. Topics may vary from year to year.

Pre/Co-requisite: CSIS0293 or CSIS0250

Assessment: 30% continuous assessment, 70% examination

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### **CSIS0325. Topics in Web technologies (6 credits)**

This course presents selected topics that are essential in our understanding and appreciation of the latest advances in technologies related to the World Wide Web. Possible topics include XML, RDF and metadata, style languages, Web graphics and synchronized multimedia, privacy, content selection, accessibility, Web server architecture, mobile access, distributed authoring and versioning, and internationalization.

Prerequisite: CSIS0234 or CSIS0322

Assessment: 50% continuous assessment, 50% examination

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### **CSIS0326. Computational molecular biology (6 credits)**

The novel and specialised algorithms needed to solve computational problems related to the vast amounts of data generated by modern molecular biology techniques will be examined in detail.

Prerequisite: CSIS0250 or BIOC2808

Assessment: 40% continuous assessment, 60% examination

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### **CSIS0327. 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 and CSIS0234

Assessment: 30% continuous assessment, 70% examination

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### **CSIS0328. Wireless and mobile computing (6 credits)**

This course introduces the basic principles and technologies in various mobile and wireless communication systems. Topics include mobile communication environment; digital modulation; channel coding; medium access technologies; cellular mobile radio systems; wireless LANs; security in wireless systems; internetworking in wireless systems; mobility applications.

Prerequisite: CSIS0234 and CSIS0396

Assessment: 50% continuous assessment, 50% examination

**CSIS0329. 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: CSIS0271

Assessment: 50% continuous assessment, 50% examination

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**CSIS0351. Advanced algorithm analysis (6 credits)**

*(renamed from Applied algorithms from 2010-11)*

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 basic knowledge in probability and algorithms

Assessment: 50% continuous assessment, 50% examination

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**CSIS0396. 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 ELEC1501 or ENGG1002

Assessment: 50% continuous assessment, 50% examination

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**CSIS0402. 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

Assessment: 50% continuous assessment, 50% examination

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**CSIS0403. 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; individual software process and metrics; and reuse. Also examined are the implementation aspects of contemporary approaches such as generic programming, design patterns, and design by contract. Testing covers unit and component testing; integration testing; system, performance and acceptance testing; and test documentation. Testing techniques for OO software are examined in detail. Topics in maintenance include maintenance techniques, tools and metrics; software rejuvenation; and refactoring.

Pre/Co-requisite: CSIS0396

Assessment: 50% continuous assessment, 50% examination



**CSIS0404. Software quality and project management (6 credits)**

This course covers software quality and project management. Topics in software quality include software quality assurance; software quality metrics; review; inspection and audits. Topics in project management include project planning and scheduling; project control; risk analysis; planning and monitoring; process management and process improvement; configuration management and control; software acquisition; contract briefing, negotiation and management.

This course may not be taken with BUSI0060 or BUSI0061.

Prerequisite: CSIS0297

Assessment: 40% continuous assessment, 60% examination

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**CSIS0406. Real-time and embedded systems (6 credits)**

Topics include: specification of real-time software requirements; design, implementation, and evaluation of real-time software; analysis and verification of real-time computing system performance.

Prerequisite: CSIS0230

Assessment: 50% continuous assessment, 50% examination

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**CSIS0407. 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 ELEC1501 or ENGG1002; and CSIS1118 or CSIS1121 or ENGG1007

Assessment: 50% continuous assessment, 50% examination

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**CSIS0412. 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; the work involved must not overlap with that for the final-year project or any other major project.

Assessment: 100% continuous assessment

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**CSIS0801. 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

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**CSIS0803. System integration project (6 credits)**

This is a team project involving development and integration of software components. The objective is to put the concepts and theories covered in the core courses into practice. The output will be a

distributed software system based on well-defined requirements. Software tools will be used and system programming is a compulsory part of the project.

Assessment: 100% continuous assessment

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**ELEC2802. Engineering organization and management (3 credits)**

Management concepts, decision making processes, project management, leadership, management control, marketing.

Assessment: 30% continuous assessment, 70% examination

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**ELEC2803. Engineering and society (3 credits)**

Interaction between engineers and society; impact of technologies on society; environmental and safety issues; professional conduct and responsibility; contract law; law of tort; professional negligence and intellectual property law.

Assessment: 100% continuous assessment

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**ELEC2804. Engineering economics and finance (3 credits)**

Principles of Economics, Macroeconomics; Microeconomics, Introduction to Financial Management; Accounting concepts and financial statements; cost and profit.

Assessment: 30% continuous assessment, 70% examination

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**ELEC2814. Engineering management and society (6 credits)**

Professional conduct and social responsibility, sustainability and safety issues, technology and environment, ethics at work; Engineering organization and project, management functions and managerial skills, decision making processes, contingency and crisis management, leadership, corporate culture and philanthropy. Contract, intellectual property, tort, professional negligence and related law issues.

Assessment: 50% continuous assessment, 50% examination

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*Candidates may take up to two MSc(CompSc) courses as electives, subject to the approval of the Head of Department. An MSc(CompSc) course is equivalent to a 3 credit-unit level-2 course.*

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**COMPUTER ENGINEERING**

**SYLLABUS**

This syllabus applies to students admitted in the academic year 2011-12 and thereafter.

Definitions 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, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses include Level Two and Three courses.

All courses are grouped into the following 10 Subject Groups:

- A. Electrical Energy
- B. Electronics and Photonics
- C. Signal Processing and Control Systems
- D. Communications and Networking
- E. Computer Systems
- F. Complementary Studies
- G. Projects
- H. General Engineering
- I. Mathematics
- J. Software and IT Applications

A Discipline Core course is a compulsory course which a candidate must pass in the manner provided for in the Regulations. A Breadth Course is a Level 1 or Level 2 course and a Depth Course is a Level 3 course that is offered in one of the subject groups as an optional course for the curriculum.

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### The Curriculum

The curriculum shall comprise at least 180 credits including the following:

- (a) 24 credits from General Engineering courses, including:
  - (i) ENGG1002 Computer programming and applications; AND
  - (ii) ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB; AND
  - (iii) ENGG1015 Introduction to electrical and electronic engineering; AND
  - (iv) ENGG1007 Foundations of computer science
- (b) 60 credits of Computer Engineering (CE) Discipline Core Courses
- (c) 33 credits of Breadth/Depth Courses comprising
  - (i) 12 credits of course(s) selected from Groups E, J; *and*
  - (ii) the remaining are courses selected from Groups A, B, C, D, E, H, I, J but no more than 6 credits from Group H.
- (d) Complementary Studies courses comprising (Total 12 credits):
  - (i) ELEC2814 Engineering management and society (6 credits)
  - (ii) ELEC2815 Economics, finance and marketing for engineers (6 credits)
- (e) ELEC2813 Integrated project (CE) (6 credits)
- (f) ELEC3802 Technical project (12 credits)
- (g) ELEC1810 Workshop training (6 credits)
- (h) ELEC1811 Industrial training (6 credits)
- (i) UG5 requirements (21 credits):
  - (i) CAES1507 Professional and technical written communication for engineers<sup>5</sup> (3 credits)
  - (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
  - (iii) CENG1001 Practical Chinese language course for engineering students<sup>6</sup> (3 credits)
  - (iv) 12 credits of courses in the Common Core Curriculum, selecting no more than one course from each Area of Inquiry

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<sup>5</sup> Students pursuing the double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

<sup>6</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

To complete the degree requirement, a candidate must pass all the courses specified in the Curriculum and satisfy any other requirements as stipulated in the University or Faculty of Engineering regulations.

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### Degree Classification

The best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

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### Order of Study

Order of study is dictated by prerequisite and co-requisite requirements. Generally, Level 1 courses should be taken before Level 2 courses, Level 2 courses should be taken before Level 3 courses and core courses should be taken before breadth courses. Courses in Complementary Studies and UG5 Requirements can be taken in any order.

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### **First Year**

The first-year syllabus shall include the following courses:

General Engineering Courses (Total 24 credits)

Either

ENGG1003 Mathematics I (6 credits)

or

ENGG1004 Mathematics IA (3 credits) *and* ENGG1005 Mathematics IB (3 credits)

ENGG1002 Computer programming and applications (6 credits)

ENGG1007 Foundations of computer science (6 credits)

(can be replaced by CSIS1118 Foundations of computer science (6 credits))

(mutually exclusive with: ELEC1807, CSIS1118)

ENGG1015 Introduction to electrical and electronic engineering (6 credits)

Discipline Core Courses for CE (Total 24 credits)

CSIS1119 Introduction to data structures and algorithms (6 credits)

CSIS1122 Computer programming II (6 credits)

ELEC1401 Computer organization and microprocessors (6 credits)

ELEC1306 Electric and electronic circuits (6 credits)

(mutually exclusive with ENGG1008)

UG5 Requirements (Total 9 credits)

CAES1507 Professional and technical written communication for engineers (3 credits)<sup>7</sup>

CAES1515 Professional and technical oral communication for engineers (3 credits)

CENG1001 Practical Chinese language course for engineering students (3 credits)<sup>8</sup>

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<sup>7</sup> Students pursuing the double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

<sup>8</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

Training (Total 6 credits)

ELEC1810 Workshop training (6 credits)

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## **Second Year**

The second-year syllabus shall normally include the following courses:

Discipline Core Courses for CE (Total 36 credits)

CSIS0230 Principles of operating systems (6 credits)  
CSIS0234 Computer and communication networks (6 credits)  
CSIS0297 Introduction to software engineering (6 credits)  
ELEC1802 Engineering mathematics II (6 credits)  
ELEC2302 Digital system design (6 credits)  
ELEC2401 Computer architecture (6 credits)

Complementary Studies (Total 6 credits)

ELEC2814 Engineering management and society (6 credits)

UG5 Requirements (Total 12 credits)

Two Common Core Courses (12 credits)

Project (Total 6 credits)

ELEC2813 Integrated project (CE) (6 credits)

Training (Total 6 credits)

ELEC1811 Industrial training (6 credits)

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## **Third Year**

The third-year syllabus shall normally include the following courses:

Breadth/Depth Courses (Total 33 credits)

33 credits of Breadth/Depth Courses selected according to item (c) of the curriculum.

Complementary Studies: (Total 6 credits)

ELEC2815 Economics, finance and marketing for engineers (6 credits)

Project (Total 12 credits)

ELEC3802 Technical project (12 credits)

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## **ELECTRONIC AND COMMUNICATIONS ENGINEERING**

### **SYLLABUS**

This syllabus applies to students admitted in the academic year 2011-12 and thereafter.

## Definitions and Terminology

All courses offered by the Department of Electrical and Electronic Engineering shall be classified as either introductory level course or advanced level course, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses include Level Two and Three courses.

All courses are grouped into the following 10 Subject Groups:

- A. Electrical Energy
- B. Electronics and Photonics
- C. Signal Processing and Control Systems
- D. Communications and Networking
- E. Computer Systems
- F. Complementary Studies
- G. Projects
- H. General Engineering
- I. Mathematics
- J. Software and IT Applications

A Discipline Core course is a compulsory course which a candidate must pass in the manner provided for in the Regulations. A Breadth Course is a Level 1 or Level 2 course and a Depth Course is a Level 3 course that is offered in one of the subject groups as an optional course for the curriculum.

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## The Curriculum

The curriculum shall comprise at least 180 credits including the following:

- (a) 24 credits from General Engineering courses comprising:
  - (i) ENGG1002 Computer programming and applications; AND
  - (ii) ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB; AND
  - (iii) ENGG1015 Introduction to electrical and electronic engineering; AND
  - (iv) An additional 6-credit General Engineering course from Group H
- (b) 54 credits of Electronic and Communications Engineering Discipline Core Courses
- (c) 39 credits of Breadth/Depth Courses comprising:
  - (i) 15 credits of Breadth/Depth Courses from Groups A, B, C, D, E, J; AND
  - (ii) 6 credits of Breadth/Depth Course from Group I; AND
  - (iii) 18 credits of Depth Courses from Groups B, C, D, E with at least 12 credits selected from Groups B, D
- (d) 12 credits of Complementary Studies courses comprising:
  - (i) ELEC2814 Engineering management and society (6 credits)
  - (ii) ELEC2815 Economics, finance and marketing for engineers (6 credits)
- (e) 30 credits of Project and Training comprising:
  - (i) ELEC2812 Integrated project (EComE) (6 credits)
  - (ii) ELEC3801 Technical project (12 credits)
  - (iii) ELEC1810 Workshop training (6 credits)
  - (iv) ELEC1811 Industrial training (6 credits)
- (f) UG5 requirements (21 credits):
  - (i) CAES1507 Professional and technical written communication for engineers<sup>9</sup> (3 credits)

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<sup>9</sup> Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

- (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
- (iii) CENG1001 Practical Chinese language course for engineering students<sup>10</sup> (3 credits)
- (iv) 12 credits of courses in the Common Core Curriculum, selecting no more than one course from each Area of Inquiry

To complete the degree requirement, a candidate must pass all the courses specified in the Curriculum and satisfy any other requirements as stipulated in the University or Faculty of Engineering regulations.

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### Degree Classification

The best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

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### Order of Study

Order of study is dictated by prerequisite and co-requisite requirements. Generally, Level 1 courses should be taken before Level 2 courses, Level 2 courses should be taken before Level 3 courses and core courses should be taken before breadth courses. Courses in Complementary Studies and UG5 Requirements can be taken in any order.

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### **First Year**

The first-year syllabus shall include the following courses:

General Engineering Courses (Total 24 credits)

Either

ENGG1003 Mathematics I (6 credits)

or

ENGG1004 Mathematics IA (3 credits) *and* ENGG1005 Mathematics IB (3 credits)

ENGG1002 Computer programming and applications (6 credits)

ENGG1015 Introduction to electrical and electronic engineering (6 credits)

Additional 6 credits of General Engineering course from Group H

Discipline Core Courses for EComE (Total 24 credits)

ELEC1202 Introduction to electromagnetic waves and fields (6 credits)

ELEC1306 Electric and electronic circuits (6 credits)  
(mutually exclusive with ENGG1008)

ELEC1401 Computer organization and microprocessors (6 credits)

ELEC1503 Object oriented programming and data structures (6 credits)

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<sup>10</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

UG5 Requirements (Total 9 credits)

CAES1507	Professional and technical written communication for engineers (3 credits) <sup>11</sup>
CAES1515	Professional and technical oral communication for engineers (3 credits)
CENG1001	Practical Chinese language course for engineering students (3 credits) <sup>12</sup>

Training (Total 6 credits)

ELEC1810 Workshop training (6 credits)

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## Second Year

The second-year syllabus shall normally include the following courses:

Discipline Core Courses for EComE (Total 30 credits)

ELEC1802	Engineering mathematics II (6 credits)
ELEC2201	Signals and linear systems (6 credits)
ELEC2202	Communications engineering (6 credits)
ELEC2306	Electronic devices and circuits (6 credits)
ELEC2501	Software engineering and operating systems (6 credits)

Breadth/Depth Courses (Total 6 credits)

6 credits of Breadth/Depth Courses selected according to item (c) of the curriculum

Complementary Studies (Total 6 credits)

ELEC2814 Engineering management and society (6 credits)

UG5 Requirements (Total 12 credits)

Two Common Core Courses (12 credits)

Project (Total 6 credits)

ELEC2812 Integrated project (EComE) (6 credits)

Training (Total 6 credits)

ELEC1811 Industrial training (6 credits)

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## Third Year

The third-year syllabus shall normally include the following courses:

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<sup>11</sup> Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

<sup>12</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.



Breadth/Depth Courses (Total 33 credits)

33 credits of Breadth/Depth Courses selected according to item (c) of the curriculum

Complementary Studies (Total 6 credits)

ELEC2815 Economics, finance and marketing for engineers (6 credits)

Project (Total 12 credits)

ELEC3801 Technical project (12 credits)

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## **ELECTRICAL ENGINEERING**

### **SYLLABUS**

This syllabus applies to students admitted in the academic year 2011-12 and thereafter.

#### Definitions 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, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses include Level Two and Three courses.

All courses are grouped into the following 10 Subject Groups:

- A. Electrical Energy
- B. Electronics and Photonics
- C. Signal Processing and Control Systems
- D. Communications and Networking
- E. Computer Systems
- F. Complementary Studies
- G. Projects
- H. General Engineering
- I. Mathematics
- J. Software and IT Applications

A Discipline Core course is a compulsory course which a candidate must pass in the manner provided for in the Regulations. A Breadth Course is a Level 1 or Level 2 course and a Depth Course is a Level 3 course that is offered in one of the subject groups as an optional course for the curriculum.

#### The Curriculum

The curriculum shall comprise at least 180 credits including the following:

- (a) 24 credits from General Engineering courses, including:
  - (i) ENGG1002 Computer programming and applications; AND
  - (ii) ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB; AND
  - (iii) ENGG1015 Introduction to electrical and electronic engineering; AND
  - (iv) An additional 6-credit General Engineering Course from Group H

- (b) 48 credits of Electrical Engineering (EE) Discipline Core Courses
- (c) 45 credits of Breadth/Depth Courses comprising:
  - (i) 21 credits of Breadth/Depth Courses from Groups A, B, C, D, E, J; AND
  - (ii) 6 credits of Breadth/Depth Course from Group I; AND
  - (iii) 18 credits of Depth Courses from Group A
- (d) 12 credits of Complementary Studies Courses comprising:
  - (i) ELEC2814 Engineering management and society (6 credits)
  - (ii) ELEC2815 Economics, finance and marketing for engineers (6 credits)
- (e) ELEC2805 Integrated project (EE) (6 credits)
- (f) ELEC3801 Technical project (12 credits)
- (g) ELEC1810 Workshop training (6 credits)
- (h) ELEC1811 Industrial training (6 credits)
- (i) UG5 requirements (21 credits):
  - (i) CAES1507 Professional and technical written communication for engineers<sup>13</sup> (3 credits)
  - (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
  - (iii) CENG1001 Practical Chinese language course for engineering students<sup>14</sup> (3 credits)
  - (iv) 12 credits of courses in the Common Core Curriculum, selecting no more than one course from each Area of Inquiry

To complete the degree requirement, a candidate must pass all the courses specified in the Curriculum and satisfy any other requirements as stipulated in the University or Faculty of Engineering regulations.

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### Degree Classification

The best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

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### Order of Study

Order of study is dictated by prerequisite and co-requisite requirements. Generally, Level 1 courses should be taken before Level 2 courses, Level 2 courses should be taken before Level 3 courses and core courses should be taken before breadth courses. Courses in Complementary Studies and UG 5 Requirements can be taken in any order.

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### **First Year**

The first-year syllabus shall normally include the following courses:

General Engineering Courses (Total 24 credits)

Either

ENGG1003 Mathematics I (6 credits)

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<sup>13</sup> Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

<sup>14</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

or

ENGG1004 Mathematics IA (3 credits) *and* ENGG1005 Mathematics IB (3 credits)

ENGG1002 Computer programming and applications (6 credits)

ENGG1015 Introduction to electrical and electronic engineering (6 credits)

Additional 6 credits of General Engineering Course from Group H

Discipline Core Courses for EE (Total 24 credits)

ELEC1107 Electrical energy technology (6 credits)

ELEC1401 Computer organization and microprocessors (6 credits)

ELEC1802 Engineering mathematics II (6 credits)

ELEC1306 Electric and electronic circuits (6 credits)  
(mutually exclusive with ENGG1008)

UG5 Requirements (Total 9 credits)

CAES1507 Professional and technical written communication for engineers (3 credits)

CAES1515 Professional and technical oral communication for engineers (3 credits)

CENG1001 Practical Chinese language course for engineering students (3 credits)

Training (6 credits)

ELEC1810 Workshop training (6 credits)

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## **Second Year**

The second-year syllabus shall normally include the following courses:

Discipline Core Courses for EE (Total 24 credits)

ELEC2101 Power transmission and distribution (6 credits)

ELEC2102 Electric energy conversion (6 credits)

ELEC2103 Power electronics (6 credits)

ELEC2201 Signals and linear systems (6 credits)

Breadth/Depth Courses (Total 12 credits)

12 credits of Breadth/Depth Courses selected according to item (c) of the curriculum

Complementary Studies (Total 6 credits)

ELEC2814 Engineering management and society (6 credits)

UG5 Requirements (Total 12 credits)

Two Common Core Courses (12 credits)

Project (Total 6 credits)

ELEC2805 Integrated project (EE) (6 credits)

Training (6 credits)

ELEC1811 Industrial training (6 credits)

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### **Third Year**

The third-year syllabus shall normally include the following courses:

Breadth/Depth Courses (Total 33 credits)

33 credits of Breadth/Depth Courses selected according to item (c) of the curriculum.

Complementary Studies (Total 6 credits)

ELEC2815 Economics, finance and marketing for engineers (6 credits)

Project (Total 12 credits)

ELEC3801 Technical project (12 credits)

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## **INFORMATION ENGINEERING**

### **SYLLABUS**

This syllabus applies to students admitted in the academic year 2011-12 and thereafter.

#### Definitions 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, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses includes Level Two and Three courses.

All subject-related courses are grouped into the following 10 Subject Groups:

- A. Electrical Energy
- B. Electronics and Photonics
- C. Signal Processing and Control Systems
- D. Communications and Networking
- E. Computer Systems
- F. Complementary Studies
- G. Projects
- H. General Engineering
- I. Mathematics
- J. Software and IT Applications

A Discipline Core course is a compulsory course which a candidate must pass in the manner provided for in the Regulations. A Breadth Course is a Level 1 or Level 2 course and a Depth Course is a Level 3 course that is offered in one of the subject groups as an optional course for the curriculum.

## The Curriculum

The curriculum shall comprise at least 180 credits including the following:

- (a) 24 credits from General Engineering courses, including:
  - (i) ENGG1002 Computer programming and applications; AND
  - (ii) ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB; AND
  - (iii) ENGG1015 Introduction to electrical and electronic engineering; AND
  - (iv) An additional 6-credits of General Engineering course from Group H
- (b) 54 credits of Information Engineering (InfoE) Discipline Core Courses
- (c) 39 credits of Breadth/Depth Courses comprising:
  - (i) 18 credits of Depth Courses from Groups A, B, C, D, E, J; AND
  - (ii) 21 credits of Breadth/Depth Courses from Group A, B, C, D, E, I, J but no more than 6 credits from Group I.
- (d) 12 credits of Complementary Studies courses comprising:
  - (i) ELEC2814 Engineering management and society (6 credits)
  - (ii) ELEC2815 Economics, finance and marketing for engineers (6 credits)
- (g) ELEC2807 Integrated project (InfoE) (6 credits)
- (h) ELEC3801 Technical project (12 credits)
- (i) ELEC1810 Workshop training (6 credits)
- (j) ELEC1811 Industrial training (6 credits)
- (k) UG5 requirements (21 credits):
  - (i) CAES1507 Professional and technical written communication for engineers<sup>15</sup> (3 credits)
  - (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
  - (iii) CENG1001 Practical Chinese language course for engineering students<sup>16</sup> (3 credits)
  - (iv) 12 credits of courses in the Common Core Curriculum, selecting no more than one course from each Area of Inquiry

To complete the degree requirement, a candidate must pass all the courses specified in the Curriculum and satisfy any other requirements as stipulated in the University or Faculty of Engineering regulations.

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## Degree Classification

The best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

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## Order of Study

Order of study is dictated by prerequisite and co-requisite requirements. Generally, Level 1 courses should be taken before Level 2 courses, Level 2 courses should be taken before Level 3 courses and core courses should be taken before breadth courses. Courses in Complementary Studies and UG5 Requirements can be taken in any order.

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<sup>15</sup> Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

<sup>16</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

## First Year

The first-year syllabus shall include the following courses:

General Engineering Courses (Total 24 credits)

Either

ENGG1003 Mathematics I (6 credits)

or

ENGG1004 Mathematics IA (3 credits) *and* ENGG1005 Mathematics IB (3 credits)

ENGG1002 Computer programming and applications (6 credits)

ENGG1015 Introduction to electrical and electronic engineering (6 credits)

Additional 6 credits of General Engineering course from Group H

Discipline Core Courses for InfoE (Total 24 credits)

ELEC1306 Electric and electronic circuits (6 credits)  
(mutually exclusive with ENGG1008)

ELEC1401 Computer organization and microprocessors (6 credits)

ELEC1503 Object oriented programming and data structures (6 credits)

ELEC1802 Engineering mathematics II (6 credits)

UG5 Requirements (Total 9 credits)

CAES1507 Professional and technical written communication for engineers (3 credits)<sup>17</sup>

CAES1515 Professional and technical oral communication for engineers (3 credits)

CENG1001 Practical Chinese language course for engineering students (3 credits)<sup>18</sup>

Training (Total 6 credits)

ELEC1810 Workshop training (6 credits)

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## Second Year

The second-year syllabus shall normally include the following courses:

Discipline Core Courses for InfoE (Total 30 credits)

ELEC2201 Signals and linear systems (6 credits)

ELEC2202 Communications engineering (6 credits)

ELEC2403 Computer networks (6 credits)

ELEC2501 Software engineering and operating systems (6 credits)

ELEC2817 Probability and statistics in engineering (6 credits)

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<sup>17</sup> Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

<sup>18</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

Breadth/Depth Courses (Total 6 credits)

6 credits of Breadth/Depth Courses selected according to item (c) of the curriculum

UG5 Requirements (Total 12 credits)

Two Common Core Courses (12 credits)

Complementary Studies (Total 6 credits)

ELEC2814 Engineering management and society (6 credits)

Project (Total 6 credits)

ELEC2807 Integrated project (InfoE) (6 credits)

Training (Total 6 credits)

ELEC1811 Industrial training (6 credits)

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### Third Year

The third-year syllabus shall normally include the following courses:

Breadth/Depth Courses (Total 33 credits)

33 credits of Breadth/Depth Courses selected according to item (c) of the curriculum.

Complementary Studies (Total 6 credits)

ELEC2815 Economics, finance and marketing for engineers (6 credits)

Project (Total 12 credits)

ELEC3801 Technical project (12 credits)

### List of Courses by Subject Groups

Note:

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 Depth Courses in their respective subject groups. Each MSc course is counted as 3 credits.

Group A: Electrical Energy

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ELEC1107	Electrical energy technology (core: EE)	6	-	-
2	ELEC2101	Power transmission and distribution (core: EE)	6	-	ELEC1104 or ELEC1107

2	ELEC2102	Electric energy conversion (core: EE)	6	-	ELEC1103 or ELEC1107
2	ELEC2103	Power electronics (core: EE)	6	-	-
3	ELEC3104	Electric vehicle technology	6	-	-
3	ELEC3105	Building services - electrical services	6	-	-
3	ELEC3106	Building services - electrical installations	6	-	-
3	ELEC3107	Power system analysis and control	6	ELEC2101	-
3	ELEC3111	Electric railway systems	6	ELEC1103 or ELEC1107	-
3	ELEC3112	Power system protection and switchgear	6	ELEC2101	-

Group B: Electronics and Photonics

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ELEC1306	Electric and electronic circuits (core: CE, EE, EComE, InfoE) (mutually exclusive with ENGG1008)	6	-	-
2	ELEC2301	Analogue electronics	6	ELEC1306 or ELEC1305 or ELEC1614	-
2	ELEC2302	Digital system design (core: CE)	6	ENGG1008 or ELEC1306 or ELEC1401	-
2	ELEC2305	Electronic materials and devices	6	-	-
2	ELEC2306	Electronic devices and circuits	6	-	-
3	ELEC3303	Design of digital integrated circuits (mutually exclusive with ELEC2303)	6	ELEC2305 or ELEC1304 or ELEC2306	-
3	ELEC3223	Optical networking devices and technologies	6	ELEC2206 or ELEC2207	-
3	ELEC3612	VLSI design principles	6	-	-

Group C: Signal Processing and Control Systems

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2201	Signals and linear systems (core: EComE, EE, InfoE)	6	-	-
2	ELEC2204	Digital signal processing	6	ELEC2201	-
2	ELEC2205	Control and instrumentation	6	-	ELEC2201
3	ELEC3206	Control systems	6	ELEC2205	-
3	ELEC3222	Robotics	6	ELEC2205	-
3	ELEC3224	Multimedia signals and applications (mutually exclusive with CSIS0315)	6	ELEC2201	-
3	ELEC3225	Digital image processing (mutually exclusive with ELEC3505)	6	ELEC2201	-



Group D: Communications and Networking

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ELEC1202	Introduction to electromagnetic waves and fields (core: EComE)	6	-	-
2	ELEC2202	Communications engineering (core: EComE, InfoE)	6	-	ELEC2201
2	ELEC2207	Engineering electromagnetism	6	ELEC1201 or ELEC1202	-
2	ELEC2403	Computer networks (mutually exclusive with ELEC2402, ELEC2701, CSIS0234) (core: InfoE)	6	-	-
3	ELEC3201	Communication systems	6	ELEC2202	-
3	ELEC3203	Cellular radio and personal communication systems (mutually exclusive with CSIS0328, ELEC6071)	6	ELEC2202	-
3	ELEC3227	Information theory and coding (mutually exclusive with ELEC2304)	6	-	-
3	ELEC3221	Microwave engineering	6	ELEC1201 or ELEC1202 or ELEC2206 or ELEC2207	-
3	ELEC3402	Advanced networking technologies (mutually exclusive with ELEC3401)	6	ELEC2402 or ELEC2403 or ELEC2701 or CSIS0234	-

Group E: Computer Systems

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ELEC1401	Computer organization and microprocessors (core: CE, EComE, EE, InfoE) (mutually exclusive with CSIS1120)	6	-	-
1	ELEC1503	Object-Oriented programming and data structures (mutually exclusive with CSIS0396) (core: EComE, InfoE,)	6	ENGG1002	-
2	ELEC2401	Computer architecture (core: CE) (mutually exclusive with CSIS0231)	6	ELEC1401	-
2	ELEC2501	Software engineering and operating systems (mutually exclusive with CSIS0230 and CSIS0297) (core: EComE, InfoE)	6	-	-
2	ELEC2601	Human computer interaction	6	ELEC1501 or ELEC1502 or ELEC1503 or CSIS0396	-
2	ELEC2603	Systems and network programming (mutually exclusive with ELEC3628, CSIS0402)	6	ELEC1501 or ELEC1502 or ELEC1503 or (CSIS1119 & CSIS0396)	-
3	ELEC3226	Embedded systems	6	ELEC1401 & ELEC2302	-
3	ELEC3503	Fuzzy systems and neural networks	6	-	-
3	ELEC3629	Parallel computing	6	ELEC2401	-
3	ELEC3630	Distributed computing systems	6	(ELEC2501 or CSIS0230) & (ELEC2402 or ELEC2403 or CSIS0234)	-
3	ELEC3631	Computer network security (mutually exclusive with CSIS0327)	6	ELEC2402 or ELEC2403 or CSIS0234	-

Group F: Complementary Studies

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ELEC1810	Workshop training	6	-	-
1	ELEC1811	Industrial training	6	-	-
2	ELEC2814	Engineering management and society	6	-	-
2	ELEC2815	Economics, finance and marketing for engineers	6	-	-

Group G: Projects

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2805	Integrated project (EE)	6	-	-
2	ELEC2807	Integrated project (InfoE)	6	-	-
2	ELEC2812	Integrated project (EComE)	6	-	-
2	ELEC2813	Integrated project (CE)	6	-	-
3	ELEC3801	Technical project	12	-	-
3	ELEC3802	Technical project	12	-	-

Group H: General Engineering

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ENGG1002	Computer programming and applications	6	-	-
1	ENGG1003	Mathematics I	6	-	-
1	ENGG1004	Mathematics IA (mutually exclusive with ENGG1003)	3	-	-
1	ENGG1005	Mathematics IB (mutually exclusive with ENGG1003)	3	-	-
1	ENGG1006	Engineering for sustainable development	6	-	-
1	ENGG1007	Foundations of computer science (can be replaced by CSIS1118 Foundations of computer science) (mutually exclusive with: ELEC1807, CSIS1118)	6	-	-
1	ENGG1009	Industrial management and logistics	6	-	-
1	ENGG1010	Foundations of engineering mechanics	6	-	-
1	ENGG1011	Introduction to biomedical engineering	6	-	-
1	ENGG1015	Introduction to electrical and electronic engineering	6	-	-
1	ENGG10xx	Physics for Engineers	6		

Group I: Mathematics

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ENGG10xx	Mathematics 0	6		
1	ENGG10xx	Mathematics I	6		
2	ENGG10xx	Mathematics IIA	6		
2	ENGG10xx	Mathematics IIB	6		
2	ENGG10xx	Mathematics IIC	6		
2	ENGG10xx	Mathematics III	6		
2	ELEC1802	Engineering mathematics II (core: CE, EComE, EE, InfoE)	6		
2	ELEC2816	Numerical methods and	6		

		optimization (mutually exclusive with CSIS0407)			
2	ELEC2817	Probability and statistics in engineering (core: InfoE)	6		
3	ELEC3705	Queuing theory	6	ELEC2817	

Group J: Software and IT Applications

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	CSIS1119	Introduction to data structures and algorithms (core: CE)	6	CSIS1117 or ELEC1501 or ENGG1002	CSIS1122 (Computer Programming II) (Pre- or Co-requisites)
1	CSIS1122	Computer programming II (core: CE)	6	CSIS1117 or ELEC1501 or ENGG1002	-
2	CSIS0230	Principles of operating systems (mutually exclusive with ELEC2501) (core: CE)	6	CSIS1122 & (CSIS1120 or ELEC1401)	-
2	CSIS0234	Computer and communication networks (mutually exclusive with ELEC2402, ELEC2403) (core: CE)	6	CSIS1120 or ELEC1401	-
2	CSIS0259	Principles of programming languages	6	CSIS1119 & (CSIS1120 or ELEC1401)	-
2	CSIS0278	Introduction to database management systems	6	CSIS1119 or ELEC1501 or ELEC1502 or ELEC1503	-
2	CSIS0297	Introduction to software engineering (core: CE)	6	CSIS1122	-
2	CSIS0311	Legal aspects of computing	6	-	-
2	CSIS0396	Object-oriented programming and Java (mutually exclusive with ELEC1502, ELEC1503)	6	CSIS1117 or ELEC1501 or ENGG1002	-
3	CSIS0218	Discrete event simulation	6	CSIS1119 or CSIS1122 or ELEC1501 or ELEC1502 or ELEC1503	-
3	CSIS0235	Compiling techniques	6	CSIS0259	-
3	CSIS0250	Design and analysis of algorithms	6	CSIS1119 or ELEC1501 or ELEC1502 or ELEC1503 (Pre- or Co-requisites)	
3	CSIS0270	Artificial intelligence	6	CSIS1119 or CSIS1122	-
3	CSIS0271	Computer graphics	6	CSIS1119 or CSIS1122	-

3	CSIS0314	Pattern classification and machine learning	6	CSIS1119 or ELEC1501 or ELEC1502 or ELEC1503	-
3	CSIS0315	Multimedia computing and applications (mutually exclusive with ELEC3224)	6	CSIS1119	-
3	CSIS0317	Computer vision	6	CSIS1119 or ELEC1501 or ELEC1502 or ELEC1503	-
3	CSIS0320	Electronic commerce technology	6	CSIS0278	-
3	CSIS0322	Internet and the World Wide Web (mutually exclusive with CSIS0325)	6	CSIS1117 or ELEC1501 or ENGG1002	-
3	CSIS0323	Advanced database systems	6	CSIS0278	-
3	CSIS0325	Topics in Web technologies (mutually exclusive with CSIS0322)	6	CSIS0322 or CSIS0234	-
3	CSIS0326	Computational molecular biology	6	CSIS0250; or BIOC2808	-
3	CSIS0327	Computer and network security (mutually exclusive with ELEC3631, ELEC3626)	6	CSIS0230 & CSIS0234	-
3	CSIS0328	Wireless and mobile computing (mutually exclusive with ELEC3203, ELEC6071)	6	CSIS0234 & CSIS0396	
3	CSIS0329	Computer game design and programming	6	CSIS0271	-
3	CSIS0351	Advanced algorithm analysis	6	CSIS0250	-
3	CSIS0402	System architecture and distributed computing (mutually exclusive with ELEC2603)	6	CSIS0396	-
3	CSIS0403	Implementation, testing and maintenance of software systems	6	CSIS0396 (Pre- or Co-requisite)	-
3	CSIS0407	Scientific computing (mutually exclusive with ELEC2816)	6	(CSIS1117 or ELEC1501 or ENGG1002) and (CSIS1118 or CSIS1121 or ENGG1007)	-

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### Minor in Electrical and Electronic Engineering

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

- Passed in HKALE Pure Mathematics and
- Passed in HKAL/AS Physics/Engineering Science

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

<u>Code</u>	<u>Course Name</u>	<u>Credits</u>
<i>(i) 12 credits of core courses</i>		
ELEC1306	Electric and Electronic circuits	6
ENGG1015	Introduction to electrical and electronic engineering*	6
<i>(ii) 24 credits of discipline elective courses selected from the following:</i>		
ELEC1107	Electrical energy technology	6
ELEC1202	Introduction to electromagnetic waves and fields	6
ELEC1401	Computer organization and microprocessors	6
ELEC1503	Object-oriented programming and data structures	6
ELEC2101	Power transmission and distribution	6
ELEC2102	Electric energy conversion	6
ELEC2103	Power electronics	6
ELEC2201	Signals and linear systems	6
ELEC2202	Communications engineering	6
ELEC2204	Digital signal processing	6
ELEC2205	Control and instrumentation	6
ELEC2207	Engineering electromagnetism	6
ELEC2301	Analog electronics	6
ELEC2302	Digital system design	6
ELEC2305	Electronic materials and devices	6
ELEC2306	Electronic devices and circuits	6
ELEC2401	Computer architecture	6
ELEC2403	Computer networks	6
ELEC2501	Software engineering & operating systems	6
ELEC2601	Human computer interaction	6
ELEC2603	Systems and network programming	6
ELEC3303	Design of digital integrated circuits	6

\*ELEC1015 cannot be used for satisfying the requirement of both this Minor programme and another degree programme. If ELEC1015 has already been taken for another degree programme, the student should take 6 credits of discipline elective course in list (ii) as a replacement.

### **Double-Degrees in BEng/BBA**

Students pursuing studies for the double-degrees in BEng/BBA curriculum are required to satisfy all the requirement of the above BEng curriculum and pass 54 credits of courses as listed below:

<b>Course Code</b>	<b>Course</b>	<b>Credits</b>
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information system	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6
	Business Electives (Any 2 courses in Finance, HRM or Marketing major)	12
	<b>Total</b>	<b>54</b>

Furthermore, such students are deemed to have satisfied 6 credits of Complementary Studies (ELEC2815 Economics, finance and marketing for engineers), 6 credits of Workshop Training (ELEC1810), 12 credits of Breadth Courses after they have successfully completed 24 credits of courses from the following list. The students are also deemed to have satisfied “CAES1507 Professional and technical written communication for engineers” after they have successfully completed the course “CAES1907 Business communication”.

Course Code	Course	Credits
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information systems	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6

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### Minor in Business/Economics/Finance

Students pursuing studies for Minor in Business/Economics/Finance are required to satisfy all the requirement of the above BEng curriculum and pass 36 credits of courses as prescribed by the Faculty of Business and Economics (information also available from <http://engg.hku.hk/>).

Furthermore, such students are deemed to have satisfied 6 credits of Complementary Studies (ELEC2815 Economics, finance and marketing for engineers) and 6 credits of Workshop Training (ELEC1810) after they have successfully completed 12 credits of courses from the following list.

Course Code	Course	Credits
BUSI1002	Introduction to accounting	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
ECON1002	Introduction to economics II	6
ECON2101	Microeconomic theory	6
ECON2113	Microeconomic analysis	6
FINA1003	Corporate finance	6
FINA2802	Investments and portfolio analysis	6

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### Descriptions of the courses offered by the Department of Electrical and Electronic Engineering for the four specialisms: Computer Engineering, Electrical Engineering, Electronic and Communications Engineering, and Information Engineering.

#### Level One

#### **ELEC1107. Electrical energy technology (6 credits)**

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.

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

**ELEC1202. Introduction to electromagnetic waves and fields (6 credits)**

Vector and Fields; Gauss' Law; Ampere's Circular Law; Feraday's Law; Electrostatic Field; Magnetostatic Fields; Wave Propagation; Tansmission Lines.

Assessment: 60% continuous assessment, 40% examination

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**ELEC1306. Electric and electronic circuits ( 6 credits)**

Electric circuits: Kirchhoff's laws, Thevenin and Norton theorems, superposition, mesh and nodal analyses; ideal operational amplifiers; d.c. circuit analysis; a.c. circuit analysis.

Electronic circuits: diode circuits; basic operation of BJT .

Combinational logic elements and design; sequential circuits; application examples of digital circuits. (mutually exclusive with ENGG1008)

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

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**ELEC1401. Computer organization and microprocessors (6 credits)**

Integer and floating point number representations; brief introduction to digital circuits; memory cells and systems; 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; exception handling; assembler, linker and loader.

(mutually exclusive with CSIS1120)

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

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**ELEC1503. Object-Oriented programming and data structures ( 6 credits)**

This course aims to provide students with solid background on Java software development. The course covers basic concepts of object oriented programming including inheritance, polymorphism, exception handling, multithreading, data structures in object oriented system implementations.

(mutually exclusive with: CSIS0396)

Prerequisite: ENGG1002 Computer Programming and applications

Assessment: 40% continuous assessment, 60% examination

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**ELEC1802. Engineering mathematics II (6 credits)**

Complex variables, Fourier series and transforms, numerical methods, probability and statistics.

Assessment: 20% continuous assessment, 80% examination

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**ELEC1810. Workshop training (6 credits)**

Assessment: 100% continuous assessment



**ELEC1811. Industrial training (6 credits)**

Assessment: 100% continuous assessment

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**Level Two**

**ELEC2101. Power transmission and distribution (6 credits)**

Overhead lines and underground cables; transformers; generators and excitation systems; transmission system steady-state operation; control of power and frequency; control of voltage and reactive power; power system faults analysis; fundamentals of power system stability; substations and protection; power system economics and management.

Co-requisite: ELEC1104 Electrical power plants or ELEC1107 Electrical energy technology

Assessment: 10% practical work, 90% examination

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**ELEC2102. Electric energy conversion (6 credits)**

Electric machines: synchronous machines; induction machines; dc machines; special machines. Electric heating: resistive heating; induction heating; dielectric heating. Lighting: incandescent lamps; discharge lamps. Electrochemistry: batteries; fuel cells.

Co-requisite: ELEC1103 Electrical technology or ELEC1107 Electrical energy technology

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

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**ELEC2103. Power electronics (6 credits)**

Power Semiconductor Devices, AC to DC conversion, AC to AC conversion, DC to DC conversion, DC to AC conversion, computer simulations, practical converter design.

Assessment: 20% continuous assessment, 80% examination

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**ELEC2201. Signals and linear systems (6 credits)**

Linear time-invariant systems; continuous-time signals; convolution; frequency response; time-domain and frequency-domain representation of discrete-time signals and systems; continuous and discrete Fourier transform; z-transform; A/D and D/A conversion; sampling and reconstruction; digital filters.

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

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**ELEC2202. Communications engineering (6 credits)**

Communications system models, properties of signals, baseband transmission, analogue signal transmission, digital transmissions of analogue signals, digital and analogue communications systems, transmission line theory.

Co-requisite: ELEC2201 Signals and linear systems

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

**ELEC2204. Digital signal processing (6 credits)**

Applications of digital signal processing, discrete-time signal and system, design of digital filters, DFT and fast algorithms, digital signal processing using Matlab, fundamentals of random signals, spectral estimation, adaptive signal processing, digital signal processors.

Prerequisite: ELEC2201 Signals and linear systems

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

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**ELEC2205. Control and instrumentation (6 credits)**

Introduction to control systems; principles of feedback; root-locus method; frequency-response design methods; state-space methods; control system software; digital control; measurement systems; electromagnetic compatibility; data acquisition.

Co-requisite: ELEC2201 Signals and linear systems

Assessment: 15% practical work, 85% examination

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**ELEC2207. Engineering electromagnetism (6 credits)**

Maxwell's Equations; Materials; Vector Potentials and Scalar Potentials; Wave Propagation; Waveguide; Transmission Lines; Antennas.

Prerequisite: ELEC1201 Fundamental electromagnetic theory or ELEC1202 Introduction to electromagnetic waves and fields

Assessment: 60% continuous assessment, 40% examination

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**ELEC2301. Analogue electronics (6 credits)**

FET amplifiers; frequency responses of amplifiers; differential and multistage amplifiers; feedback amplifiers; active filters and tuned amplifiers; oscillators; regulators; A/D and D/A converters.

Prerequisite: ELEC1306 Electric and electronic circuits or ELEC1305 Electronic circuits or ELEC1614 Electronic devices and circuits

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

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**ELEC2302. Digital system design (6 credits)**

Digital system concepts and digital components; digital design using discrete and programmable devices; high speed digital system design considerations; Hardware Description Language (HDL); digital system structures; digital logic and memory testing; fault detection analysis and design; Design for Test (DFT) techniques.

Prerequisites: ENGG1008 or ELEC1306 or ELEC1401

Assessment: 15% practical work, 85% examination

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**ELEC2305. Electronic materials and devices (6 credits)**

Quantum theory; solid-state theory; electrical, dielectric, optical and magnetic properties of materials; PN junction theory; optoelectronics; bipolar junction transistor; field-effect devices : JFET, MOS capacitor, MESFET and MOSEFET.

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

**ELEC2306. Electronic devices and circuits (6 credits)**

Electronic devices: quantum theory; solid-state theory; PN junction theory; bipolar junction transistor; field-effect devices including JFET and MOSFET. Electronic circuits: analyses of BJT and FET amplifiers; digital circuits.

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

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**ELEC2401. Computer architecture (6 credits)**

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; parallel processors  
Prerequisite: ELEC1401 Computer organization and microprocessors  
(mutually exclusive with CSIS0231)

Assessment: 40% continuous assessment, 60% examination

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**ELEC2403. Computer networks (6 credits)**

Data communication networks and facilities; network structures; protocols; local area networks; wide area networks; network trends; data security.  
(mutually exclusive with: ELEC2402, ELEC2701 & CSIS0234)

Assessment: 20% continuous assessment, 80% examination

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**ELEC2501. Software engineering and operating systems (6 credits)**

Fundamentals of Software Engineering: software life cycle and software engineering process; planning and requirements definition; software design concepts; software architectural and detail design methodologies; software testing strategies; software maintenance; software quality and metrics; software documentation.

Fundamentals of operating systems: basic operating system and process concepts; concurrent processes and programming; processor management; primary and secondary memory management; file and database systems.  
(mutually exclusive with CSIS0230 and CSIS0297)

Assessment: 15% practical work, 85% examination

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**ELEC2601. Human computer interaction (6 credits)**

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.

Prerequisite: ELEC1501 Computer programming and data structures, or ELEC1502 Object oriented programming and data structures, or ELEC1503 Object-oriented programming and data structures, or

CSIS0396 Object-oriented programming and Java.  
Assessment: 40% continuous assessment, 60% examination

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**ELEC2603. 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. The course covers both classical UNIX multiprogramming software development and object oriented system implementations for networked applications.

Prerequisite: ELEC1501 Computer programming and data structures or ELEC1502 Object oriented programming and data structures or ELEC1503 Object-oriented programming and data structures,, or CSIS1119 Introduction to data structures and algorithms and CSIS0396 Object-oriented programming and Java

(Mutually exclusive with ELEC3628 Network programming, CSIS0402 System architecture and distributed computing)

Assessment: 40% continuous assessment, 60% examination

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**ELEC2805. Integrated project (EE) (6 credits)**

A group project consisting of guided design and implementation of an engineering product. This project offers students in small teams an opportunity to apply their knowledge in electronics, electrical machines, computer hardware and software as well as project management, following a disciplined engineering process, to achieve the final goal.

Assessment: 100% continuous assessment

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**ELEC2807. Integrated project (InfoE) (6 credits)**

A group project consisting of guided design and implementation of an engineering product. This project offers students in small teams an opportunity to apply their knowledge in electronics, electrical machines, computer hardware and software as well as project management, following a disciplined engineering process, to achieve the final goal.

Assessment: 100% continuous assessment

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**ELEC2812. Integrated project (EComE) (6 credits)**

A group project consisting of guided design and implementation of an engineering product. This project offers students in small teams an opportunity to apply their knowledge in electronics, electrical machines, computer hardware and software as well as project management, following a disciplined engineering process, to achieve the final goal.

Assessment: 100% continuous assessment

**ELEC2813. Integrated project (CE) (6 credits)**

A group project consisting of guided design and implementation of an engineering product. This project offers students in small teams an opportunity to apply their knowledge in electronics, electrical machines, computer hardware and software as well as project management, following a disciplined engineering process, to achieve the final goal.

Assessment: 100% continuous assessment

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**ELEC2814. Engineering management and society (6 credits)**

Professional conduct and social responsibility, sustainability and safety issues, technology and environment, ethics at work; Engineering organization and project, management functions and managerial skills, decision making processes, contingency and crisis management, leadership, corporate culture and philanthropy. Contract, intellectual property, tort, professional negligence and related law issues.

Assessment: 50% continuous assessment, 50% examination

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**ELEC2815. Economics, finance and marketing for engineers (6 credits)**

Macroeconomics, microeconomics, value chain, international trade; Financial management, cost and profit, shares and bonds, accounting concepts and financial statements, cash flow, rate of return; Risk management, hedging and future, investment portfolio, technical analysis; Marketing management, marketing mix, marketing media, marketing plan, and Business ethics.

Assessment: 30% continuous assessment, 70% examination

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**ELEC2816. Numerical methods and optimization (6 credits)**

Initial value problems; Numerical methods in linear algebra; Optimization theory; Unconstrained optimization; Constrained optimization; Optimization algorithms; Optimization theory; Unconstrained optimization; Constrained optimization; Optimization algorithms.

(mutually exclusive with CSIS0407)

Assessment: 20% continuous assessment, 80% examination

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**ELEC2817. Probability and statistics in engineering (6 credits)**

Probability, random variables, mathematical expectation, functions of random variables, fundamental sampling distributions, sample estimation problems, hypothesis testing, linear regression.

Assessment: 30% continuous assessment, 70% examination

### **Level Three**

#### **ELEC3104. Electric vehicle technology (6 credits)**

Electric Vehicle (EV) development; EV systems; electric propulsion; energy sources; EV auxiliaries; EV infrastructure; impacts.

Assessment: 40% continuous assessment, 60% examination

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#### **ELEC3105. Building services - electrical services (6 credits)**

Design and installation criteria of lighting systems, vertical transportation systems, building automation systems, energy management, communication systems, ventilation systems, fire services, security and alarm systems of buildings.

Assessment: 20% continuous assessment, 80% examination

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#### **ELEC3106. Building services - electrical installations (6 credits)**

Design and installation criteria: electricity distribution in buildings; protection against direct and indirect contacts, earthing and bonding; protective devices; cable management; lightning protection; standby power supplies.

Assessment: 20% continuous assessment, 80% examination

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#### **ELEC3107. Power system analysis and control (6 credits)**

Load flow analysis, fault analysis, power system components modeling, small and large disturbance synchronous stability, voltage stability, economic operation, HVDC systems.

Prerequisite: ELEC2101 Power transmission and distribution

Assessment: 10% continuous assessment, 90% examination

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#### **ELEC3111. Electric railway systems (6 credits)**

DC/AC electrification systems; operation, control and protection systems; rolling-stocks; magnetic levitation systems; high-speed rail networks.

Prerequisite: ELEC1103 Electrical technology or ELEC1107 Electrical energy technology

Assessment: 25% continuous assessment, 75% examination

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#### **ELEC3112. Power system protection and switchgear (6 credits)**

Protective relays; transducers, transmission line protection, rotating machine protection, over-voltage, circuit breaker technologies, switchgear, auto-recloser and sectionalizer, surge protection.

Prerequisite: ELEC2101 Power transmission and distribution

Assessment: 10% practical work, 90% examination

**ELEC3201. Communication systems (6 credits)**

Spectral analysis; random signal theory; information theory; noise in analogue systems; digital transmission through AWGN channels; digital carrier-modulation schemes; error control coding.

Prerequisite: ELEC2202 Communications engineering

Assessment: 10% practical work, 90% examination

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**ELEC3203. Cellular radio and personal communications systems (6 credits)**

Cellular radio and mobile communications systems; FDMA; TDMA; CDMA..

Prerequisite: ELEC2202 Communications engineering

(mutually exclusive with CSIS0328, ELEC6071)

Assessment: 30% practical work, 70% examination

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**ELEC3206. Control systems (6 credits)**

State-space theory for dynamic systems; linear quadratic optimal control; nonlinear systems; digital systems and computer control; system identification; Kalman filtering; fuzzy control.

Prerequisite: ELEC2205 Control and instrumentation

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

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**ELEC3221. Microwave engineering (6 credits)**

Maxwell's Equations; Transmission Lines; Waveguides; Network Analysis; Impedance; Resonator; Power Divider; Coupler; Microstrip Lines; Antennas.

Prerequisite: ELEC1201 Fundamental electromagnetic theory or ELEC1202 Introduction to electromagnetic waves and fields or ELEC2206 Electromagnetic waves or ELEC2207 Engineering electromagnetism or ELEC1202 Introduction to electromagnetic waves and fields

Assessment: 60% continuous assessment, 40% examination

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**ELEC3222. Robotics (6 credits)**

Introduction to robot configurations; forward and inverse kinematics; robot dynamics and control; robot path planning and programming; robot applications; special topics in robotics.

Prerequisite: ELEC2205 Control and instrumentation

Assessment: 20% continuous assessment, 80% examination

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**ELEC3223. Optical networking devices and technologies (6 credits)**

Principles of optical waveguides and fibers; light sources and detectors; optical transmitters and receivers designs; optical system designs; optical passive devices and sensor technologies.

Prerequisite: ELEC2206 Electromagnetic waves or ELEC2207 Engineering electromagnetism

Assessment: 20% continuous assessment, 80% examination

**ELEC3224. Multimedia signals and applications (6 credits)**

Basic concept and terminology in multimedia applications. Digital representations of important media such as speech, audio, images and videos. Formats, compression methods and standards.

Prerequisite: ELEC2201 Signal and Linear Systems  
(mutually exclusive with CSIS0315)

Assessment: 30% continuous assessment, 70% examination

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**ELEC3225. Digital image processing (6 credits)**

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.

Prerequisite: ELEC2201 Signals and Linear Systems  
(mutually exclusive with ELEC3505)

Assessment: 40% continuous assessment, 60% examination

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**ELEC3226. 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.

Prerequisite: ELEC1401 Computer organization and microprocessors & ELEC2302 Digital system design

Assessment: 60% continuous assessment, 40% practical work

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**ELEC3227. Information theory and coding (6 credits)**

Measure of information, source entropy, Shannon's theorems, channel capacity. Noiseless source coding, error control coding, linear block codes, cyclic codes, convolution code, data encryption.

(mutually exclusive with ELEC3204 Information theory and coding)

Assessment: 30% continuous assessment, 70% examination

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**ELEC3303. Design of digital integrated circuits (6 credits)**

IC processing, MOSFET, NMOS logic, Layout design, Design rules, Extraction of device parameters, Isolation concerns, Design of memory circuits, CMOS processing and problems, SOI, analysis and layout design CMOS circuits, Effects of scaling on circuit performance, Bipolar junction transistor, BiCMOS circuits.

Prerequisite: ELEC2305 Electronic materials and devices or ELEC1304 Electronic devices or ELEC2306 Electronic devices and circuits

(mutually exclusive with ELEC2303 Design of digital integrated circuits)

Assessment: 50% continuous assessment, 50% examination



**ELEC3402. Advanced networking technologies (6 credits)**

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

Prerequisite: ELEC2402 Computer communications or ELEC2403 Computer networks or ELEC2701 Internet technologies and applications or CSIS0234  
(mutually exclusive with ELEC3401)

Assessment: 40% continuous assessment, 60% examination

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**ELEC3503. Fuzzy systems and neural networks (6 credits)**

The mathematics of fuzzy systems; linguistic variables; fuzzy rules; fuzzy inference; fuzzifiers and defuzzifiers; approximation properties of fuzzy systems; design of fuzzy systems; design of fuzzy systems; artificial neural networks; learning procedures of adaptive networks; supervised learning; unsupervised learning; fuzzy-neuro modeling; applications to control problems.

Assessment: 30% continuous assessment, 70% examination

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**ELEC3612. VLSI design principles (6 credits)**

Technology issues, custom and semi-custom design, gate array and standard cell approach, programmable logic arrays, hierarchical design methodologies, design verification, automatic circuit/system synthesis, silicon compilation, design for testability.

Assessment: 50% continuous assessment, 50% examination

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**ELEC3629. Parallel computing (6 credits)**

In-depth study of contemporary parallel architectures; parallel programming paradigms; parallel programming languages and libraries; parallel computing models; parallel algorithms; performance analysis.

Prerequisite: ELEC2401 Computer architecture

Assessment: 40% continuous assessment, 60% examination

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**ELEC3630. Distributed computing systems (6 credits)**

General theory of distributed computing systems; distributed protocol design and analysis; case studies on existing distributed systems; network programming

Prerequisite: (ELEC2501 Software engineering and operating systems or CSIS0230 Principles of operating systems) and (ELEC2402 Computer communications or ELEC2403 Computer networks or CSIS0234 Computer and communication networks)

Assessment: 40% continuous assessment, 60% examination

**ELEC3631. 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.).

Prerequisite: ELEC2402 Computer communications or ELEC2403 Computer networks or CSIS0234 Computer and communication networks  
(mutually exclusive with CSIS0327 Computer and network security)

Assessment: 40% continuous assessment, 60% examination

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**ELEC3705. Queuing theory (6 credits)**

Basic notation, discrete and continuous time Markov chains, birth-death processes, elementary queuing systems (M/M/m/A/B queuing systems), Markovian queues in equilibrium, simulation techniques.

Pre-requisite: ELEC2817 Probability and Statistics in Engineering

Assessment: 30% continuous assessment, 70% examination

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**ELEC3801. Technical project (12 credits)**

Assessment: 100% continuous assessment

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**ELEC3802. Technical project (12 credits)**

Assessment: 100% continuous assessment

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**General Engineering Courses**

- ENGG1002. Computer programming and applications (6 credits)**
- ENGG1003. Mathematics I (6 credits)**
- ENGG1004. Mathematics IA (3 credits)**
- ENGG1005. Mathematics IB (3 credits)**
- ENGG1006. Engineering for sustainable development (6 credits)**
- ENGG1007. Foundations of computer science (6 credits)**
- ENGG1009. Industrial management and logistics (6 credits)**
- ENGG1010. Foundations of engineering mechanics (6 credits)**
- ENGG1011. Introduction to biomedical engineering (6 credits)**
- ENGG1015. Introduction to electrical and electronic engineering (6 credits)**

Please refer to the General Engineering courses in the syllabus for the degree of BEng for details.

# INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT

## SYLLABUS

(Applicable to students admitted in the academic year 2010-11 and thereafter)

### Definitions 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, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses includes Level Two and Three courses. The course level is indicated in the first left-most digit of the 4-digit numeral in the latter half of the course code. As an example, a Level One course shall read <IMSE1xxx>.

A Core course is a course in the curriculum that a candidate must take and pass according to the criteria provided in the Regulations. A Discipline Elective course refers to any optional subject offered by the Department, provided that it does not overlap significantly with the other courses that the student has already enrolled in. An Elective Courses is a course offered by other departments under the Faculty of Engineering, or by other faculties.

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### The Curriculum

The curriculum comprises 180 credits of courses as follows:

- (a) 96 credits of Core Engineering courses of the curriculum, including:
  - (i) Integrative project (6 credits)
  - (ii) Technical project (12 credits)
  - (iii) either (1) ENGG1002 Computer programming and applications (6 credits) or ENGG1016 Computer programming and applications I (6 credits)
  - (iv) either (1) ENGG1003 Mathematics I (6 credits) or (2) ENGG1004 Mathematics IA (3 credits) and IMSE1018 Mathematics (IMSE) (3 credits)
- (b) 51 credits of Elective courses, including:
  - (i) Discipline Elective courses (36 credits)
  - (ii) General Engineering Courses (12 credits)
  - (iii) Elective course (3 credits)
- (c) 9 credits of Language Enhancement courses, comprising:
  - (i) Professional and technical written communication for engineers (3 credits)<sup>19</sup>
  - (ii) Professional and technical oral communication for engineers (3 credits)
  - (iii) Practical Chinese language course for engineering students (3 credits)<sup>20</sup>
- (d) Common Core Courses (selecting not more than one course from each Area of Inquiry) (12 credits)
- (e) Engineering training (6 credits)
- (f) Internship (6 credits)

To complete the curriculum, a candidate must enroll in all the courses specified in the curriculum, and must pass the courses listed under (a) to (f) for a combination totaling to 180 credits.

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<sup>19</sup> Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1509

<sup>20</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

## Degree Classification

All the 180 credits under the curriculum will be counted towards degree classification, according to the following:

- (a) 9 credits of Language Enhancement courses;
- (b) 96 credits of Core Engineering courses;
- (c) 12 credits of Engineering training and Internship;
- (d) 12 credits of Common Core Courses;
- (e) The remaining courses with the best results, including at least 36 credits of Discipline Elective courses, 12 credits of General Engineering Courses and 3 credits of Elective course.

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## Order of Study

Order of study is dictated by the prerequisite and the co-requisite requirements. Generally, Level One courses should be taken before Level Two courses, Level Two courses should be taken before Level Three courses and Core Engineering courses should be taken before Discipline Elective courses.

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## **First Year**

### Loading

The normal loading is 60 credits of Level One courses, with 30 credits of courses in each semester. Students are required to do Engineering Training (6 credits / Major Course Level: Introductory) within the 60 credits of courses.

### Courses

Students must take the examination/coursework/continuous assessment in the following courses and pass the courses listed under (a) to (f):

- (a) Core Engineering courses (24 credits)
- (b) 2 Elective courses from the General Engineering Courses (12 credits)
- (c) 3 Language Enhancement courses (9 credits) consisting of
  - (i) 2 English Communications courses (6 credits)
  - (ii) 1 Chinese Language course (3 credits)
- (d) 1 course from the Common Core Curriculum (6 credits)
- (e) 1 elective course offered by other departments of the Faculty of Engineering or other faculties (3 credits)
- (f) Engineering Training (6 credits)

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE1003	Introduction to business and management	6	1	Introductory
IMSE1009	Fundamentals of engineering design	6	1	Introductory
ENGG1003	Mathematics I	6	1	N/A
<b>OR</b>				
ENGG1004	Mathematics IA	3	1	N/A
IMSE1018	Mathematics (IMSE)	3	1	Introductory
ENGG1002	Computer programming and applications	6	1	N/A

OR				
ENGG1016	Computer programming and applications I	6	1&2	N/A
Credits required: 24				

General Engineering Courses			
Code	Title	Credits	Length (Sem)
ENGG1009	Industrial management and logistics	6	1
ENGG1006	Engineering for sustainable development	6	1
ENGG1007	Foundations of computer science	6	1
ENGG1010	Foundations of engineering mechanics	6	1
ENGG1011	Introduction to biomedical engineering	6	1
ENGG1015	Introduction to electrical and electronic engineering	6	1
Select 2 courses from the above General Engineering Courses; credits required: 12			

Language Enhancement Courses			
Code	Title	Credits	Length (Sem)
CAES1509	Professional and technical written communication for engineers <sup>21</sup>	3	1
CAES1515	Professional and technical oral communication for engineers	3	1
CENG1001	Practical Chinese language course for engineering students <sup>22</sup>	3	1
Credits required: 9			

Common Core / Elective Courses			
Code	Title	Credits	Length (Sem)
	Common Core Course	6	1
	(Any Elective course)	3	1
Credits required: 9			

Training			
Code	Title	Credits	Length (Sem)
IMSE1021	Engineering Training	6	Summer
Credits required: 6			

## Second Year

### Loading

The normal loading for a student is 60 credits of Level Two courses, with 30 credits of courses in each semester. Students are required to do Internship (6 credits / Major Course Level: Advanced) within the 60 credits of courses.

<sup>21</sup> Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1509

<sup>22</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

## Courses

Students must take the examination/coursework/continuous assessment in the following courses and pass the courses listed under (a) to (d).

- (a) 7 Core Engineering courses (42 credits)
- (b) 1 Discipline Elective course (6 credits)
- (c) 1 course from the Common Core Curriculum (6 credits) (d) Internship (6 credits)

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE2005	Managerial accounting and finance	6	1	Advanced
IMSE2006	Manufacturing technology	6	1	Advanced
IMSE2008	Operational research techniques	6	1	Advanced
IMSE2009	Quality management	6	1	Advanced
IMSE2024	Mathematics II	6	1	Advanced
IMSE2025	Integrative studies (IE practice)	6	1	Advanced
IMSE2026	Engineers in society	6	1	Advanced
Credits required: 42				

Discipline Elective Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE1012	Engineering technology	6	1	Advanced
IMSE1013	Introduction to information systems	6	1	Advanced
IMSE1014	Product development	6	1	Advanced
IMSE1017	Engineering systems analysis	6	1	Advanced
IMSE1019	Industrial systems modeling and simulation	6	1	Advanced
IMSE2016	Internet technology for e-commerce	6	1	Advanced
IMSE2028	Human factors engineering	6	1	Advanced
Select 1 course from the above Discipline Elective Courses; credits required: 6				

Common Core Course			
Code	Title	Credits	Length (Sem)
	Common Core Course	6	1
Credits required: 6			

Training			
Code	Title	Credits	Length (Sem)
IMSE2029	Internship	6	Summer
Credits required: 6			

## **Third Year**

### Loading

The normal loading for a student is 60 credits of Level Three courses, with 30 credits of courses in each semester.

## Courses

Students must take the examination/coursework/continuous assessment in the following courses and pass the courses listed under (a) and (b):

- (a) 4 Core Engineering courses (30 credits), comprising:
  - (i) IMSE3001 Computer integrated manufacturing (6 credits)
  - (ii) Technical Project - IMSE3014 Project (12 credits)
  - (iii) Integrative project - IMSE3015 Industrial systems integration (6 credits)
  - (iv) IMSE3016 Operations planning and controls (6 credits)
- (b) A combination of Discipline Elective courses totaling to 30 credits

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE3001	Computer integrated manufacturing	6	1	Advanced
IMSE3014	Project	12	2	Advanced
IMSE3015	Industrial systems integration	6	2	Advanced
IMSE3016	Operations planning and controls	6	1	Advanced
Credits required: 30				

Discipline Elective Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE0201	Supply chain design and development	6	1	Advanced
IMSE2003	Industrial automation	6	1	Advanced
IMSE2018	Industrial organisation and management	6	1	Advanced
IMSE2019	Stochastic decision systems	6	1	Advanced
IMSE2027	Facilities planning and design	6	1	Advanced
Select 2 courses from the above IMSE2XXX Discipline Elective courses; credits required: 12				
IMSE3002	Engineering project management	6	1	Advanced
IMSE3010	Financial engineering	6	1	Advanced
IMSE3018	Advanced manufacturing technology	6	1	Advanced
IMSE3019	Digital enterprises and e-commerce	6	1	Advanced
IMSE3020	Technology marketing	6	1	Advanced
IMSE3021	Strategic management of business and technology	6	1	Advanced
IMSE3028	Innovation and entrepreneurship	6	1	Advanced
IMSE3029	Manufacturing system analysis and design	6	1	Advanced
Select 3 courses from the above IMSE3XXX Discipline Elective courses: credits required: 18				
Credits required: 30				

## **Summary of the prerequisite relationship between First, Second and Third Year courses**

### **First Year**

Code	Title	Prerequisite
Core Engineering courses		
IMSE1003	Introduction to business and management	None
IMSE1009	Fundamentals of engineering design	None

ENGG1003	Mathematics I	None
<b>OR</b>		
ENGG1004 IMSE1018	Mathematics IA Mathematics (IMSE)	None None
ENGG1002	Computer programming and applications	None
<b>OR</b>		
ENGG1016	Computer programming and applications I	None
General Engineering Courses		
ENGG1009	Industrial management and logistics	None
ENGG1006	Engineering for sustainable development	None
ENGG1007	Foundations of computer science	None
ENGG1015	Introduction to electrical and electronic engineering	None
ENGG1010	Foundations of engineering mechanics	None
ENGG1011	Introduction to biomedical engineering	None

## Second Year

Code	Title	Prerequisite
Core Engineering Courses		
IMSE2005	Managerial accounting and finance	IMSE1003 Introduction to business and management
IMSE2006	Manufacturing technology	None
IMSE2008	Operational research techniques	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2009	Quality management	None
IMSE2024	Mathematics II	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2025	Integrative studies (IE practice)	None
IMSE2026	Engineers in society	None
Discipline Elective Courses		
IMSE1012	Engineering technology	None
IMSE1013	Introduction to information systems	None
IMSE1014	Product development	None
IMSE1017	Engineering systems analysis	None
IMSE1019	Industrial systems modeling and simulation	None
IMSE0201	Supply chain design and development	IMSE1003 Introduction to business and management
IMSE2003	Industrial automation	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2016	Internet technology for e-commerce	None
IMSE2018	Industrial organisation and management	IMSE1003 Introduction to business and management



IMSE2019	Stochastic decision systems	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2028	Human factors engineering	None

### Third Year

Code	Title	Prerequisite
Core Engineering Courses		
IMSE3001	Computer integrated manufacturing	IMSE1009 Fundamentals of engineering design
IMSE3014	Project	None
IMSE3015	Industrial systems integration	None
IMSE3016	Operations planning and control	IMSE2008 Operational research techniques
Discipline Elective Courses		
IMSE0201	Supply chain design and development	IMSE1003 Introduction to business and management
IMSE2003	Industrial automation	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2018	Industrial organisation and management	IMSE1003 Introduction to business and management
IMSE2019	Stochastic decision systems	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2028	Human factors engineering	None
IMSE3002	Engineering project management	Co-requisite: IMSE2008 Operational research techniques
IMSE3010	Financial engineering	IMSE2005 Managerial accounting and finance
IMSE3018	Advanced manufacturing technology	IMSE2006 Manufacturing technology
IMSE3019	Digital enterprises and e-commerce	IMSE2016 Internet technology for e-commerce or IMSE1013 Introduction to information systems or IMSE1008 Computer applications for engineers or ENGG1002 Computer programming and applications or ENGG1013 Computer programming and applications IA and

		ENGG1014 Computer programming and applications IB or ENGG1016 Computer programming and applications I
IMSE3020	Technology marketing	IMSE1003 Introduction to business and management
IMSE3021	Strategic management of business and technology	IMSE1003 Introduction to business and management
IMSE3028	Innovation and entrepreneurship	None
IMSE3029	Manufacturing system analysis and design	IMSE2008 Operational research techniques

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## COURSE DESCRIPTIONS

### Level One

#### A. Core Engineering Courses

##### **IMSE1003. Introduction to business and management (6 credits)**

Business of production; business environment, globalization, the positions of Hong Kong and China; marketing and distribution; the firm and the customer; the firm and its suppliers; finance and the firm; costs of production; human resource management; introduction to manufacturing systems; management and integration; the engineer in society, professional ethics; development of technology and interaction between societies and technology, intellectual property; the environment and safety.

Assessment: 30% continuous assessment and 70% examination

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##### **IMSE1009. 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

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##### **IMSE1018. Mathematics (IMSE) (3 credits)**

Probability laws, random variables, probability distributions and expectation; optimization of functions of two or more variables; numerical methods in root-finding, approximation and integration of single variable functions.

Assessment: 10% continuous assessment and 90% examination

## **B. Language Enhancement Courses**

### **CAES1509. Professional and technical written communication for engineers (3 credits)**

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using written English. Topics include accessing, abstracting, analysing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; small-scale project design and implementation.

Assessment: 100% continuous assessment

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### **CAES1515. Professional and technical oral communication for engineers (3 credits)**

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: 100% continuous assessment

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### **CENG1001. Professional Chinese language course for engineering students (3 credits)**

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

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## **C. Common Core Course (6 credits)**

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## **D. Elective Course (3 credits)**

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## **E. Engineering Training**

### **IMSE1021. 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

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## **Level Two**

### **A1. Core Engineering Courses**

#### **IMSE2005. Managerial accounting and finance (6 credits)**

Cost accounting - procedures; direct costs, absorption costing; marginal costing. Planning and control - budgetary planning 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 - cash flow statements; interpretation of accounting data.

Prerequisite: IMSE1003 Introduction to business and management

Assessment: 30% continuous assessment and 70% examination

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**IMSE2006. 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: 25% continuous assessment and 75% examination

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**IMSE2008. Operational research techniques (6 credits)**

Philosophy and methodology of Operational Research: problem analysis, establishing objectives, identifying decision variables, model building, implementation and monitoring solutions; Operational Research techniques and their applications in operations management: linear programming and its extensions, dynamic programming, queuing theory, and replacement models for single components and capital equipment.

Prerequisite: ENGG1003 Mathematics I, or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)

Assessment: 10% continuous assessment and 90% examination

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**IMSE2009. Quality management (6 credits)**

Total quality management; management tools for quality; benchmarking; quality assurance management systems; ISO9000 series; national quality awards; design of industrial experiments; statistical process control; control charts; acceptance sampling; environmental management; ISO14000 series; environmental management systems; business process reengineering; customer services quality.

Assessment: 30% continuous assessment and 70% examination

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**IMSE2024. Mathematics II (6 credits)**

Probability laws, random variables, probability distributions and expectation; some important discrete and continuous distributions; random samples and sampling distributions; parameter estimation and hypothesis testing; design of experiments and analysis of variance; regression analysis; non-parametric methods; statistical quality control and reliability engineering; introduction to stochastic processes and Markov chains; application examples in industrial and logistics engineering.

Prerequisite: ENGG1003 Mathematics I, or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)

Assessment: 10% continuous assessment and 90% examination

**IMSE2025. Integrative studies (IE practice) (6 credits)**

To develop students in the areas of technical literature survey, analysis and assimilation of materials, skills of written and oral presentation, composition and implementation of ideas, communication and interactive skills through student and product centred activities, interactive and project-based learning.

The major element of the module is a group project on the product and manufacturing system design of a manufactured product. The group project is to integrate the applications of various topics including: project management; product life-cycle management; manufacturing logistics; cost accounting; scheduling; process planning and workflow; human factors; distribution and marketing.

Assessment: 100% continuous assessment

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**IMSE2026. Engineers in society (6 credits)**

Economic, industrial and social context of engineering; responsibilities of professional engineers, the legal, environmental, economical and ethical roles of engineers in society, judgment and decision process based on non-technical aspects such as financial, environmental and cultural considerations, meeting with professional engineers from the industrial and logistics sectors.

Assessment: 30% continuous assessment and 70% examination

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**A2. Discipline Elective Courses****IMSE1012. 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 and phasors.

Assessment: 20% continuous assessment and 80% examination

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**IMSE1013. Introduction to information systems (6 credits)**

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

Assessment: 40% continuous assessment and 60% examination

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**IMSE1014. 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 and 60% examination

**IMSE1017. 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); artificial intelligence techniques for system analysis and solution generation.

Assessment: 20% continuous assessment and 80% examination

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**IMSE1019. Industrial systems modeling 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: 40% continuous assessment and 60% examination

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**IMSE0201. Supply chain design and development (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: IMSE1003 Introduction to business and management

Assessment: 20% continuous assessment and 80% examination

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**IMSE2003. Industrial automation (6 credits)**

Conditions and justification for automation; basic components of industrial automation; electric, pneumatic/hydraulic systems, automation systems design, introduction to robotics. Open-loop and closed-loop control; system performance analysis, system stability assessment; analogue and digital control systems, and their applications in industry.

Prerequisite: ENGG1003 Mathematics I, or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)

Assessment: 20% continuous assessment and 80% examination

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**IMSE2016. Internet technology for e-commerce (6 credits)**

Overview of E-Business and E-Commerce: Electronic Business Solutions (EBS), 3-tiered architecture, EBS technologies; Business Models: Their new dimensions and impacts, types and choice; Design and development: user requirement analysis, system development paradigms, structured system development and object-oriented system development methods. Adoption and Implementation: internet programming, web-based system development, online database design and implementation, case studies and mini-project.

Assessment: 60% continuous assessment and 40% examination

**IMSE2018. 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: IMSE1003 Introduction to business and management

Assessment: 30% continuous assessment and 70% examination

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**IMSE2019. Stochastic decision systems (6 credits)**

Decision analysis: decision making under uncertainty, axioms of decision analysis, methodology of decision analysis, analytical hierarchy approach, quantification of judgemental uncertainties, assessing utilities, and group decision problems; game theory and gaming: extensive and normal forms, zero-sum two-person games, two-persons nonzero-sum games, n-persons games, teaching and training and operational gaming; stochastic processes: random walks, recurrent events, Markov chains, and renewal-processes.

Prerequisite: ENGG1003 Mathematics I, or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)

Assessment: 30% continuous assessment and 70% examination

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**IMSE2027. Facilities planning and design (6 credits)**

Plant location problem; advanced techniques in plant layout design, computer-based layout planning, and quantitative approaches; materials handling, storage and warehousing for global manufacturing; lean manufacturing, cellular manufacturing, one-piece flow; workplace design in the information age; digital factory; fire safety and security; study cases drawn from the manufacturing and service industries.

Assessment: 30% continuous assessment and 70% examination

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**IMSE2028. Human factors engineering (6 credits)**

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

Assessment: 20% continuous assessment and 80% examination

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**B. Common Core Course (6 credits)**

## **C. Internship**

### **IMSE2029. Internship (6 credits)**

A minimum of six week summer internship in the industry.

Assessment: **100% practical work**

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## **Level Three**

### **A1. Core Engineering Courses**

#### **IMSE3001. 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 and virtual manufacturing; CAD and CAM integration.

Prerequisite: IMSE1009 Fundamentals of Engineering Design

Assessment: 30% continuous assessment and 70% examination

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## **Technical project**

#### **IMSE3014. 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.

Assessment: 100% continuous assessment

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## **Integrative project**

#### **IMSE3015. Industrial systems integration (6 credits)**

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

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

Assessment: 100% continuous assessment

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#### **IMSE3016. 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: IMSE2008 Operational research techniques

Assessment: Continuous assessment (20%) and Examination (80%)



## **A2. Discipline Elective Courses**

For the syllabuses of Discipline Elective Courses with the code IMSE2XXX, please refer to the previous section Level 2 A2.

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### **IMSE3002. 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.

Co-requisite: IMSE2008 Operational research techniques

Assessment: 30% continuous assessment and 70% examination

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### **IMSE3010. 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: IMSE2005 Managerial accounting and finance

Assessment: 30% continuous assessment and 70% examination

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### **IMSE3018. Advanced manufacturing technology (6 credits)**

Metal cutting and machining, analysis of cutter geometry and materials; mechanics of cutting, tool wear and tool life, cutting optimization, analysis of milling, grinding, EDM, ECM, LBM; analysis of metal forming processes; engineering plasticity, Upper-Bound Theorem, CAD/CAM for mould and dies, rapid prototyping technologies; melt rheology, temperature and pressure effects, viscosity, mixing systems, polymeric materials, analysis of injection, extrusion, mould and die design.

Prerequisite: IMSE2006 Manufacturing technology

Assessment: 20% continuous assessment and 80% examination

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### **IMSE3019. 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; electronic product and component cataloguing; cryptographic systems; capability maturity model; social accountability standard; E-commerce business models; technological, business planning and social issues of E-commerce; order taking and processing; electronic payment systems, smart cards.

Prerequisite: IMSE2016 Internet technology for e-commerce, or IMSE1013 Introduction to information systems, or IMSE1008 Computer applications for engineers, or ENGG1002 Computer programming and applications, or ENGG1013 Computer programming and applications IA and ENGG1014 Computer programming and applications IB, or ENGG1016 Computer programming and applications I

Assessment: 40% continuous assessment and 60% examination

**IMSE3020. Technology marketing (6 credits)**

Customer relationships and value, marketing strategies and plans, marketing environment, ethical and social responsibility in marketing, marketing mix, marketing research and forecasting, marketing segmentation and positioning, technology trend, distribution channels, intellectual property, e-marketing.

Prerequisite: IMSE1003 Introduction to business and management

Assessment: 30% continuous assessment and 70% examination

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**IMSE3021. 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: IMSE1003 Introduction to business and management

Assessment: 30% continuous assessment and 70% examination

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**IMSE3028. Innovation and entrepreneurship (6 credits)**

Entrepreneurship in the new world economy, developments in the pacific region and greater China; general characteristics of entrepreneurs; enterprise formation, organizational structure, new economy business models; enterprise resources, business plan, venture capital; technological growth; environmental and contingency factors; case studies. Skill workshops: identifying strengths and improving skills; organising yourself and your time; communication; systematic problem solving; group work; negotiating and assertiveness; coping with pressure; leadership.

Assessment: 30% continuous assessment and 70% examination

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**IMSE3029. Manufacturing system analysis and design (6 credits)**

Types of manufacturing systems; modelling and analysis of manufacturing systems, material flow analysis, assembly line balancing, discrete-event simulation; stochastic modelling: Markov chains, central server model, network of queues; factory physics, effects of variability on performance; competitive manufacturing: just-in-time production, quick-response manufacturing; advanced manufacturing systems, group technology, flexible manufacturing systems, holonic manufacturing.

Prerequisite: IMSE2008 Operational research techniques

Assessment: 30% continuous assessment and 70% examination

## DOUBLE-DEGREES IN BENG/BBA OPTION

(Applicable to students admitted in the academic year 2010-11 and thereafter)

Candidates are given an option to pursue the double-degrees 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.

Candidates who have satisfied all the requirements of the BEng curriculum will be awarded the degree of Bachelor of Engineering. The BEng(IETM) curriculum under the double-degrees in BEng/BBA option is as follows:

### Exemptions

Candidates who have taken and passed the courses BUSI1007 (Principles of Management) and BUSI0027 (Management accounting I) under the double-degrees in BEng/BBA option are automatically granted exemption for the courses IMSE1003 (Introduction to business and management), IMSE2005 (Managerial accounting and finance) and IMSE3021 (Strategic management of business and technology).

### First Year

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE1009	Fundamentals of engineering design	6	1	Introductory
IMSE2009	Quality management	6	1	Introductory
ENGG1003 <b>OR</b>	Mathematics I	6	1	N/A
ENGG1004	Mathematics IA	3	1	N/A
IMSE1018	Mathematics (IMSE)	3	1	N/A
ENGG1002 <b>OR</b>	Computer programming and applications	6	1	N/A
ENGG1016	Computer programming and applications I	6	1&2	N/A
Credits required: 24				

General Engineering Courses			
Code	Title	Credits	Length (Sem)
ENGG1009	Industrial management and logistics	6	1
ENGG1006	Engineering for sustainable development	6	1
ENGG1007	Foundations of computer science	6	1
ENGG1010	Foundations of engineering mechanics	6	1
ENGG1011	Introduction to biomedical engineering	6	1
ENGG1015	Introduction to electrical and electronic engineering	6	1
Select 2 courses from the above General Engineering Courses; credits required: 12			

Language Enhancement Courses			
Code	Title	Credits	Length (Sem)
CAES1907	Business Communication	3	1
CAES1515	Professional and technical oral communication for engineers	3	1
CENG1001	Practical Chinese language course for engineering students	3	1
Credits required: 9			

Common Core Courses			
Code	Title	Credits	Length (Sem)
	Common Core Course	6	1
	Common Core Course	6	1
Credits required: 12			

### Second Year

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE1021	Engineering training	6	summer	Advanced
IMSE2006	Manufacturing technology	6	1	Advanced
IMSE2008	Operational research techniques	6	1	Advanced
IMSE2018	Industrial organisation and management	6	1	Advanced
IMSE2024	Mathematics II	6	1	Advanced
IMSE2025	Integrative studies (IE practice)	6	1	Advanced
IMSE2026	Engineers in society	6	1	Advanced
IMSE2027	Facilities planning and design	6	1	Advanced
IMSE2028	Human factors engineering	6	1	Advanced
Credits required: 54				

### Third Year

Core Engineering courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE2029	Internship	6	summer	Advanced
IMSE3001	Computer integrated manufacturing	6	1	Advanced
IMSE3002	Engineering project management	6	1	Advanced
IMSE3014	Project	12	2	Advanced
IMSE3015	Industrial systems integration	6	2	Advanced
IMSE3016	Operations planning and controls	6	1	Advanced
IMSE3029	Manufacturing system analysis and design	6	1	Advanced
Credits required: 48				

Elective Course			
Code	Title	Credits	Length (Sem)
	(Any Elective course)	3	1
Credits required: 3			

*Note: Candidates can refer to the previous sections for further information on the prerequisite relationship and course syllabuses of the above-listed courses.*

To be eligible for proceeding to the BBA programme in the 4<sup>th</sup> year, candidates must (1) fulfill the requirements of the BEng curriculum; and (2) 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
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information systems	6
BUSI1004	Marketing	6

BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6
	Electives (Any 2 courses in Finance, HRM or Marketing major)	12
	<i>Total</i>	<i>54</i>

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 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 4<sup>th</sup> year in accordance with the Regulations and Syllabuses for the Degree of BBA in Conjunction with the Degree of BEng.

*Note: Further details about the length and content of the courses listed may be obtained on application to the department concerned.*

#### **MINOR OPTION - INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT**

(Applicable to students admitted in the academic year 2010-11 and thereafter)

(Candidates enrolled in BEng degree curriculum with specialism in either Industrial Engineering and Technology Management or Logistics Engineering and Supply Chain Management are NOT eligible to choose this Minor Option.)

Candidates are given an option to pursue the minor in Industrial Engineering and Technology Management, subject to approval of the Head of Department concerned. Candidates who wish to have their minor recorded on the transcript must take and pass all the required courses listed below in addition to the graduation requirements of their own degree curriculum:

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE1019	Industrial systems modeling and simulation	6	1	Advanced
IMSE2027	Facilities planning and design	6	1	Advanced
Credits required: 12				

Discipline Elective Courses				
Code	Title	Credit-units	Length (Sem)	Major Course Level
IMSE1014	Product development	6	1	Advanced
IMSE2005	Managerial accounting and finance	6	1	Advanced
IMSE2008	Operational research techniques	6	1	Advanced
IMSE2026	Engineers in society	6	1	Advanced
IMSE3001	Computer integrated manufacturing	6	1	Advanced
Select 4 courses from the above Discipline Elective Courses; credits required: 24				

# LOGISTICS ENGINEERING AND SUPPLY CHAIN MANAGEMENT

## SYLLABUS

(Applicable to students admitted in the academic year 2010-11 and thereafter)

### Definitions 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, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses includes Level Two and Three courses. The course level is indicated in the first left-most digit of the 4-digit numeral in the latter half of the course code. As an example, a Level One course shall read <IMSE1xxx>.

A Core course is a course in the curriculum that a candidate must take and pass according to the criteria provided in the Regulations. A Discipline Elective course refers to any optional subject offered by the Department, provided that it does not overlap significantly with the other courses that the student has already enrolled in. An Elective Course is a course offered by other departments under the Faculty of Engineering, or by other faculties.

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### The Curriculum

The curriculum comprises 180 credits of courses as follows:

- (a) 96 credits of Core Engineering courses of the curriculum, including
  - (i) Integrative project (6 credits)
  - (ii) Technical project (12 credits)
  - (iii) either (1) ENGG1002 Computer programming and applications (6 credits)  
or  
(2) ENGG1016 Computer programming and applications I (6 credits)
  - (iv) either (1) ENGG1003 Mathematics I (6 credits)  
or  
(2) ENGG1004 Mathematics IA (3 credits) and  
IMSE1018 Mathematics (IMSE) (3 credits)
- (b) 51 credits of Elective courses, including:
  - (i) Discipline Elective courses (36 credits)
  - (ii) General Engineering Courses (12 credits)
  - (iii) Elective course (3 credits)
- (c) 9 credits of Language Enhancement courses, comprising:
  - (i) Professional and technical written communication for engineers (3 credits)<sup>23</sup>
  - (ii) Professional and technical oral communication for engineers (3 credits)
  - (iii) Practical Chinese language course for engineering students (3 credits)<sup>24</sup>
- (d) Common Core Courses (selecting not more than one course from each Area of Inquiry) (12 credits)
- (e) Engineering training (6 credits)
- (f) Internship (6 credits)

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<sup>23</sup> Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1509

<sup>24</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

To complete the curriculum, a candidate must enroll in all the courses specified in the curriculum and must pass the courses listed under (a) to (f) for a combination totaling to 180 credits.

### Degree Classification

All the 180 credits under the curriculum will be counted towards degree classification, according to the following:

- (a) 9 credits of Language Enhancement courses;
- (b) 96 credits of Core Engineering courses;
- (c) 12 credits of Engineering training and Internship;
- (d) 12 credits of Common Core Courses;
- (e) The remaining courses with the best results, including at least 36 credits of Discipline Elective courses, 12 credits of General Engineering Courses and 3 credits of Elective course.

### Order of Study

Order of study is dictated by prerequisite and co-requisite requirements. Generally, Level One courses should be taken before Level Two courses, Level Two courses should be taken before Level Three courses and Core Engineering courses should be taken before Elective courses.

### **First Year**

#### Loading

The normal loading is 60 credits of Level One courses, with 30 credits of courses in each semester. Students are required to do Engineering Training (6 credits / Major Course Level: Introductory) within the 60 credits of courses.

#### Courses

Students must take the examination/coursework/continuous assessment in the following courses and pass the courses listed under (a) to (e).

- (a) Core Engineering courses (30 credits)
- (b) 2 Elective courses from the General Engineering Courses (12 credits)
- (c) 3 Language Enhancement courses (9 credits) consisting of
  - (i) 2 English Communications courses (6 credits)
  - (ii) 1 Chinese Language course (3 credits)
- (d) 1 Elective course offered by other departments of the Faculty of Engineering or other faculties (3 credits)
- (e) Engineering Training (6 credits)

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE1003	Introduction to business and management	6	1	Introductory
IMSE1009	Fundamentals of engineering design	6	1	Introductory
IMSE1016	Fundamentals of business logistics	6	1	Introductory
ENGG1003	Mathematics I	6	1	N/A
<b>OR</b>				

ENGG1004	Mathematics IA	3	1	N/A
IMSE1018	Mathematics (IMSE)	3	1	N/A
ENGG1002	Computer programming and applications	6	1	N/A
<b>OR</b>				
ENGG1016	Computer programming and applications I	6	1&2	N/A
Credits required: 30				

General Engineering Courses			
Code	Title	Credits	Length (Sem)
ENGG1009	Industrial management and logistics	6	1
ENGG1006	Engineering for sustainable development	6	1
ENGG1007	Foundations of computer science	6	1
ENGG1010	Foundations of engineering mechanics	6	1
ENGG1011	Introduction to biomedical engineering	6	1
ENGG1015	Introduction to electrical and electronic engineering	6	1
Select two courses from the above General Engineering courses; credits required: 12			

Language Enhancement Courses			
Code	Title	Credits	Length (Sem)
CAES1509	Professional and technical written communication for engineers <sup>25</sup>	3	1
CAES1515	Professional and technical oral communication for engineers	3	1
CENG1001	Practical Chinese language course for engineering students <sup>26</sup>	3	1
Credits required: 9			

Elective Course			
Code	Title	Credits	Length (Sem)
	(Any Elective course)	3	1
Credits required: 3			

Training			
Code	Title	Credits	Length (Sem)
IMSE1021	Engineering Training	6	Summer
Credits required: 6			

## Second Year

### Loading

The normal loading is 60 credits of Level Two courses, with 30 credits of courses in each semester. Students are required to do Internship (6 credits / Major Course Level: Advanced) within the 60 credits of courses.

<sup>25</sup> Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1509

<sup>26</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.



## Courses

Students must take the examination/coursework/continuous assessment in the following courses and pass the courses listed under (a) to (d).

- (a) 6 Core Engineering courses (36 credits)
- (b) 1 Discipline Elective course (6 credits)
- (c) 2 courses from the Common Core Curriculum, selecting not more than one course from each Area of Inquiry (12 credits)
- (d) Internship (6 credits)

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE0201	Supply chain design and development	6	1	Advanced
IMSE2008	Operational research techniques	6	1	Advanced
IMSE2021	Transportation and distribution planning	6	1	Advanced
IMSE2024	Mathematics II	6	1	Advanced
IMSE2026	Engineers in society	6	1	Advanced
IMSE2035	Integrative studies (LSC practice)	6	1	Advanced
Credits required: 36				

Discipline Elective Courses				
Code	Title	Credits	Length (Sem)	
IMSE1012	Engineering technology	6	1	Advanced
IMSE1013	Introduction to information systems	6	1	Advanced
IMSE1017	Engineering systems analysis	6	1	Advanced
IMSE1029	Logistics systems modeling and simulation	6	1	Advanced
IMSE2009	Quality management	6	1	Advanced
IMSE2016	Internet technology for e-commerce	6	1	Advanced
IMSE2020	Purchasing and supply management	6	1	Advanced
IMSE2028	Human factors engineering	6	1	Advanced
Select 1 course from the above Discipline Elective Courses; credits required: 6				

Common Core Courses			
Code	Title	Credits	Length (Sem)
	Common Core Course	6	1
	Common Core Course	6	1
Credits required: 12			

Training			
Code	Title	Credits	Length (Sem)
IMSE2029	Internship	6	Summer
Credits required: 6			

### Third Year

#### Loading

The normal loading for a student is 60 credits of Level Three courses (excluding summer vacation) with 30 credits of courses in each semester.

#### Courses

Students must take the examination/coursework/continuous assessment in the following courses and pass the courses listed under (a) and (b).

- (a) 4 Core Engineering courses (30 credits) comprising:
  - (i) IMSE3016 Operations planning and controls (6 credits)
  - (ii) IMSE3022 Global logistics systems (6 credits)
  - (iii) Technical Project - IMSE 3024 Project (12 credits)
  - (iv) Integrative project - IMSE3025 Industrial systems integration (6 credits)
- (b) A combination of Discipline Elective courses totaling to 30 credits

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE3016	Operations planning and control	6	1	Advanced
IMSE3022	Global logistics systems	6	1	Advanced
IMSE3024	Project (Logistics engineering related)	12	2	Advanced
IMSE3025	Logistics systems integration	6	2	Advanced
Credits required: 30				

Discipline Elective Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE2003	Industrial automation	6	1	Advanced
IMSE2005	Managerial accounting and finance	6	1	Advanced
IMSE2018	Industrial organisation and management	6	1	Advanced
IMSE2019	Stochastic decision systems	6	1	Advanced
IMSE2027	Facilities planning and design	6	1	Advanced
Select 2 courses from the above IMSE2XXX Discipline Elective courses; credits required:				12
IMSE3002	Engineering project management	6	1	Advanced
IMSE3010	Financial engineering	6	1	Advanced
IMSE3019	Digital enterprises and e-commerce	6	1	Advanced
IMSE3020	Technology marketing	6	1	Advanced
IMSE3021	Strategic management of business and technology	6	1	Advanced
IMSE3023	Warehousing and terminal operations	6	1	Advanced
IMSE3028	Innovation and entrepreneurship	6	1	Advanced
Select 3 courses from the above IMSE3XXX Discipline Elective courses; credits required:				18
Credits required: 30				

## Summary of the prerequisite relationship between First, Second and Third Year courses

### First Year

Code	Title	Prerequisite
Core Engineering courses		
IMSE1003	Introduction to business and management	None
IMSE1009	Fundamentals of engineering design	None
IMSE1016	Fundamentals of business logistics	None
ENGG1003	Mathematics I	None
<b>OR</b>		
ENGG1004	Mathematics IA	None
IMSE1018	Mathematics (IMSE)	None
ENGG1002	Computer programming and applications	None
<b>OR</b>		
ENGG1016	Computer programming and applications I	None
General Engineering Courses		
ENGG1009	Industrial management and logistics	None
ENGG1006	Engineering for sustainable development	None
ENGG1007	Foundations of computer science	None
ENGG1010	Foundations of engineering mechanics	None
ENGG1011	Introduction to biomedical engineering	None
ENGG1015	Introduction to electrical and electronic engineering	None

### Second Year

Code	Title	Prerequisite
Core Engineering Courses		
IMSE0201	Supply chain design and development	IMSE1003 Introduction to business and management
IMSE2008	Operational research techniques	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2021	Transportation and distribution planning	IMSE1016 Fundamentals of business logistics
IMSE2024	Mathematics II	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2026	Engineers in society	None
IMSE2035	Integrative studies (LCS practice)	None
Discipline Elective Courses		
IMSE1012	Engineering technology	None
IMSE1013	Introduction to information systems	None
IMSE1017	Engineering systems analysis	None
IMSE1029	Logistics systems modeling and simulation	None

IMSE2003	Industrial automation	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2005	Managerial accounting and finance	IMSE1003 Introduction to business and management
IMSE2009	Quality management	None
IMSE2016	Internet technology for e-commerce	None
IMSE2018	Industrial organisation and management	IMSE1003 Introduction to business and management
IMSE2019	Stochastic decision systems	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2020	Purchasing and supply management	None
IMSE2028	Human factors engineering	None

### Third Year

Code	Title	Prerequisite
Core Engineering Courses		
IMSE3016	Operations planning and control	IMSE2008 Operational research techniques
IMSE3022	Global logistics systems	IMSE1016 Fundamentals of business logistics
IMSE3024	Project	None
IMSE3025	Logistics systems integration	None
Discipline Elective Courses		
IMSE2003	Industrial automation	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2005	Managerial accounting and finance	IMSE1003 Introduction to business and management
IMSE2009	Quality management	None
IMSE2018	Industrial organisation and management	IMSE1003 Introduction to business and management
IMSE2019	Stochastic decision systems	ENGG1003 Mathematics I or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)
IMSE2020	Purchasing and supply management	None
IMSE2028	Human factors engineering	None
IMSE3002	Engineering project management	Co-requisite: IMSE2008 Operational research techniques
IMSE3010	Financial engineering	IMSE2005 Managerial accounting and finance
IMSE3019	Digital enterprises and e-commerce	IMSE2016 Internet technology for e-commerce

		or IMSE1013 Introduction to information systems or IMSE1008 Computer applications for engineers or ENGG1002 Computer programming and applications or ENGG1013 Computer programming and applications IA and ENGG1014 Computer programming and applications IB or ENGG1016 Computer programming and applications I
IMSE3020	Technology marketing	IMSE1003 Introduction to business and management
IMSE3021	Strategic management of business and technology	IMSE1003 Introduction to business and management
IMSE3023	Warehousing and terminal operations	IMSE1016 Fundamentals of business logistics
IMSE3028	Innovation and entrepreneurship	None

## COURSE DESCRIPTIONS

### Level One

#### A. Core Engineering Courses

##### **IMSE1003. Introduction to business and management (6 credits)**

Business of production; business environment, globalization, the positions of Hong Kong and China; marketing and distribution; the firm and the customer; the firm and its suppliers; finance and the firm; costs of production; human resource management; introduction to manufacturing systems; management and integration; the engineer in society, professional ethics; development of technology and interaction between societies and technology, intellectual property; the environment and safety.

Assessment: 30% continuous assessment and 70% examination

##### **IMSE1009. 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

**IMSE1016. Fundamentals of business logistics (6 credits)**

Definition, importance and objectives of business logistics; 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 and 80% examination

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**IMSE1018. Mathematics (IMSE) (3 credits)**

Probability laws, random variables, probability distributions and expectation; optimization of functions of two or more variables; numerical methods in root-finding, approximation and integration of single variable functions.

Assessment: 10% continuous assessment and 90% examination

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**B. Language enhancement courses**

**CAES1509. Professional and technical written communication for engineers (3 credits)**

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using written English. Topics include accessing, abstracting, analysing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; small-scale project design and implementation.

Assessment: 100% continuous assessment

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**CAES1515. Professional and technical oral communication for engineers (3 credits)**

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: 100% continuous assessment

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**CENG1001. Professional Chinese language course for engineering students (3 credits)**

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

### C. Elective Course (3 credits)

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### D. Engineering Training

#### IMSE1021. 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

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### Level Two

#### A1. Core Engineering Courses

#### IMSE0201. Supply chain design and development (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: IMSE1003 Introduction to business and management

Assessment: 20% continuous assessment and 80% examination

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#### IMSE2008. Operational research techniques (6 credits)

Philosophy and methodology of Operational Research: problem analysis, establishing objectives, identifying decision variables, model building, implementation and monitoring solutions; Operational Research techniques and their applications in operations management: linear programming and its extensions, dynamic programming, queuing theory, and replacement models for single components and capital equipment.

Prerequisite: ENGG1003 Mathematics I, or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)

Assessment: 10% continuous assessment and 90% examination

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#### IMSE2021. 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: IMSE1016 Fundamentals of business logistics

Assessment: 30% continuous assessment and 70% examination

**IMSE2024. Mathematics II (6 credits)**

Probability laws, random variables, probability distributions and expectation; some important discrete and continuous distributions; random samples and sampling distributions; parameter estimation and hypothesis testing; design of experiments and analysis of variance; regression analysis; non-parametric methods; statistical quality control and reliability engineering; introduction to stochastic processes and Markov chains; application examples in industrial and logistics engineering.

Prerequisite: ENGG1003 Mathematics I, or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)

Assessment: 10% continuous assessment and 90% examination

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**IMSE2026. Engineers in society (6 credits)**

Economic, industrial and social context of engineering; responsibilities of professional engineers, the legal, environmental, economical and ethical roles of engineers in society, judgment and decision process based on non-technical aspects such as financial, environmental and cultural considerations, meeting with professional engineers from the industrial and logistics sectors.

Assessment: 30% continuous assessment and 70% examination

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**IMSE2035. Integrative studies (LSC practice) (6 credits)**

To develop students in the areas of technical literature survey, analysis and assimilation of materials, skills of written and oral presentation, composition and implementation of ideas, communication and interactive skills through student and product centred activities, interactive and project-based learning.

The major element of the module is a group project on the design of a logistic system or a logistic-related product or service. The group project is to integrate the applications of various topics including: project management; product life-cycle management; business logistics; cost accounting; scheduling; transportation planning; material handling; workflow design; human factors; distribution and marketing.

Assessment: 100% continuous assessment

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**A2. Discipline Elective Courses****IMSE1012. 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 and phasors.

Assessment: 20% continuous assessment and 80% examination

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**IMSE1013. Introduction to information systems (6 credits)**

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

Assessment: 40% continuous assessment and 60% examination



**IMSE1017. 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); artificial intelligence techniques for system analysis and solution generation.

Assessment: 20% continuous assessment and 80% examination

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**IMSE1029. Logistics systems modeling 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 logistics systems and operation; model development for logistics systems, analysis of systems; model validation and verification; analysis of simulation results, case studies of logistics and supply chain systems using discrete event simulations.

Assessment: 40% continuous assessment and 60% examination

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**IMSE2003. Industrial automation (6 credits)**

Conditions and justification for automation; basic components of industrial automation; numerical control technology; pneumatic/hydraulic actuators, programmable logic controllers, electro-pneumatic systems design. Open-loop and closed-loop control; system stability; analogue and digital control.

Prerequisite: ENGG1003 Mathematics I, or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)

Assessment: 20% continuous assessment and 80% examination

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**IMSE2005. Managerial accounting and finance (6 credits)**

Cost accounting - procedures; direct costs, absorption costing; marginal costing. Planning and control - budgetary planning 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 - cash flow statements; interpretation of accounting data.

Prerequisite: IMSE1003 Introduction to business and management

Assessment: 30% continuous assessment and 70% examination

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**IMSE2009. Quality management (6 credits)**

Total quality management; management tools for quality; benchmarking; quality assurance management systems; ISO9000 series; national quality awards; design of industrial experiments; statistical process control; control charts; acceptance sampling; environmental management; ISO14000 series; environmental management systems; business process reengineering; customer services quality.

Assessment: 30% continuous assessment and 70% examination

**IMSE2016. Internet technology for e-commerce (6 credits)**

Overview of E-Business and E-Commerce: Electronic Business Solutions (EBS), 3-tiered architecture, EBS technologies; Business Models: Their new dimensions and impacts, types and choice; Design and development: user requirement analysis, system development paradigms, structured system development and object-oriented system development methods. Adoption and Implementation: internet programming, web-based system development, online database design and implementation, case studies and mini-project.

Assessment: 60% continuous assessment and 40% examination

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**IMSE2018. Industrial organisation and management (6 credits)**

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

Prerequisite: IMSE1003 Introduction to business and management

Assessment: 30% continuous assessment and 70% examination

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**IMSE2019. Stochastic decision systems (6 credits)**

Decision analysis: decision making under uncertainty, axioms of decision analysis, methodology of decision analysis, analytical hierarchy approach, quantification of judgmental uncertainties, assessing utilities, and group decision problems; game theory and gaming: extensive and normal forms, zero-sum two-person games, two-persons nonzero-sum games, n-persons games, teaching and training and operational gaming; stochastic processes: random walks, recurrent events, Markov chains, and renewal-processes.

Prerequisite: ENGG1003 Mathematics I, or ENGG1004 Mathematics IA and IMSE1018 Mathematics (IMSE)

Assessment: 30% continuous assessment and 70% examination

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**IMSE2020. 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 and 60% examination

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**IMSE2027. Facilities planning and design (6 credits)**

Plant location problem; advanced techniques in plant layout design, computer-based layout planning, and quantitative approaches; materials handling, storage and warehousing for global manufacturing; lean manufacturing, cellular manufacturing, one-piece flow; workplace design in the information age; digital factory; fire safety and security; study cases drawn from the manufacturing and service industries.

Assessment: 30% continuous assessment and 70% examination

**IMSE2028. Human factors engineering (6 credits)**

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

Assessment: 20% continuous assessment and 80% examination

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**B. Common Core Courses (12 credits)**

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**C. Internship**

**IMSE2029. Internship (6 credits)**

A minimum of six week summer internship in the industry.

Assessment: 100% practical work

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**Level Three**

**A1. Core Engineering Courses**

**IMSE3016. 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: IMSE2008 Operational research techniques

Assessment: 20% continuous assessment and 80% examination

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**IMSE3022. 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: IMSE1016 Fundamentals of business logistics

Assessment: 20% continuous assessment and 80% examination

## **Technical project**

### **IMSE3024. Project (12 credits)**

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

Assessment: 100% continuous assessment

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## **Integrative project**

### **IMSE3025. Logistics systems integration (6 credits)**

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

Facility location analysis; network planning process; warehouse design and management; logistics information management; supply chain performance analysis; alternative supply chain strategies; vehicle routing and scheduling; systems modelling and simulation; customer-supplier relationship; international transportation strategies.

Assessment: 100% continuous assessment

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## **A2. Discipline Elective Courses**

**For the syllabuses of Discipline Elective Courses with the code IMSE2XXX, please refer to the previous section Level 2 A2.**

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### **IMSE3002. 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.

Co-requisite: IMSE2008 Operational research techniques

Assessment: 30% continuous assessment and 70% examination

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### **IMSE3010. 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: IMSE2005 Managerial accounting and finance

Assessment: 30% continuous assessment and 70% examination

**IMSE3019. 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; electronic product and component cataloguing; cryptographic systems; capability maturity model; social accountability standard; E-commerce business models; technological, business planning and social issues of E-commerce; order taking and processing; electronic payment systems, smart cards.

Prerequisite: IMSE2016 Internet technology for e-commerce, or IMSE1013 Introduction to information systems, or IMSE1008 Computer applications for engineers, or ENGG1002 Computer programming and applications, or ENGG1013 Computer programming and applications IA and ENGG1014 Computer programming and applications IB, or ENGG1016 Computer programming and applications I

Assessment: 40% continuous assessment and 60% examination

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**IMSE3020. Technology marketing (6 credits)**

Customer relationships and value, marketing strategies and plans, marketing environment, ethical and social responsibility in marketing, marketing mix, marketing research and forecasting, marketing segmentation and positioning, technology trend, distribution channels, intellectual property, e-marketing.

Prerequisite: IMSE1003 Introduction to business and management

Assessment: 30% continuous assessment and 70% examination

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**IMSE3021. 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: IMSE1003 Introduction to business and management

Assessment: 30% continuous assessment and 70% examination

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**IMSE3023. 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 its various functions, container ship structure and generations, terminal management system, terminal planning and design methodology and analysis tools.

Prerequisite: IMSE1016 Fundamentals of business logistics

Assessment: 30% continuous assessment and 70% examination

**IMSE3028. Innovation and entrepreneurship (6 credits)**

Entrepreneurship in the new world economy, developments in the Pacific region and Greater China; general characteristics of entrepreneurs; enterprise formation, organizational structure, new economy business models; enterprise resources, business plan, venture capital; technological growth; environmental and contingency factors; case studies. Skill workshops: identifying strengths and improving skills; organizing yourself and your time; communication; systematic problem solving; group work; negotiating and assertiveness; coping with pressure; leadership.

Assessment: 30% continuous assessment and 70% examination

**DOUBLE-DEGREES IN BENG/BBA OPTION**

(Applicable to students admitted in the academic year 2010-11 and thereafter)

Candidates are given an option to pursue the double-degrees 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.

Candidates who have satisfied all the requirements of the BEng curriculum will be awarded the degree of Bachelor of Engineering. The BEng(LESCM) curriculum under the double-degrees in BEng/BBA option is as follows:

**Exemptions**

Candidates who have taken and passed the courses BUSI1007 (Principles of Management) and BUSI0027 (Management accounting I) under the double-degrees in BEng/BBA option are automatically granted exemption for the courses IMSE1003 (Introduction to business and management), IMSE2005 (Managerial accounting and finance) and IMSE3021 (Strategic management of business and technology).

**First Year**

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE1009	Fundamentals of engineering design	6	1	Introductory
IMSE1016	Fundamentals of business logistics	6	1	Introductory
ENGG1003 <b>OR</b>	Mathematics I	6	1	N/A
ENGG1004	Mathematics IA	3	1	N/A
IMSE1018	Mathematics (IMSE)	3	1	N/A
ENGG1002 <b>OR</b>	Computer programming and applications	6	1	N/A
ENGG1016	Computer programming and applications I	6	1&2	N/A
Credits required: 24				

General Engineering Courses			
Code	Title	Credits	Length (Sem)
ENGG1009	Industrial management and logistics	6	1
ENGG1006	Engineering for sustainable development	6	1
ENGG1007	Foundations of computer science	6	1
ENGG1010	Foundations of engineering mechanics	6	1
ENGG1011	Introduction to biomedical engineering	6	1
ENGG1015	Introduction to electrical and electronic engineering	6	1
Select two courses from the above General Engineering Courses; credits required:			12

Language Enhancement Courses			
Code	Title	Credits	Length (Sem)
CAES1907	Business Communication	3	1
CAES1515	Professional and technical oral communication for engineers	3	1
CENG1001	Practical Chinese language course for engineering students	3	1
Credits required:			9

Common Core Courses			
Code	Title	Credits	Length (Sem)
	Common Core Course	6	1
	Common Core Course	6	1
Credits required:			12

## Second Year

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE1021	Engineering training	6	summer	Advanced
IMSE0201	Supply chain design and development	6	1	Advanced
IMSE2008	Operational research techniques	6	1	Advanced
IMSE2009	Quality management	6	1	Advanced
IMSE2016	Internet technology for e-commerce	6	1	Advanced
IMSE2021	Transportation and distribution planning	6	1	Advanced
IMSE2024	Mathematics II	6	1	Advanced
IMSE2026	Engineers in society	6	1	Advanced
IMSE2035	Integrative studies (LSC practice) – Project	6	1	Advanced
Credits required:				54

### Third Year

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE2029	Internship	6	summer	Advanced
IMSE3002	Engineering project management	6	1	Advanced
IMSE3016	Operations planning and control	6	1	Advanced
IMSE3022	Global logistics systems	6	1	Advanced
IMSE3023	Warehousing and terminal operations	6	1	Advanced
IMSE3024	Project (Logistics engineering related)	12	2	Advanced
IMSE3025	Logistics systems integration	6	2	Advanced
Credits required: 48				

Elective Course			
Code	Title	Credits	Length (Sem)
	(Any Elective course)	3	1
Credits required: 3			

*Note: Candidates can refer to the previous sections for further information on the prerequisite relationship and course syllabuses of the above-listed courses.*

To be eligible for proceeding to the BBA programme in the 4<sup>th</sup> year, candidates must (1) fulfil the requirements of the BEng curriculum; and (2) 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
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information systems	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6
	Electives (Any 2 courses in Finance, HRM or Marketing major)	12
	<b>Total</b>	<b>54</b>

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 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 4<sup>th</sup> year in accordance with the Regulations and Syllabuses for the Degree of BBA in Conjunction with the Degree of BEng.

*Note: Further details about the length and content of the courses listed may be obtained on application to the department concerned.*



### **MINOR OPTION - LOGISTICS ENGINEERING AND SUPPLY CHAIN MANAGEMENT**

(Applicable to students admitted in the academic year 2010-11 and thereafter)

(Candidates enrolled in BEng degree curriculum with specialism in either Industrial Engineering and Technology Management or Logistics Engineering and Supply Chain Management are NOT eligible to choose this Minor Option.)

Candidates are given an option to pursue the minor in Logistics Engineering and Supply Chain Management, subject to approval of the Head of Department concerned. Candidates who wish to have their minor recorded on the transcript must take and pass all the required courses listed below in addition to the graduation requirements of their own degree curriculum:

Core Engineering Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE1029	Logistics systems modeling and simulation	6	1	Advanced
IMSE0201	Supply chain design and development	6	1	Advanced
Credits required: 12				

Discipline Elective Courses				
Code	Title	Credits	Length (Sem)	Major Course Level
IMSE2005	Managerial accounting and finance	6	1	Advanced
IMSE2008	Operational research techniques	6	1	Advanced
IMSE2021	Transportation and distribution planning	6	1	Advanced
IMSE2026	Engineers in society	6	1	Advanced
IMSE3019	Digital enterprises and e-commerce	6	1	Advanced
Select 4 courses from the above Discipline Elective Courses; credits required: 24				

## **MECHANICAL ENGINEERING** **(with optional Environmental Engineering Stream)**

### **SYLLABUSES**

This syllabus applies to students admitted in the academic year 2011-12 and thereafter.

#### Definitions and Terminology

Each course offered by the Department of Mechanical Engineering shall be classified as either introductory level course or advanced level course, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses include Level Two and Three courses.

A *Discipline Core Course* is a compulsory course which a candidate must pass in the manner provided in the Regulations. A *Project Course* is also a compulsory course which a candidate must pass. A *Breadth Course* is a Level 1, level 2 or level 3 course that is offered normally as an optional course for the curriculum. A *Depth Course* is a Level 3 course offered as an optional course for the curriculum. *Elective course* is a course offered by the Department of Mechanical Engineering, other departments under the Faculty of Engineering, or by other faculties.

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#### The Curriculum

The curriculum comprises of 180 credits of courses as follows:

- (a) 24 credits from General Engineering courses, including:
  - (i) either ENGG1002 Computer programming and applications (6 credits) or ENGG1016 Computer programming and applications I (6 credits); AND
  - (ii) either ENGG1003 Mathematics I (6 credits) or ENGG1004 Mathematics IA (3 credits) and ENGG1005 Mathematics IB (3 credits); AND
  - (iii) ENGG1010 Foundations of engineering mechanics; AND
  - (iv) ENGG1006 Engineering for sustainable development; OR an equivalent course ENGG10XX
- (b) 72 credits of Discipline Core courses
- (c) 18 credits of Project courses
- (d) 6 credits of Breadthcourse
- (e) 39 credits of Elective courses (Main stream students); OR 12 credits of Compulsory courses and 27 credits of Elective courses (for Environmental Engineering stream students)
- (f) University requirements (21 credits), including:
  - (i) CAES1513 Professional and technical written communication for engineers (3 credits)<sup>27</sup>
  - (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
  - (iii) CENG1001 Practical Chinese language course for engineering students (3 credits)<sup>28</sup>
  - (iv) 12 credits of courses from the University Common Core Curriculum, selecting no more than one course from each Area of Inquiry

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<sup>27</sup> Students pursuing BEng/BBA should take CAES1907 in lieu of CAES1513

<sup>28</sup> "Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective language course in lieu".

To complete the degree curriculum, a candidate must pass all the courses listed under (a) to (f) for a combination totaling to at least 180 credits, and satisfy any other requirements as stipulated in the University or Faculty of Engineering regulations.

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### Degree Classification

The best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

### Order of Study

There are no course prerequisites but lower level courses should preferably be taken before higher level courses.

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### **First Year**

The first-year syllabuses shall normally include the following courses:

#### General Engineering Courses (Total 24 credits)

Either

ENGG1002 Computer programming and applications (6 credits); or  
ENGG1016 Computer programming and applications I (6 credits); AND

Either

ENGG1003 Mathematics I (6 credits) or  
both ENGG1004 Mathematics IA (3 credits) and ENGG1005 Mathematics IB (3 credits); AND

ENGG1010 Foundations of engineering mechanics (6 credits); AND

ENGG1006 Engineering for sustainable development; OR  
an equivalent course ENGG10xx (6 credits)

#### Discipline Core Courses (Total 24 credits)

MECH1004 Drawing and elements of design and manufacture (6 credits)

MECH1005 Fundamentals of electrical and electronic engineering (6 credits)

MECH1013 Engineering mechanics (6 credits)

MECH1014 Thermofluids (6 credits)

#### UG5 requirements (Total 9 credits)

CAES1513 Professional and technical written communication for engineers (3 credits)<sup>1</sup>

CAES1515 Professional and technical oral communication for engineers (3 credits)

CENG1001 Practical Chinese language course for engineering students (3 credits)<sup>2</sup>

#### Optional Elective Course (Total 6 credits)

MECH1018 Engineering training (6 credits) (Summer semester)

## **Second Year**

### Main Stream

The second-year syllabuses for Main Stream students shall normally include the following courses:

Discipline Core Courses (Total 48 credits)

- MECH1019 Properties of materials (6 credits)
- MECH2002 Engineering thermodynamics (6 credits)
- MECH2005 Design and manufacture (6 credits)
- MECH2006 Electrical and electronic engineering (6 credits)
- MECH2007 Mathematics II (6 credits)
- MECH2008 Mechanics of fluids (6 credits)
- MECH2009 Mechanics of solids (6 credits)
- MECH2018 Dynamics and control (6 credits)

UG5 requirements (Total 12 credits)

- 2 University Common Core Courses (12 credits)

Optional Elective Courses (Total 12 credits)

- MECH2017 Industrial training (6 credits) (Summer semester)
- MECH2019 Advanced computer programming in mechanical engineering applications (6 credits)

### Environmental Engineering Stream

The second-year syllabuses for Environmental Engineering Stream students shall normally include the following courses:

Discipline Core Courses (Total 48 credits)

- MECH1019 Properties of materials (6 credits)
- MECH2002 Engineering thermodynamics (6 credits)
- MECH2005 Design and manufacture (6 credits)
- MECH2007 Mathematics II (6 credits)
- MECH2008 Mechanics of fluids (6 credits)
- MECH2009 Mechanics of solids (6 credits)
- MECH2018 Dynamics and control (6 credits)
- CIME2001 Water and air quality: concepts and measurement (6 credits)

UG5 requirements (Total 12 credits)

- 2 University Common Core Courses (12 credits)

Optional Elective Courses (Total 12 credits)

- MECH2017 Industrial training (6 credits) (Summer semester)
- MECH2019 Advanced computer programming in mechanical engineering applications (6 credits)

## **Third Year**

### Main Stream

The third-year syllabuses for Main Stream students shall normally include the following courses:

Project Courses (Total 18 credits)

MECH3008 Design (6 credits)  
MECH3022 Project (12 credits)

Breadth Course (Total 6 credits)

MECH3010 Engineering and technology management (6 credits)

Elective Courses (39 credits)

Students are required to complete 36 credits of Elective courses in the following manner:

- (i) Elective Breadth/Depth Courses (up to 39 credits)
- (ii) Elective MSc(Eng) Courses (0 to 6 credits)
- (iii) Free Elective Course (0 to 6 credits)

Elective Breadth/Depth Courses (Up to 39 credits from the following)

BBSE3009	Project management and engineering economics (6 credits)
MECH2016	Fundamentals of aeronautical engineering (6 credits)
MECH2019	Advanced computer programming in mechanical engineering applications (6 credits)
MECH3002	Air pollution control (6 credits)
MECH3004	Automatic control (6 credits)
MECH3005	Building services (6 credits)
MECH3007	Computer-aided design and manufacture (CAD/CAM) (6 credits)
MECH3009	Energy conversion systems (6 credits)
MECH3011	Heat transfer (6 credits)
MECH3012	Product design and development (6 credits)
MECH3014	Materials for engineering applications (6 credits)
MECH3015	Applied stress and strength analysis (6 credits)
MECH3016	Waves in fluids (6 credits)
MECH3017	Mechatronic design methodology (6 credits)
MECH3020	Vibration (6 credits)
MECH3021	Viscous flow(6 credits)
MECH3023	Building energy management and control systems (6 credits)
MECH3026	Acoustics and noise control (6 credits)

Elective MSc(Eng) courses (Up to 6 credits)

MECH6024 Applied mathematics for engineers (3 credits)  
MECH6028 Processing and properties of engineering plastics (3 credits)  
MECH6040 Foundations of nanotechnology (3 credits)

Free Elective Course (Up to 6 credits)

Any other elective course as approved by the department (6 credits)

### Environmental Engineering stream

The third-year syllabuses for Environmental Engineering Stream students shall normally include the following courses:

#### Project Courses (Total 18 credits)

MECH3008 Design (6 credits)  
MECH3022 Project (12 credits)

#### Compulsory Breadth/Depth Courses (Total 12 credits)

MECH2006 Electrical and electronic engineering (6 credits)  
MECH3002 Air pollution control (6 credits)

#### Breadth Course (Total 6 credits)

MECH3010 Engineering and technology management (6 credits)

#### Elective Courses (27 credits)

Students are required to complete 27 credits of Elective courses in the following manner:

- (i) Elective Breadth/Depth Courses (up to 27 credits)
- (ii) Elective MSc(Eng) Courses (0 to 6 credits)
- (iii) Free Elective Course (0 to 6 credits)

#### Elective Breadth/Depth Courses (Up to 27 credits)

BBSE3009	Project management and engineering economics (6 credits)
CIVL3011	Municipal and industrial waste treatment (6 credits)
CIVL3015	Solid and hazardous waste management (6 credits)
CIVL3022	Wind engineering (6 credits)
MECH2016	Fundamentals of aeronautical engineering (6 credits)
MECH2019	Advanced computer programming in mechanical engineering applications (6 credits)
MECH3005	Building services (6 credits)
MECH3007	Computer-aided design and manufacture (CAD/CAM) (6 credits)
MECH3009	Energy conversion systems (6 credits)
MECH3011	Heat transfer (6 credits)
MECH3012	Product design and development (6 credits)
MECH3015	Applied stress and strength analysis (6 credits)
MECH3016	Waves in fluids (6 credits)
MECH3017	Mechatronic design methodology (6 credits)
MECH3020	Vibration (6 credits)
MECH3021	Viscous flow (6 credits)
MECH3023	Building energy management and control systems (6 credits)
MECH3026	Acoustics and noise control (6 credits)

#### Elective MSc(Eng) courses (Up to 6 credits)

MECH6024 Applied mathematics for engineers (3 credits)  
MECH6028 Processing and properties of engineering plastics (3 credits)  
MECH6040 Foundations of nanotechnology (3 credits)

Free Elective Course (Up to 6 credits)

Any other elective course as approved by the department (6 credits)

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## **Course Descriptions**

### **Level One**

#### **MECH1004. Drawing and elements of design and manufacture (6 credits)**

Engineering drawing techniques; orthographic and pictorial projections; dimensioning and tolerancing, limits and fits, screw fasteners; cam; gears; computer aided drafting, with 3D CAD modeling; manufacturing processes, process selection, design for manufacturability.

Assessment: Continuous assessment 100%.

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#### **MECH1005. Fundamentals of electrical and electronic engineering (6 credits)**

Basic circuit principles; steady-state A.C. circuit theory; magnetic circuits; transformers; bipolar junction transistors; field effect transistors; direct-current motors; solid-state controller for D.C. motors; combinational logic circuits.

Assessment: Practical Work 15%; Examination 85%.

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#### **MECH1013. Engineering Mechanics (6 credits)**

Stress and strain; bending of beams; deflection of beams; thin-walled pressure vessels; kinematics of particles with different forms of accelerations; momentum and energy conservation; applications of kinetic principles to particles and vehicles with mass variation; velocity-dependent resistance and the action of central forces; undamped and damped free vibration; simple and epicyclic gear trains.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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#### **MECH1014. Thermofluids (6 credits)**

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: Practical Work 10%; Examination 90%.

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#### **MECH1018. Engineering training (6 credits)**

Practical work in manufacturing processes; the use of hand and machine tools; joining and fastening of metals; basic electrical engineering training, programmable logic controllers; virtual instrumentation; design; modeling and prototyping, CNC machining and metrology.

Assessment: Continuous assessment 100%.

**MECH1019. Properties of materials (6 credits)**

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; service behaviour of plastics.

Assessment: Practical Work 10%; Examination 90%.

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**ENGG1002. Computer programming and applications (6 credits)**

**ENGG1003. Mathematics I (6 credits)**

**ENGG1004. Mathematics IA (3 credits)**

**ENGG1005. Mathematics IB (3 credits)**

**ENGG1006. Engineering for sustainable development (6 credits)**

**ENGG1010. Foundations of engineering mechanics (6 credits)**

**ENGG1016. Computer programming and applications I (6 credits)**

Please refer to the General Engineering courses for details.

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**CENG1001. Practical Chinese language course for engineering students (3 credits)**

Please refer to the University Language Enhancement Courses for details.

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**CAES1513. Professional and technical written communication for engineers (3 credits)**

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using written English. Topics include accessing, abstracting, analysing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; small-scale project design and implementation.

Assessment: Continuous assessment 100%

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**CAES1515 Professional and technical oral communication for engineers (3 credits)**

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: 100% Continuous assessment.

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**CCXXxxxx University Common Core course (6 credits)**

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**CCXXxxxx University Common Core course (6 credits)**

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## Level Two

### **MECH2002. Engineering thermodynamics (6 credits)**

Steam and gas power plant; refrigeration; jet propulsion and turbomachinery; gas mixture; psychrometry and air-conditioning; introduction to heat transfer.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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### **MECH2005. Design and manufacture (6 credits)**

Materials selection; joining and fastening; mechanism design; tooling system design; power transmission systems design; CNC machining; rapid prototyping.

Assessment: Continuous assessment 100%.

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### **MECH2006. Electrical and electronic engineering (6 credits)**

Analog electronics; sequential logic circuits; digital-to-analog and analog-to-digital converters; introduction to microcontrollers; three-phase power systems; induction motors; synchronous motors; step motors; solid-state controllers for A.C. motors.

Assessment: Practical Work 10%; Examination 90%.

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### **MECH2007. Mathematics II (6 credits)**

Complex variables; Fourier series and Fourier transforms; partial differential equations; introduction to probability and statistics; elementary numerical analysis.

Assessment: Continuous assessment 20%; Examination 80%.

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### **MECH2008. Mechanics of fluids (6 credits)**

Navier-Stokes equations; pipe and channel viscous flows; lubrication; boundary layer flows; two-dimensional potential flows; open-channel flows; fluid machines.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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### **MECH2009. Mechanics of solids (6 credits)**

Two-dimensional theory of elasticity; thermal stress and rotating disks; energy methods; introduction to the finite element method; experimental methods; bending of circular plate.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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### **MECH2016. Fundamentals of aeronautical engineering (6 credits)**

History of aeronautical science; wing aerodynamics; propulsion; flight mechanics; systems and airframe structures; lightweight materials, failure modes, high-temperature materials, creep damage; maintenance.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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### **MECH2017. Industrial training (6 credits)**

Training in industry for a nominal period of at least six weeks during the summer vacation of the Second Year of Study

Assessment: Continuous assessment 100%.

**MECH2018. Dynamics and control (6 credits)**

Advanced rotational motion; balancing of rotating and reciprocating masses; vibration isolation and control; vibration of multi degree-of-freedom in-line systems; free transverse vibration of beams. Modelling of physical systems; time response analysis of dynamical systems; feedback control systems; control system design and applications; stability; root locus method; analogue computer programming  
Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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**MECH2019. Advanced computer programming in mechanical engineering applications (6 credits)**

Windows® Form programming in C# with user interface and graphics; group project on the application of computing to the solution of an engineering problem; interfacing a microcontroller with a window program; basic programming technique on numerical computation with SCILab for solving engineering problems.  
Assessment: Continuous assessment 100%.

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**CIME2001. Water and air quality: concepts and measurement (6 credits)**

Water quality and water pollution; standard methods of water and wastewater examination; air quality and air pollution control principles; measurement techniques in air pollution.  
Assessment: Practical Work 20%; Examination 80%.

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**Level Three****BBSE3009. Project management and engineering economics (6 credits)**

Characteristics of building projects and typical contracts; roles of different building professionals; project planning, scheduling and control; contract documentation and contractual arrangement; estimating and tendering; site organisation and supervision; measurement and valuation of works; claim management and settlement; alternative dispute resolution; time value of money; interest and interest formulas; equivalent analysis; bases for comparison of alternatives; present worth analysis; annual equivalent worth analysis; rate of return analysis; project cash flow analysis; decision making among alternatives; applications to real-world economy.  
Assessment: Continuous assessment 20%; Examination 80%.

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**MECH3002. Air pollution control (6 credits)**

Particulate and aerosol abatement technology; gas absorption - plate and packed columns; adsorption for the removal of odours and trace gases; combustion fundamentals and abatement of volatile organic compounds using incineration techniques.  
Assessment: Continuous assessment 10%; Examination 90%.

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**MECH3004. Automatic control (6 credits)**

Control of mechanical, hydraulic and pneumatic 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: Practical Work 10%; Examination 90%.

**MECH3005. Building services (6 credits)**

Introduction to the construction industry; electrical supply and lighting system design; lifts and escalators; air conditioning and refrigeration; cold and hot water supply systems; stormwater and sanitary drainage systems; fire safety and protection.

Assessment: Practical Work 15%; Examination 85%.

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**MECH3007. Computer-aided design and manufacture (CAD/CAM) (6 credits)**

Basic data structure techniques; transformation techniques; mathematical bases for surface modeling; principles of solid modeling and applications; numerical control; computer-aided production technologies; computer-integrated manufacturing.

Assessment: Continuous assessment 30%; Examination 70%.

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**MECH3008. Design (6 credits)**

Design methodology; engineering design; design for manufacturability; prototyping; project management; design project.

Assessment: Continuous assessment 100%.

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**MECH3009. Energy conversion systems (6 credits)**

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: Continuous assessment 10%; Examination 90%.

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**MECH3010. Engineering and technology management (6 credits)**

Quantitative methods for engineering and technology management; managing technology through the product life cycle; planning; organizing; staffing; leading; controlling; quantitative methods for analyzing / solving decision making involving engineering and technology management problems; quantitative methods for forecasting; resource allocations subject to constraints; linear programming and simplex method; decision theory with the application of decision trees; inventory control models; queuing theory; transportation and resource allocation for business operations.

Assessment: Continuous assessment 20%; Examination 80%.

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**MECH3011. Heat transfer (6 credits)**

Fourier's law; heat-conduction equation; steady and unsteady conduction; basic convection principles; laminar and turbulent heat transfer in tubes and over plates; Reynolds analogy; log mean temperature difference; effectiveness-NTU method; heat exchanger design; exergy analysis; optimisation of heat transfer process and system.

Assessment: Practical Work 10%; Examination 90%.

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**MECH3012. Product design and development (6 credits)**

Product design and product development process; methods and tools for design, analysis and testing; prototype making methods and practices; design for tooling; design of electromechanical products.

Assessment: Practical Work 20%; Examination 80%.

**MECH3014. Materials for engineering applications (6 credits)**

Materials for high strength/weight ratio; high and low temperature service; resistance to corrosion resistance and protection; residual stresses; composite and ceramic materials; manufacturing properties; problem based learning module; introduction to materials classification.

Assessment: Continuous assessment 10%; Examination 90%.

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**MECH3015. Applied stress and strength analysis (6 credits)**

Theory of elasticity, bending of cantilever beams, torsion of non-circular members; finite element methods; analysis of rectangular plates; fracture mechanics; elasto-plastic analysis.

Assessment: Practical Work 10%; Examination 90%.

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**MECH3016. Waves in fluids (6 credits)**

Small amplitude waves, shallow water waves, wave forces, ship waves, harbour oscillations, mass transport.

Assessment: Practical Work 10%; Examination 90%.

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**MECH3017. Mechatronic design methodology (6 credits)**

Introduction to mechatronics and robotics; applications of sensors for intelligent control; embedded microprocessor; motion generation and transfer systems, design and control; case studies.

Assessment: Practical Work 10%; Examination 90%.

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**MECH3020. Vibration (6 credits)**

Vibration measurement; single- and two-plane balancing of rotors in situ, machinery condition monitoring; random vibration; digital signal analysis; matrix analysis of free and forced vibrations of multi-degree-of-freedom systems; classical analysis of beam vibration; energy methods for approximate vibration analysis.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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**MECH3021. Viscous flow (6 credits)**

Eulerian and Lagrangian descriptions; Navier-Stokes equations; low-Reynolds-number flows; laminar boundary layers; laminar stability theory; turbulent flows.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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**MECH3022. Project (12 credits)**

A dissertation or report on a topic consisting of design, experimental or analytical investigations.

Assessment: Continuous assessment 100%.

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**MECH3023. Building energy management and control systems (6 credits)**

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: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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**MECH3026. Acoustics and noise control (6 credits)**

Human hearing; sound measurement and environmental noise legislation; wave equation, sound radiation by piston and aeroacoustic source mechanisms; sound propagation and reflection in ducts; duct modes; sound absorption mechanisms; sound reverberation in rooms and transmission through walls; physics of active noise control; introduction to vibration isolation.

Assessment: Practical Work 10%; Examination 90%.

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**MECH6024. Applied mathematics for engineers (3 credits)**

Statistical and numerical methods in engineering; hypothesis testing; estimation of parameters and confidence intervals; correlation coefficient; direct and iterative methods for systems of equations; numerical analysis; finite difference and finite element schemes; wave propagation and vibration; normal modes.

Assessment: Examination 100%.

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**MECH6028. Processing and properties of engineering plastics (3 credits)**

Viscosity of polymer melts; extrusion; injection moulding; blow moulding; joining; plating; yield criteria; environmental stress cracking; UV degradation; flame retardation; biodegradable polymers; viscoelastic behaviour of plastics; dynamic behaviour; design methods for plastics based on creep data.

Assessment: Examination 100%.

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**MECH6040. Foundations of nanotechnology (3 credits)**

Characteristic length scales, nanomaterials, nanostructures, physical properties of nanostructures, deposition techniques of nanofabrication, high resolution analysis and characterization, scanning probe methods, nanoindentation, deformation of nanostructures, mechanical behaviours of nanocrystalline solids, ultra-high strength of nanostructures, sensors, actuators, MEMS, NEMS, functional nanomaterials, nano-scale devices, modelling and computer-aided designs, bio-nanotechnology

Assessment: Examination 100%.

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**CIVL3022. Wind engineering (6 credits)**

**CIVL3015. Solid and hazardous waste management (6 credits)**

**CIVL3011. Municipal and industrial wastewater treatment (6 credits)**

For course descriptions, see the syllabuses of the Civil Engineering programme

## MECHANICAL ENGINEERING (BUILDING SERVICES ENGINEERING)

### SYLLABUSES

**This syllabus applies to students admitted in the academic year 2011-12 and thereafter.**

#### Definitions and Terminology

Each course offered by the Department of Mechanical Engineering shall be classified as either introductory level course or advanced level course, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses includes Level Two and Three courses.

A *Discipline Core Course* is a compulsory course which a candidate must pass in the manner provided in the Regulations. A *Project Course* is also a compulsory course which a candidate must pass. A *Breadth Course* is a Level 1, level 2 or level 3 course that is offered normally as an optional course for the curriculum. A *Depth Course* is a Level 3 course offered as an optional course for the curriculum. *Elective course* is a course offered by the Department of Mechanical Engineering, other departments under the Faculty of Engineering, or by other faculties.

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#### The Curriculum

The curriculum comprises of 180 credits of courses as follows:

- (a) 24 credits from General Engineering courses, including:
  - (i) either ENGG1002 Computer programming and applications (6 credits) or ENGG1016 Computer programming and applications I (6 credits); AND
  - (ii) either ENGG1003 Mathematics I (6 credits) or ENGG1004 Mathematics IA (3 credits) and ENGG1005 Mathematics IB (3 credits); AND
  - (iii) ENGG1010 Foundations of engineering mechanics; AND
  - (iv) ENGG1006 Engineering for sustainable development; OR an equivalent course ENGG10XX
- (b) 90 credits of Discipline Disciplinary Core courses
- (c) 18 credits of Project courses
- (d) 6 credits of Breadth courses
- (e) 21 credits of Elective courses
- (f) University requirements (21 credits), including:
  - (i) CAES1513 Professional and technical written communication for engineers (3 credits)<sup>29</sup>
  - (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
  - (iii) CENG1001 Practical Chinese language course for engineering students (3 credits)<sup>30</sup>
  - (iv) 12 credits of courses from the University Common Core Curriculum, selecting no more than one course from each Area of Inquiry

To complete the degree curriculum, a candidate must pass all the courses listed under (a) to (f) for a combination totaling to at least 180 credits, and satisfy any other requirements as stipulated in the University or Faculty of Engineering regulations.

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<sup>29</sup> Students pursuing BEng/BBA should take CAES1907 in lieu of CAES1513

<sup>30</sup> “Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective language course in lieu”.

### Degree Classification

The best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

### Order of Study

There are no course prerequisites but lower level courses should preferably be taken before higher level courses.

### **First Year**

The first-year syllabuses shall normally include the following courses:

General Engineering Courses (Total 24 credits)

Either

ENGG1002 Computer programming and applications (6 credits); or  
ENGG1016 Computer programming and applications I (6 credits); AND

Either

ENGG1003 Mathematics I (6 credits) or  
both ENGG1004 Mathematics IA (3 credits) and ENGG1005 Mathematics IB (3 credits); AND

ENGG1010 Foundations of engineering mechanics (6 credits); AND  
ENGG1006 Engineering for sustainable development; OR  
an equivalent course ENGG10xx (6 credits)

Discipline Core Courses (Total 24 credits)

MECH1004 Drawing and elements of design and manufacture (6 credits)  
MECH1005 Fundamentals of electrical and electronic engineering (6 credits)  
MECH1013 Engineering mechanics (6 credits)  
MECH1014 Thermofluids (6 credits)

UG5 requirements (Total 9 credits)

CAES1513 Professional and technical written communication for engineers (3 credits)<sup>3</sup>  
CAES1515 Professional and technical oral communication for engineers (3 credits)  
CENG1001 Practical Chinese language course for engineering students (3 credits)<sup>4</sup>

Optional Elective Course (Total 6 credits)

BBSE1012 Engineering training (6 credits) (Summer semester)

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### **Second Year**

The second-year syllabuses shall normally include the following courses:

Discipline Core Courses (Total 48 credits)

BBSE2001 Utility services (6 credits)

BBSE2007 Electrical power supply and lighting engineering (6 credits)  
BBSE2008 Air conditioning and refrigeration (6 credits)  
MECH1019 Properties of materials (6 credits)  
MECH2002 Engineering thermodynamics (6 credits)  
MECH2007 Mathematics II (6 credits)  
MECH2008 Mechanics of fluids (6 credits)  
MECH2018 Dynamics and control (6 credits)

UG5 requirements (Total 12 credits)

2 University Common Core Courses (12 credits)

Optional Elective Courses (Total 12 credits)

BBSE2006 Industrial training (6 credits) (Summer semester)  
MECH2019 Advanced computer programming in mechanical engineering applications (6 credits)

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### **Third Year**

The third-year syllabuses for Main Stream students shall normally include the following courses:

Project Courses (Total 18 credits)

BBSE3002 Applied research project (12 credits)  
BBSE3008 Design project (6 credits)

Breadth Course (Total 6 credits)

MECH3010 Engineering and technology management (6 credits)

Discipline Core Courses (18 credits)

BBSE3003 Fire protection engineering (6 credits)  
BBSE3009 Project management and engineering economics (6 credits)  
MECH3023 Building energy management and control systems (6 credits)

Elective Courses (21 credits)

Students are required to complete 21 credits of Elective courses in the following manner:

- (i) Elective Breadth/Depth Courses (up to 21 credits)
- (ii) Elective MSc(Eng) courses (0 to 6 credits)
- (iii) Free Elective Course (0 to 6 credits)

Elective Breadth/Depth Courses (Up to 21 credits)

MECH2016 Fundamentals of aeronautical engineering (6 credits)  
MECH3002 Air pollution control (6 credits)  
MECH3004 Automatic control (6 credits)  
MECH3007 Computer-aided design and manufacture (CAD/CAM) (6 credits)  
MECH3009 Energy conversion systems (6 credits)  
MECH3011 Heat transfer (6 credits)  
MECH3012 Product design and development (6 credits)



MECH3014 Materials for engineering applications (6 credits)  
MECH3020 Vibration (6 credits)  
MECH3021 Viscous flow (6 credits)  
MECH3026 Acoustics and noise control (6 credits)

Elective MSc(Eng) courses (Up to 6 credits)

MECH6024 Applied mathematics for engineers (3 credits)  
MECH6028 Processing and properties of engineering plastics (3 credits)  
MECH6040 Foundations of nanotechnology (3 credits)

Free Elective Course (Up to 6 credits)

Any other elective course as approved by the department (6 credits)

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### **Minor Programmes**

From 2010-11 academic year, candidates from other than the Department of Mechanical Engineering may pursue a Minor in Mechanical Engineering or Minor in Mechanical Engineering – Building Services Engineering. Candidates who are interested in pursuing minor in Mechanical Engineering must satisfy the following prerequisites:

- Passed HKALE Pure Mathematics and
- Passed HKAL/AS Physics/Engineering Science

### **Minor in Mechanical Engineering**

Candidates are required to complete a total of 36 credits of courses comprising:

- (a) Introductory courses (12 credits)

Students are required to complete:

ENGG1010 Foundations of engineering mechanics (6 credits)\*  
MECH1014 Thermofluids (6 credit units)

- (b) Advanced Elective courses (24 credits)

Students must complete 24 credits of advanced elective courses to be chosen from the following list:

MECH1004 Drawing and elements of design and manufacture (6 credits)  
MECH1013 Engineering mechanics (6 credits)  
MECH2002 Engineering thermodynamics (6 credits)  
MECH2005 Design and manufacture (6 credits)  
MECH2008 Mechanics of fluids (6 credits)  
MECH2009 Mechanics of solids (6 credits)  
MECH2018 Dynamics and control (6 credits)

\*Students opting for the Minor cannot use the course “ENGG1010 Foundations of engineering mechanics” as satisfying the requirements of the General Engineering Course.

## Minor in Mechanical Engineering – Building Services Engineering

Candidates are required to complete a total of 36 credits of courses comprising:

(a) Introductory courses (12 credits)

Students are required to complete:

ENGG1010 Foundations of engineering mechanics (6 credits)\*  
 MECH1014 Thermofluids (6 credit units)

(b) Advanced Elective courses (24 credits)

Students must complete 24 credits of advanced elective courses to be chosen from the following list with at least 12 credits of courses selected from those with course code BBSExxxx:

MECH1004 Drawing and elements of design and manufacture (6 credits)  
 MECH1013 Engineering mechanics (6 credits)  
 MECH2002 Engineering thermodynamics (6 credits)  
 MECH2008 Mechanics of fluids (6 credits)  
 BBSE2001 Utility services (6 credits)  
 BBSE2007 Electrical power supply and lighting engineering (6 credits)  
 BBSE2008 Air conditioning and refrigeration (6 credits)

## Double –Degree in BEng/BBA

Candidates pursuing studies for the double-degree in BEng/BBA curriculum are required to satisfy all the requirement of the above BEng curriculum and pass 54 credits of courses as listed below:

Course Code	Course	Credits
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information system	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6
	Business Electives (Any 2 courses in Finance, HRM or Marketing major)	12
	<b>Total</b>	<b>54</b>

Candidates pursuing studies for the double-degree in BEng/BBA curriculum are granted exemptions from the following courses:

Courses in the BEng curriculum to be exempted	Business courses to be completed
CAES1513 Professional and technical written communication for engineers (3 credits)	CAES1907 Business communication (3 credits)
Two Elective courses in Mechanical Engineering (total 12 credits) (1) MECH3010 Engineering and technology management (6 credits) (2) BBSE3009 Project management and engineering economics (6 credits)	BUSI1003 Introduction to management information system (6 credits) and BUSI1007 Principles of management (6 credits)
One Elective Course (6 credits)	ECON1001 Introduction to economics I (6 credits)

## **COURSE DESCRIPTIONS**

### **Level One**

#### **BBSE1012. Engineering training (6 credits)**

Knowledge and use of hand and machine tools; sheet metal work; welding; fixing and jointing of cables and pipes; construction, assembly and appreciation of electrical and mechanical systems; properties of metals and other building materials.

Assessment: Continuous assessment 100%.

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#### **MECH1004. Drawing and elements of design and manufacture (6 credits)**

Engineering drawing techniques; orthographic and pictorial projections; dimensioning and tolerancing, limits and fits, screw fasteners; cam; gears; computer aided drafting, with 3D CAD modeling; manufacturing processes, process selection, design for manufacturability.

Assessment: Continuous Assessment 100%.

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#### **MECH1005. Fundamentals of electrical and electronic engineering (6 credits)**

Basic circuit principles; steady-state A.C. circuit theory; magnetic circuits; transformers; bipolar junction transistors; field effect transistors; direct-current motors; solid-state controller for D.C. motors; combinational logic circuits.

Assessment: Practical Work 15%; Examination 85%.

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#### **MECH1013. Engineering Mechanics (6 credits)**

Stress and strain; bending of beams; deflection of beams; thin-walled pressure vessels; kinematics of particles with different forms of accelerations; momentum and energy conservation; applications of kinetic principles to particles and vehicles with mass variation; velocity-dependent resistance and the action of central forces; undamped and damped free vibration; simple and epicyclic gear trains.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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#### **MECH1014. Thermofluids (6 credits)**

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: Practical Work 10%; Examination 90%.

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#### **MECH1019. Properties of materials (6 credits)**

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; service behaviour of plastics.

Assessment: Practical Work 10%; Examination 90%.

- ENGG1002. Computer programming and applications (6 credits)**  
**ENGG1003. Mathematics I (6 credits)**  
**ENGG1004. Mathematics IA (3 credits)**  
**ENGG1005. Mathematics IB (3 credits)**  
**ENGG1006. Engineering for sustainable development (6 credits)**  
**ENGG1010. Foundations of engineering mechanics (6 credits)**  
**ENGG1016. Computer programming and applications I (6 credits)**

Please refer to the General Engineering courses for details.

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- CENG1001. Practical Chinese language course for engineering students (3 credits)**

Please refer to the University Language Enhancement Courses for details.

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- CAES1513. Professional and technical written communication for engineers (3 credits)**

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using written English. Topics include accessing, abstracting, analysing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; small-scale project design and implementation.

Assessment: Continuous Assessment 100%

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- CAES1515 Professional and technical oral communication for engineers (3 credits)**

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: 100% Continuous assessment.

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- CCXXxxxx University Common Core course (6 credits)**
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- CCXXxxxx University Common Core course (6 credits)**
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## **Level Two**

- BBSE2001. Utility services (6 credits)**

Characteristics and design of different service installations: cold, hot and flushing water supply systems; steam supply, sanitary and stormwater; drainage systems; vertical transportation system; L.V. electrical system; communication systems; security and alarm systems.

Assessment: Continuous assessment 20%; Examination 80%.

**BBSE2006. Industrial training (6 credits)**

Training in industry for a nominal period of at least six weeks during the summer vacation of the Second Year of Study

Assessment: Continuous assessment 100%.

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**BBSE2007 Electrical power supply and lighting engineering (6 credits)**

Electrical power systems and motors; electricity market, system planning and design; electrical power supply and distribution; standby generators and power supplies; introduction and lighting basic concepts; light sources and luminaires; lighting design principles and process; lighting energy management

Assessment: Continuous assessment 20%; Examination 80%.

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**BBSE2008 Air conditioning and refrigeration (6 credits)**

Air conditioning systems, psychrometry, thermal comfort criteria, fresh air requirement, indoor air quality and pollutants, cooling and heating load estimation, energy consumption estimation, analysis of thermal load and energy consumption, air conditioning processes and systems, air-side systems, fan design and control, air duct design, space air diffusion, water-side systems, piping system design, pump design and operation, mechanical and natural ventilation, ventilation efficiency, refrigerants and refrigeration systems, refrigeration cycles and components, design of refrigeration systems, refrigeration system components and performance.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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**MECH2002. Engineering thermodynamics (6 credits)**

Steam and gas power plant; refrigeration; jet propulsion and turbomachinery; gas mixture; psychrometry and air-conditioning, introduction to heat transfer.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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**MECH2007. Mathematics II (6 credits)**

Complex variables; Fourier series and Fourier transforms; partial differential equations; introduction to probability and statistics, elementary numerical analysis.

Assessment: Continuous assessment 20%; Examination 80%.

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**MECH2008. Mechanics of fluids (6 credits)**

Navier-Stokes equations; pipe and channel viscous flows; lubrication; boundary layer flows; two-dimensional potential flows; open-channel flows; fluid machines.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

**MECH2016. Fundamentals of aeronautical engineering (6 credits)**

History of aeronautical science; wing aerodynamics; propulsion; flight mechanics; systems and airframe structures; lightweight materials, failure modes, high-temperature materials, creep damage; maintenance.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

---

**MECH2018. Dynamics and control (6 credits)**

Advanced rotational motion; balancing of rotating and reciprocating masses; vibration isolation and control; vibration of multi degree-of-freedom in-line systems; free transverse vibration of beams. Modelling of physical systems; time response analysis of dynamical systems; feedback control systems; control system design and applications; stability; root locus method; analogue computer programming

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

---

**MECH2019. Advanced computer programming in mechanical engineering applications (6 credits)**

Windows® Form programming in C# with user interface and graphics; group project on the application of computing to the solution of an engineering problem; interfacing a microcontroller with a window program; basic programming technique on numerical computation with SCILab for solving engineering problems.

Assessment: Continuous assessment 100%.

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**Level Three**

**BBSE3002. Applied research project (12 credits)**

The project aims at the application of knowledge acquired during the course of the programme to a research investigation in building services systems targeted at achieving a novel design or an improvement in functionality, performance or cost savings.

Assessment: Continuous Assessment 100%.

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**BBSE3003. Fire protection engineering (6 credits)**

Fire behaviour and characteristics; compartment fires; fire hazards; automatic fire detection and alarm systems; automatic fixed water-based and gas-based fire extinguishing systems; special fire extinguishing systems; portable fire extinguishers; smoke production; smoke management and control systems; staircase pressurization systems; building evacuation; LPC/FOC rules; FSD and NFPA codes; prescriptive and performance-based approaches; fire risk management.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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**BBSE3008. Design Project (6 credits)**

Innovation / Inter-disciplinary in building services design, design rationales, feasibility studies, scheme design, detail design of air conditioning, fire services, plumbing and drainage, electrical power supply and lighting, vertical transportation, building control and automation, sustainability and energy efficient, design coordination and integration.

Assessment: Practical Work 50%; Continuous assessment 50%.

**BBSE3009. Project management and engineering economics (6 credits)**

Characteristics of building projects and typical contracts; roles of different building professionals; project planning, scheduling and control; contract documentation and contractual arrangement; estimating and tendering; site organisation and supervision; measurement and valuation of works; claim management and settlement; alternative dispute resolution; time value of money; interest and interest formulas; equivalent analysis; bases for comparison of alternatives; present worth analysis; annual equivalent worth analysis; rate of return analysis; project cash flow analysis; decision making among alternatives; applications to real-world economy.

Assessment: Continuous assessment 20%; Examination 80%.

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**MECH3002. Air pollution control (6 credits)**

Particulate and aerosol abatement technology; gas absorption - plate and packed columns; adsorption for the removal of odours and trace gases; combustion fundamentals and abatement of volatile organic compounds using incineration techniques.

Assessment: Continuous assessment 10%; Examination 90%.

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**MECH3004. Automatic control (6 credits)**

Control of mechanical, hydraulic and pneumatic 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: Practical Work 10%; Examination 90%.

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**MECH3007. Computer-aided design and manufacture (CAD/CAM) (6 credits)**

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: Continuous assessment 30%; Examination 70%.

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**MECH3009. Energy conversion systems (6 credits)**

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: Continuous assessment 10%; Examination 90%.

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**MECH3010. Engineering and technology management (6 credits)**

Quantitative methods for engineering and technology management; managing technology through the product life cycle; planning; organizing; staffing; leading; controlling, quantitative methods for analyzing / solving decision making involving engineering and technology management problems; quantitative methods for forecasting; resource allocations subject to constraints; linear programming and simplex method; decision theory with the application of decision trees; inventory control models; queuing theory; transportation and resource allocation for business operations.

Assessment: Continuous assessment 20%; Examination 80%.

**MECH3011. Heat transfer (6 credits)**

Fourier's law; heat-conduction equation; steady and unsteady conduction; basic convection principles; laminar and turbulent heat transfer in tubes and over plates; Reynolds analogy; log mean temperature difference; effectiveness-NTU method; heat exchanger design; exergy analysis; optimisation of heat transfer process and system.

Assessment: Continuous assessment 10%; Examination 90%.

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**MECH3012. Product design and development (6 credits)**

Product design and product development process; methods and tools for design, analysis and testing; prototype making methods and practices; design for tooling; design of electromechanical products.

Assessment: Practical Work 20%; Examination 80%.

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**MECH3014. Materials for engineering applications (6 credits)**

Materials for high strength/weight ratio; high and low temperature service; resistance to corrosion resistance and protection; residual stresses; composite and ceramic materials; manufacturing properties; problem based learning module; introduction to materials classification.

Assessment: Continuous assessment 10%; Examination 90%.

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**MECH3020. Vibration (6 credits)**

Vibration measurement; single- and two-plane balancing of rotors in situ, machinery condition monitoring; random vibration; digital signal analysis; matrix analysis of free and forced vibrations of multi-degree-of-freedom systems; classical analysis of beam vibration; energy methods for approximate vibration analysis.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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**MECH3021. Viscous flow (6 credits)**

Eulerian and Lagrangian descriptions; Navier-Stokes equations; low-Reynolds-number flows; laminar boundary layers; laminar stability theory; turbulent flows.

Assessment: Practical Work 10%; Continuous assessment 10%; Examination 80%.

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**MECH3023. Building energy management and control systems (6 credits)**

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: Practical Work 10%; Continuous assessment 10%; Examination 80%.



### **MECH3026. Acoustics and noise control (6 credits)**

Human hearing; sound measurement and environmental noise legislation; wave equation, sound radiation by piston and aeroacoustic source mechanisms; sound propagation and reflection in ducts; duct modes; sound absorption mechanisms; sound reverberation in rooms and transmission through walls; physics of active noise control; introduction to vibration isolation.

Assessment: Practical Work 10%; Examination 90%.

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### **MECH6024. Applied mathematics for engineers (3 credits)**

Statistical and numerical methods in engineering; hypothesis testing; estimation of parameters and confidence intervals; correlation coefficient; direct and iterative methods for systems of equations; numerical analysis; finite difference and finite element schemes; wave propagation and vibration; normal modes.

Assessment: Examination 100%.

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### **MECH6028. Processing and properties of engineering plastics (3 credits)**

Viscosity of polymer melts; extrusion; injection moulding; blow moulding; joining; plating; yield criteria; environmental stress cracking; UV degradation; flame retardation; biodegradable polymers; viscoelastic behaviour of plastics; dynamic behaviour; design methods for plastics based on creep data.

Assessment: Examination 100%.

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### **MECH6040. Foundations of nanotechnology (3 credits)**

Characteristic length scales, nanomaterials, nanostructures, physical properties of nanostructures, deposition techniques of nanofabrication, high resolution analysis and characterization, scanning probe methods, nanoindentation, deformation of nanostructures, mechanical behaviours of nanocrystalline solids, ultra-high strength of nanostructures, sensors, actuators, MEMS, NEMS, functional nanomaterials, nano-scale devices, modelling and computer-aided designs, bio-nanotechnology.

Assessment: Examination 100%.

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## **MEDICAL ENGINEERING**

### **SYLLABUS**

*This syllabus applies to students admitted in the academic year 2011-12 and thereafter.*

#### **Definitions and Terminology**

Each course offered for the BEng in Medical Engineering curriculum shall be classified as either introductory level course or advanced level course, and be assigned a Level --- One, Two or Three, in which Level One courses are generally classified as introductory courses whereas advanced courses includes Level Two and Three courses.

*A Compulsory course* is a course which a student must study. *A Core Engineering course* is a Compulsory course which a student must pass in the manner as stipulated in the Regulations.

*The Projects* shall include MEDE2008 integrated project and MEDE3002 final-year project.

The *training course* in this curriculum consists of MEDE1010 Engineering Training and MEDE2010 Professional Training.

An *Elective course in Medical Engineering* is a Level 2 or Level 3 course offered as an optional course for the curriculum.

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### **Loading**

The normal load for a student is 60 credits of courses (excluding summer semester) per academic year with 30 credits in each semester. Students are allowed to increase the loading by not more than 6 credits in a semester or decrease the loading by the equivalent number of credits which they have previously taken as additional loading and passed.

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### **Curriculum Requirement**

The curriculum comprises 186 credits of courses as follows:

- (a) 114 credits of Core Engineering courses
- (b) 30 credits of Compulsory courses
- (c) at least 9 credits of elective courses in Medical Engineering
- (d) 21 credits of courses satisfying the UG5 requirements:
  - (i) Professional and technical communication for medical engineering students<sup>31</sup> (3 credits)
  - (ii) Professional and technical oral communication for engineers (3 credits)
  - (iii) Practical Chinese language course for engineering students<sup>32</sup> (3 credits)
  - (iv) Two courses from the Common Core Curriculum, selecting no more than one course from each Area of Inquiry (12 credits)
- (e) at least 6 credits of Complementary Studies courses comprising:
  - (i) Engineering management and society<sup>33</sup> (6 credits)
- (f) Engineering training<sup>3</sup> (3 credits)
- (g) Professional training<sup>3</sup> (3 credits)

To complete the degree requirement, a student must obtain at least 186 credits including all courses listed under (a) to (g).

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### **Order of Study**

Order of study is dictated by pre-requisite and co-requisite requirements. Generally, Level 1 course should be taken before Level 2 courses, Level 2 courses should be taken before Level 3 courses. Medical Engineering elective course can be taken in any order as long as pre-requisites are met.

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<sup>31</sup> Students pursuing the double degrees in BEng/BBA are required to take CAES1907 in lieu of CAES1511.

<sup>32</sup> Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

<sup>33</sup> Students pursuing the studies of double degrees in BEng/BBA are allowed a waiver from taking these courses, the credits of which will be replaced by the required courses in Finance, HRM or Marketing major offered by the Faculty of Business and Economics to satisfy the Medical Engineering Curriculum requirement.

## **Degree Classification**

The best 180 credits including the courses below shall be taken into account:

- (i) 6 credits of Complementary courses;
  - (ii) 21 credits of courses satisfying the UG5 requirements;
  - (iii) 114 credits of Core Engineering Courses;
  - (iv) the remaining courses with the best results including at least 9 credits of elective courses in Medical Engineering and 30 credits of Compulsory courses.
- 

The programme structure is as follows:

### **FIRST YEAR**

#### **Core Engineering Courses (Total 39 credits)**

*(The number in brackets is the number of credits of the particular course)*

ENGG1015	Introduction to electrical and electronic engineering (6 credits)
ENGG1010	Foundations of engineering mechanics (6 credits)
ENGG1011	Introduction to biomedical engineering (6 credits)
MEDE0001	Life science I (Biochemistry) (6 credits)
MEDE1003	Introduction to engineering materials (3 credits)

either

ENGG1002 Computer programming and applications (6 credits)

or

ENGG1016 Computer programming and applications I (6 credits)

either

ENGG1003 Mathematics I (6 credits)

or

ENGG1004 Mathematics IA (3 credits) and

ENGG1005 Mathematics IB (3 credits)

#### **UG5 Requirements (Total 21 credits)**

CAES1511 Professional and technical communication for medical engineering students<sup>1</sup> (3 credits)

CAES1515 Professional and technical oral communication for engineers (3 credits)

CENG1001 Practical Chinese language course for engineering students<sup>2</sup> (3 credits)

Two Common Core Courses (12 credits)

#### **Engineering Training (Total 3 credits)**

MEDE1010 Engineering training<sup>3</sup> (3 credits)

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### **SECOND YEAR**

#### **Core Engineering Courses (Total 57 credits)**

ELEC1401 Computer organization and microprocessors (6 credits)

MECH2007 Mathematics II (6 credits)

MEDE0002 Life science II (Cell Biology & Physiology) (6 credits)

MEDE2001 Biomechanics for medical engineering (6 credits)

MEDE2002	Electromagnetics in biomedicine (6 credits)
MEDE2004	Biomaterials I (3 credits)
MEDE2005	Thermofluids for medical engineering (6 credits)
MEDE2007	Medical imaging (6 credits)
MEDE2008	Integrated project (6 credits)
MEDE2201	Signals and linear systems (6 credits)

**Complementary Studies Course (Total 6 credits)**

MEDE2814	Engineering management and society <sup>3</sup> (6 credits)
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**Professional Training (Total 3 credits)**

MEDE2010	Professional training <sup>3</sup> (3 credits)
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**THIRD YEAR**

**Core Engineering Courses (Total 18 credits)**

MEDE3002	Medical engineering final year project (12 credits)
LIFE2004	Life sciences III (Physiology) (6 credits)

**Compulsory Courses (Total 30 credits)**

MEDE2006	Statistical planning and analysis for biomedical studies (3 credits)
MEDE2009	Biophotonics (6 credits)
MEDE3001	Tissue engineering (3 credits)
MEDE3003	Biomaterials II (3 credits)
MEDE3005	Transport phenomena in biological systems (6 credits)
MEDE3006	Medical devices (3 credits)
MEDE3007	Molecular and cellular biomechanics (6 credits)

**Elective Course in Medical Engineering<sup>3</sup> (Total 9 credits)**

**Recommended Elective Course**

MECH6040	Foundations of nanotechnology (3 credits)
ELEC6067	Magnetic resonance imaging (MRI) technology & applications (6 credits)
ELEC6079	Biomedical ultrasound (6 credits)
ELEC6081	Biomedical signals and systems (6 credits)
BIOC3608	Introduction to bioinformatics (6 credits)
ELEC2815	Economics, finance and marketing for engineers (6 credits)

**Additional Elective Course**

***Group A: Biomechanics, Biomaterials, Tissue Engineering***

MECH2001	Applied dynamics (3 credits)
MECH2004	Control (3 credits) (cannot be taken with ELEC2205)
MECH2005	Design and manufacture (6 credits)
MECH6024	Applied mathematics for engineers (3 credits)

***Group B: Medical Electronics and Biomedical Imaging***

ELEC2204	Digital signal processing (6 credits)
ELEC2205	Control and instrumentation (6 credits) (cannot be taken with MECH2004)
ELEC2302	Digital system design (6 credits)
ELEC2601	Human computer interaction (6 credits)
ELEC3222	Robotics (6 credits)

ELEC3225	Digital imaging processing (6 credits)
CSIS0278	Introduction to database management systems (6 credits)

The list of Elective courses in Medical Engineering is updated regularly and some courses may not be offered every year. Students are encouraged to consult the Programme Director or other teachers in Medical Engineering for advice on planning their curriculum, especially in the third-year. Due to the interdisciplinary nature of the Medical Engineering Programme, students may be permitted to take courses outside the list of Medical Engineering elective courses subject to the approval of the Programme Director.

### Double degrees in BEng/BBA option

Candidates pursuing studies for the double degrees in BEng/BBA curriculum are required to satisfy all the requirement of the above BEng curriculum and pass 54 credits of courses as listed below:

Course Code	Course	Credits
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information system	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6
	Business Electives (Any 2 courses in Finance, HRM or Marketing major)	12
	<b>Total</b>	<b>54</b>

### Exemption rule for students pursuing the BEng/BBA double degrees option:

For students pursuing the double degrees in BEng/BBA option, they are deemed to have satisfied the following courses:

- 6 credits of Complementary Studies
- 9 credits of Elective course in Medical Engineering
- 3 credits of Engineering training and
- 3 credits of Professional training
- 3 credits of Compulsory course

after they have successfully completed all the courses from the following list:

Course Code	Course	Credits
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information systems	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6

## COURSE DESCRIPTIONS

### Level One

- ENGG1002. Computer programming and applications (6 credits)**
- ENGG1003. Mathematics I (6 credits)**
- ENGG1004. Mathematics IA (3 credits)**
- ENGG1005. Mathematics IB (3 credits)**
- ENGG1010. Foundations of engineering mechanics (6 credits)**
- ENGG1011. Introduction to biomedical engineering (6 credits)**
- ENGG1015. Introduction to electrical and electronic engineering (6 credits)**
- ENGG1016. Computer programming and applications I (6 credits)**

Please refer to the General Engineering courses in the syllabus for the degree of BEng for details.

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### **MEDE0001. Life science 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: continuous assessment 30%, examination 70%

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### **MEDE1003. Introduction to engineering materials (3 credits)**

Elements of atomic structure and bonding; crystal structure; metals, ceramics and polymers; defects; solidification; plastic deformation and fracture; recrystallization; phase diagrams; alloy properties; service behaviour of plastics and metals.

Assessment: practical work 10%, examination 90%

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### **CAES1511. Professional and technical communication for medical engineering students (3 credits)**

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentation give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major. Assessment is wholly by coursework.

Assessment: continuous assessment 100%

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### **CAES1515. Professional and technical oral communication for engineers (3 credits)**

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to

improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: continuous assessment 100%

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### **CENG1001. Practical Chinese language course for engineering students (3 credits)**

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

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### **MEDE1010. Engineering training (3 credits)**

The focus of this course is on practical training. It helps students to appreciate the processes and technologies through demonstrations and hands-on experience. The topics include computer-aided drafting; design; modeling and prototyping; CNC machining principles; metrology equipment; materials processing; strain gauging; virtual instrumentation; microcontroller applications.

Assessment: continuous assessment 100%

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### **12 credits of courses from the Common Core Curriculum**

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## Level Two

### **ELEC1401. Computer organization and microprocessors (6 credits)**

Integer and floating point number representations; brief introduction to digital circuits; memory cells and systems; 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; exception handling; assembler, linker and loader.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

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### **MECH2007. Mathematics II (6 credits)**

Complex variables; Fourier series and Fourier transforms; partial differential equations; introduction to probability and statistics; elementary numerical analysis.

Assessment: Please refer to the information provided by the Department of Mechanical Engineering

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### **MEDE0002. Life science II (Cell Biology and Physiology) (6 credits)**

This course introduces cell and tissue functions that impact on physiology of the human body. Topics include chromosome structure and gene expression; plasma membrane and subcellular organelles; cytoskeleton and cell movement; extracellular matrix and cell-matrix interactions; tissue organization; homeostasis involving the cardiovascular, respiratory, musculoskeletal and nervous systems.

Assessment: continuous assessment 25%, examination 75%

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### **MEDE2001. Biomechanics for medical engineering (6 credits)**

Kinematic analysis of linkage mechanisms; stress and strain; bending and deflection of beams. Human musculoskeletal system; biomechanical analysis of the human musculoskeletal system; bone fracture & fixation; biomechanics of the spine; selected topics in biomechanics; biomechanical analysis of the human gait and motion.

Assessment: practical work 15%, examination 85%

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### **MEDE2002. Electromagnetics in biomedicine (6 credits)**

The aim of this course is two fold. First, fundamental physics and mathematics in electricity and magnetism are reviewed. Vector analysis is included. Second, emphasis is placed on the biological aspects of electromagnetism and the biomedical applications of electromagnetism.

Assessment: continuous assessment 20%, examination 80%



**MEDE2004. Biomaterials I (3 credits)**

Definitions in biomaterials science and engineering; history of biomaterials science; review of engineering materials; structure and properties of biological materials; processing, structures and properties of biomaterials; tissue engineering; analytical and testing techniques for developing new biomaterials; interaction between human body environment and biomaterials.

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

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**MEDE2005. Thermofluids for medical engineering (6 credits)**

Concepts and definitions; thermodynamic properties; heat and work; first law of thermodynamics; fluid kinematics; constitutive relations; blood rheology; continuity and momentum equations; dimensional analysis, similarity and modeling; solute fluxes in mixture; Fick's law; bio-mass transport.

Assessment: practical work 10%, examination 90%

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**MEDE2007. Medical imaging (6 credits)**

Provides an introduction to the clinical non-invasive techniques in studying the functional and pathological aspects of the human body. This course will introduce the principles of conventional (x-ray and ultrasound) and modern (Computer Assisted Tomography – CAT; Magnetic Resonance Imaging – MRI; and Positron Emission Tomography – PET) imaging techniques applied to biological tissues and in medical diagnoses and the interpretations of these images. It will also briefly introduce the hospital PACS (picture archiving computer system) and emerging medical imaging technologies.

Assessment: continuous assessment 15%, examination 85%

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**MEDE2008. Integrated project (6 credits)**

A group project consisting of guided design and implementation of a medical engineering application. This project offers students in small teams an opportunity to integrate their knowledge in engineering techniques and know-how, as well as project management, following a disciplined engineering process, to achieve the final goal.

Assessment: practical work 100%

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**MEDE2201. Signals and linear systems (6 credits)**

Linear time-invariant systems; continuous-time signals; convolution; frequency response; time-domain and frequency-domain representation of discrete-time signals and systems; continuous and discrete Fourier transform; z-transform; A/D and D/A conversion; sampling and reconstruction; digital filters; examples in biomedical engineering applications.

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

**MEDE2814. Engineering management and society (6 credits)**

Social responsibility, environmental and safety issues, professional conduct and responsibility, engineering management, decision making processes, project management, leadership, marketing, market analysis, marketing plan, new media marketing, contract law, law of tort, professional negligence and intellectual property law.

Assessment: continuous assessment 30%, examination 70%

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**MEDE2010. Professional training (3 credits)**

Assessment: continuous assessment 100%

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**Level Three****MEDE3002. Medical engineering final year project (12 credits)**

A dissertation or report on a topic consisting of design, experimental or analytical investigations. Six hours of lecturing will be introduced to discuss topics on (1) biomedical literature search; (2) experimental designs to address medical problems or questions; (3) data analysis and interpretation; and (4) medical engineering report preparation and presentation.

Assessment: continuous assessment 100%

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**LIFE2004. Life Sciences III (Physiology) (6 credits)**

This course focuses on human physiology and pathophysiology. Topics include heart and cardiovascular system and disorders; brain and neurological system and disorders; musculoskeletal system and disorders; respiration and breathing mechanics and will be illustrated with examples of quantitative analyses, where relevant.

Assessment: continuous assessment 30%, examination 70%

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**MEDE2006. Statistical planning and analysis for biomedical studies (3 credits)**

To understand the principles and concepts in statistical methodology commonly used for biomedical investigations; to apply the statistical tools in planning for biomedical studies, managing and analyzing data generated from these studies; to appreciate the principles and concepts for critical appraisal of biomedical literature

Assessment: continuous assessment 20%, examination 80%

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**MEDE2009. Biophotonics (6 credits)**

This is an introductory course in optics and photonics covering the basic concepts of ray optics, imaging system design, electromagnetic waves, propagation characteristics of light through media, Fourier optics, and other optical phenomena such as interference and diffraction. Modern topics in photonics such as optical waveguides, fiber optics, lasers are also discussed. Their applications in biomedical

areas are also included, such as optical microscopy and spectroscopy for medical diagnosis, laser therapy, micro-endoscopy, and optical biosensing.

Assessment: continuous assessment 60%, examination 40%

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### **MEDE3001. Tissue engineering (3 credits)**

To understand the basic composition of engineered tissues; appreciate the breadth and depth of the engineering considerations when designing tissue substitutes; introduce the current technological advances enabling the tissue engineering sectors and the future trends; review some real examples of engineered tissue, skin and cartilage as the only marketed products and candidates in R&D stage; outline other key issues such as safety and regulations.

Assessment: practical work 20%, examination 80%

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### **MEDE3003. Biomaterials II (3 credits)**

Medical devices and tissue replacement; medical device regulations; standards; ethical issues; medical device evaluation; hard tissue replacement; soft tissue replacement; new trends and emerging technologies.

Assessment: continuous assessment 20%, examination 80%

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### **MEDE3005. Transport phenomena in biological systems (6 credits)**

Basic fluid flow problems in biomechanics; non-Newtonian rheology; flow in porous media; conservation of mass, momentum and energy; diffusion; diffusion with convection; Taylor dispersion; hemodialysis; biomedical and biotechnological applications.

Assessment: examination 100%

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### **MEDE3006. Medical devices (3 credits)**

Provides a practical introduction to various medical devices in modern healthcare industries, including the basic principals and applications of commonly used medical instruments and devices, monitoring and analysis equipment, therapeutic equipment, software systems, and the safety and regulatory issues.

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

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### **MEDE3007. 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) Introduction to intermolecular interactions (electrostatic force, van der Waals force); and (4) Mechanics of the cell (membrane elasticity, cell shape, cell adhesion).

Assessment: continuous assessment 40%, examination 60%

## **Elective Courses in Medical Engineering**

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### **MECH6040. Foundations of nanotechnology (3 credits)**

Characteristic length scales, nanomaterials, nanostructures, physical properties of nanostructures, deposition techniques of nanofabrication, high resolution analysis and characterization, scanning probe methods, nanoindentation, deformation of nanostructures, mechanical behaviours of nanocrystalline solids, ultra-high strength of nanostructures, sensors, actuators, MEMS, NEMS, functional nanomaterials, nano-scale devices, modelling and computer-aided designs, bio-nanotechnology.

Assessment: Please refer to the information provided by the Department of Mechanical Engineering

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### **ELEC6067. Magnetic resonance imaging (MRI) technology and applications (6 credits)**

Fundamentals of Nuclear Magnetic Resonance (NMR); introduction to MR imaging system; design principle of permanent and super-conducting magnets; RF antennas (probes), gradient coils, RF transmitter and receivers; signal processing and imaging reconstruction; basic pulse sequence design; advanced fast imaging methods; MR spectroscopy and MR imaging applications, including functional MRI in human brain functional research and clinical applications.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

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### **ELEC6079. Biomedical ultrasound (6 credits)**

Ultrasound physics, imaging modes, data acquisition schemes, transducer modelling; other applications of ultrasound including flow analysis, microscopy, therapy. Previous exposure to medical imaging theory (e.g. MEDE 2007 – Medical Imaging, or equivalent) is highly preferred.

Prerequisite: MEDE2007 Medical imaging

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

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### **ELEC6081. Biomedical signals and systems (6 credits)**

Biomedical signals, ECG, EEG, EMG, spectral analysis, time-frequency analysis, filtering, blind source separation, recognition.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

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### **BIOC3608. Introduction to bioinformatics (6 credits)**

This course will examine existing programs and services available on the World Wide Web for DNA and protein sequence analysis. Students will also learn how to use the sequence analysis EMBOSS package installed locally. The underlying principles of these analysis programs and services will be

presented. Students will learn how to retrieve, analyse, and compare protein and DNA sequence similarities. A basic introduction to protein modeling will also be presented.

Assessment: Please refer to the information provided by the Department of Biochemistry

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**ELEC2815. Economics, finance and marketing for engineers (6 credits)**

Macroeconomics; microeconomics, financial management; accounting concepts and financial statements; cost and profit, technical analysis, cash flow, interest rate, bonds, Black-Scholes formula

Assessment: continuous assessment 30%, examination 70%

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**MECH2001. Applied dynamics (3 credits)**

Advanced rotational motion; balancing of rotating and reciprocating masses; vibration isolation and control; vibration of multi degree-of-freedom in-line systems; free transverse vibration of beams.

Assessment: Please refer to the information provided by the Department of Mechanical Engineering

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**MECH2004. Control (3 credits)**

Modelling of physical systems; time response analysis of dynamical systems; feedback control systems; control system design and applications; stability; root locus method; analogue computer programming.

Assessment: Please refer to the information provided by the Department of Mechanical Engineering

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**MECH2005. Design and manufacture (6 credits)**

Materials selection; joining and fastening; mechanism design; tooling system design; power transmission systems; CNC machining; rapid prototyping.

Assessment: Please refer to the information provided by the Department of Mechanical Engineering

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**MECH6024. Applied mathematics for engineers (3 credits)**

Statistical and numerical methods in engineering; hypothesis testing; estimation of parameters and confidence intervals; correlation coefficient; direct and iterative methods for systems of equations; numerical analysis; finite difference and finite element schemes; wave propagation and vibration; normal modes.

Assessment: Please refer to the information provided by the Department of Mechanical Engineering

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**ELEC2204. Digital signal processing (6 credits)**

Applications of digital signal processing, discrete-time signal and system, design of digital filters, DFT and fast algorithms, digital signal processing using Matlab, fundamentals of random signals, spectral estimation, adaptive signal processing, digital signal processors.

Prerequisite: MEDE2201 Signals and linear systems

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

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**ELEC2205. Control and instrumentation (6 credits)**

Introduction to control systems; principles of feedback; root-locus method; frequency-response design methods; state-space methods; control system software; digital control; measurement systems; electromagnetic compatibility; data acquisition.

Co-requisite: MEDE2201 Signals and linear systems

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

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**ELEC2302. Digital system design (6 credits)**

Digital system concepts and digital components; digital design using discrete and programmable devices; high speed digital system design considerations; Hardware Description Language (HDL); digital system structures; digital logic and memory testing; fault detection analysis and design; Design for Test (DFT) techniques.

Prerequisites: ELEC1611 Circuit theory and digital logic or (ELEC1301 Circuits & ELEC1303 Electronics)

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

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**ELEC2601. Human computer interaction (6 credits)**

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.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

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**ELEC3222. Robotics (6 credits)**

Introduction to robot configurations; forward and inverse kinematics; robot dynamics and control; robot path planning and programming; robot applications; special topics in robotics.

Prerequisite: ELEC2205 Control and instrumentation

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

**ELEC3225. Digital imaging processing (6 credits)**

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.

Prerequisite: MEDE2201 Signals and linear systems

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

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**CSIS0278. 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 and calculus, database design and normalization, database query languages, indexing schemes, integrity, concurrency control, query processing. This course may not be taken with BUSI0052.

Prerequisite: ELEC1501 Computer programming and data structures

Assessment: Please refer to the information provided by the Department of Computer Science