REGULATIONS FOR THE DEGREE OF BACHELOR OF ENGINEERING BEng[1]

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

EN 1 Admission to the Degree

To be eligible for admission to the degree of B.Eng., 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 the regulations that follow and the syllabuses of the degree.

EN 2 Length of Study

The curriculum shall normally require six semesters of full-time study, spread over three academic years.

EN 3 Curriculum Requirements

To complete the curriculum, a candidate shall

(a) satisfy the requirements prescribed in UG 3 of the Regulations for the First Degree Curricula;
(b) in addition to the requirements in EN 3(a) above, to satisfactorily complete altogether 6 credit-units of courses in English language enhancement; and
(c) complete not less than 180 credit-units of courses, in the manner specified in the syllabuses; candidates are required to pass all core courses as specified in the syllabuses, and will have to satisfactorily complete prerequisite courses in order to enrol in a succeeding course.

EN 4 Candidates shall normally select not less than 30 and not more than 36 credit-units of courses in each semester, unless otherwise permitted or required by the Board of the Faculty. Candidates who have overloaded in preceding semesters will be allowed to reduce the load by up to the equivalent number of credit-units they have passed in excess of the normal load in a subsequent semester without having to seek prior approval.

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.

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[1] These Regulations apply to students admitted to the first year of study for the degree of B.Eng. in the academic year 1998-99 and thereafter.

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 UG 5 of the Regulations for the First Degree Curricula.

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

EN 9 A candidate who fails in any course may be required by the Board of the Faculty to repeat the same course or to take a special examination at a time specified by the Board. The grades for all the attempts made will be recorded in his transcript.

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

EN 11 A candidate will normally be recommended for discontinuation if

(a) his/her yearly average of Semester GPA is unsatisfactory for two consecutive academic years;
(b) he/she has failed in a core course three times; or
(c) he/she has accumulated less than half of the credit-units expected of a normal load for two consecutive years.

EN 12 Advanced Standing

Advanced standing may be granted to candidates in recognition of studies completed successfully elsewhere. The amount of advanced credit-units 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 credit-units shall be gained in this University.

Advanced credit-units granted shall not be included in the calculation of the cumulative GPA.

EN 13 Degree Classification

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

EN 14 The classification of honours shall be determined by the Board of the Faculty at its full discretion by taking the overall performance of candidates and other relevant factors into consideration.

PROGRAMME STRUCTURES AND SYLLABUSES FOR THE DEGREE OF BACHELOR OF ENGINEERING (BENG)

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

BUILDING SERVICES ENGINEERING

PROGRAMME STRUCTURE

Definitions and Terminology

The Level of a course shall be 1, 2 or 3. Each course offered by the Department shall be assigned a Level which is indicated by the left-most digit of the number in the course code.

A Compulsory course is a course which a student must study. A Core course is a compulsory course which a student must pass in the manner as stipulated in the Regulations. A Breadth course is a Level 2 or Level 3 course offered as a compulsory or optional course for the curriculum. A Depth course is a Level 3 course offered as a compulsory or optional course for the curriculum. A Complementary Studies course is either a Level 1, Level 2 or Level 3 course offered as a compulsory or optional course for the curriculum by the Department. It also includes broadening courses on a list approved by the Department which would normally be considered as Level 1 courses.

The Curriculum

The curriculum comprises 186 credit-units of courses as follows:

(a) Nineteen Core courses (96 credit-units)
(b) Six to Seven Compulsory/ Elective Depth/Breadth courses (36 credit-units)
(c) Nine Complementary Studies courses (30 credit-units) **
(d) Inter-disciplinary Building Services Design and Applied Research Project (18 credit-units)
(e) Workshop training (3 credit-units)
(f) Industrial training (3 credit-units)

There are no course prerequisites but there is a course co-requisite structure so that lower level courses should preferably be taken before higher level courses. To complete the curriculum, a candidate must take all the courses listed under (a) to (f) and obtain at least 180 credit-units including all the courses listed under (a) , (c)** and (d).

** Students must pass the English and Chinese language courses (9 credit-units), at least a pass in a broadening course (3 credit-units) in Humanities and Social Sciences Studies, and at least a pass in a broadening course (3 credit-units) in Culture and Value Studies or an area of study outside this degree curriculum as an elective.

First Year

Loading

The normal load for a student is 60 credit-units of courses (excluding summer vacation) with 30 credit-units in each semester. Students are allowed to increase the loading by not more than 6 credit-units in a semester.

Courses

Students must take the examination/coursework in the following courses and pass the courses listed under (a), (b)(i) and (b)(ii).

(a) 8 Core courses (45 credit-units)
(b) 5 Complementary Studies courses (15 credit-units) consisting of
  (i) 2 English Communications courses (6 credit-units)
  (ii) 1 Chinese Language course (3 credit-units)
  (iii) "Engineer in Society" (3 credit-units)
  (iv) 1 Broadening course on the approved list (3 credit-units)

Core Courses		
Code	Title	Credit-units
MECH1004	Drawing and elements of design and manufacture	6
MECH1005	Fundamentals of electrical and electronic engineering	6
MECH1006	Mathematics I	6
MECH1009	Properties of materials I	3
MECH1012	Foundations of engineering mechanics	6
MECH1013	Engineering mechanics	6
MECH1014	Thermofluids	6
MECH1015	Integrated computer and laboratory studies I	6
Total credit-units		45

Complementary Studies Courses		
Code	Title	Credit-units
ECEN1509	Professional and technical written communication for engineers	3
ECEN1510	Professional and technical oral communication for engineers	3
CENG1001	Practical Chinese language course for engineering students	3
MECH1010	Engineer in society	3
Xxxxx	Broadening course	3
Total credit-units		15

Second Year

Loading

The normal load for a student is 60 credit-units of courses (excluding summer vacation) with 30 credit-units in each semester. Students are allowed to increase the loading by not more than 6 credit-units in a semester or decrease the loading by the equivalent number of credit-units which they have previously taken as additional loading and passed. Students are required to take the additional course of "Workshop training" (3 credit-units) in the First Year's summer vacation.

Courses

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

(a) 11 Core courses (51credit-units)
(b) 3 Complementary Studies Courses (9 credit-units)
(c) "Workshop training" (3 credit-units)

Core Courses		
Code	Title	Credit-units
MECH2001	Applied dynamics	3
MECH2002	Engineering thermodynamics	6
MECH2004	Control	3
MECH2006	Electrical and electronic engineering	6
MECH2007	Mathematics II	6
MECH2008	Mechanics of fluids	6
MECH2010	Properties of materials II	3
MECH2013	Integrated computer and laboratory studies II	6
BBSE2001	Utility services	6
BBSE2002	Electrical power supply and lighting engineering	3
BBSE2003	Project and contract management	3
Total credit-units		51

Complementary Studies Courses		
Code	Title	Credit-units
MECH2011	Engineering economics	3
Xxxxx	Broadening course	3
Xxxxx	Broadening course	3
Total credit-units		9

Training		
Code	Title	Credit-units
BBSE1011	Workshop training	3
Total credit-units		3

Third Year

Loading

The normal load for a student is 60 credit-units of courses with 30 credit-units in each semester. Students are allowed to increase the loading by up to 6 credit-units in a semester or to decrease the loading by the equivalent number of credit-units which they have previously taken as additional loading and passed. Students are required to take the additional course of "Industrial training" (3 credit-units) in the Second Year's summer vacation.

Courses

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

(a) Inter-disciplinary Building Services Design and Applied Research Project (18 credit-units)
(b) 3 Compulsory courses (18 credit-units)
(c) 3 to 4 Elective Depth/Breadth courses (18 credit-units)
(d) 1 Complementary Studies course “Engineering and technology management” (6 credit-units)
(e) “Industrial training” (3 credit-units)

Projects		
Code	Title	Credit-units
BBSE3005	Inter-disciplinary building services design	6
BBSE3002	Applied research project	12
Total credit-units		18

Compulsory Courses		
Code	Title	Credit-units
BBSE3003	Fire protection engineering	6
BBSE3004	Air conditioning and refrigeration	6
MECH3023	Building energy management and control systems	6
Total credit-units		18

Elective Depth/Breadth Courses		
Code	Title	Credit-units
MECH3001	Acoustics	3
MECH3002	Air pollution control	6
MECH3004	Automatic control	6
MECH3006	Case studies of failure investigations	3
MECH3007	Computer-aided design and manufacture (CAD/CAM)	6
MECH3009	Energy conversion systems	6
MECH3011	Heat transfer	6
MECH3014	Materials for engineering applications	6
MECH3020	Vibration	6
MECH3021	Viscous flow	6
Total credit-units		18

Complementary Studies Course		
Code	Title	Credit-units
MECH3010	Engineering and technology management	6
Total credit-units		6

Training		
Code	Title	Credit-units
BBSE2004	Industrial Training	3
Total credit-units		3

SYLLABUSES

Level One

BBSE1011. Workshop training (3 credit-units)

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.

MECH1004. Drawing and elements of design and manufacture (6 credit-units)

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.

MECH1005. Fundamentals of electrical and electronic engineering (6 credit-units)

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. motor.

MECH1006. Mathematics I (6 credit-units)

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

MECH1009. Properties of materials I (3 credit-units)

Elements of atomic structure and bonding; crystal structure; defect theory; solidification; plastic deformation; recrystallization; phase diagrams; alloy properties; TTT diagrams; heat treatment.

MECH1010. Engineer in society (3 credit-units)

Perceptions of engineering; historical development of engineering design; risk awareness, safety issues; green and environmental issues.

MECH1012. Foundations of engineering mechanics (6 credit-units)

Force systems and equilibrium; moments of mass and area; introduction to stress and strain; kinematics of particles; Newton's 2^{nd} law and dynamics of particles; dynamics of bodies; energy; impulse and momentum; hydrostatics; fluid in motion.

MECH1013. Engineering mechanics (6 credit-units)

Stress and strain; bending of beams; deflection of beams; torsion of shafts; thin-wall pressure vessels; kinematics of linkage mechanisms; gear trains; dynamics of particles and bodies under velocity-dependent forces; undamped and damped free vibration.

MECH1014. Thermofluids (6 credit-units)

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 modeling; pipe flow analysis.

MECH1015. Integrated computer and laboratory studies I (6 credit-units)

Introduction to computer hardware and operating systems; Internet access and e-mail; standard computational packages for symbolic mathematics and numerical calculations; programming in C and C++; use of mathematical subroutine libraries; application of programming to mathematical and engineering problems; experimental and analytical techniques; safety issues; demonstrations and experiments in applied mechanics, thermofluids, properties of materials and electrical engineering.

ECEN1509. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1510. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations.

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

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xxxxxx Broadening course in humanities and social sciences (3 credit-units)

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xxxxxx Broadening course in culture & value studies or an area of studies outside this degree curriculum as an elective (3 credit-units)

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xxxxxx Broadening course on the approved list (3 credit-units)

Level Two

BBSE2001. Utility services (6 credit-units)

Characteristics and design of different service installations: cold, hot and flushing water supply systems; steam supply system; stormwater and sanitary drainage systems; vertical transportation system; L.V. electrical system; communication systems; security and alarm systems.

BBSE2002. Electrical power supply and lighting engineering (3 credit-units)

Design of electricity distribution in buildings; earthing and bonding requirements; protective devices; standby generators and power supplies; lightning protection; I.E.E. regulations and codes of practice; light production and measurement; photometry and colorimetry; human perception; artificial lighting and daylighting; lighting design for interior and exterior lighting.

BBSE2003. Project and contract management (3 credit-units)

Characteristics of building services projects and contracts; role of architect, consultants, quantity surveyor, builder and subcontractors; statutory requirements; project planning, scheduling and control; contract documentation and contractual arrangement; estimating and tendering; site organization and supervision; measurement and valuation of work; claim management and settlement; alternative dispute resolution.

BBSE2004. Industrial training (3 credit-units)

Training in industry for a nominal period of eight weeks during the summer vacation of the Second Year of Study

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MECH2001. Applied dynamics (3 credit-units)

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.

MECH2002. Engineering thermodynamics (6 credit-units)

Steam power cycles, refrigeration cycles, gas power cycles, jet propulsion cycles, gas mixture, combustion, turbomachineries, Psychrometry and air-conditioning, introduction to heat transfer.

MECH2004. Control (3 credit-units)

Frequency response methods; feedback control systems; control system design and applications; stability; root locus method; analogue computer programming.

MECH2006. Electrical and electronic engineering (6 credit-units)

Analog electronics; combinational logic circuits; 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.

MECH2007. Mathematics II (6 credit-units)

Complex variables; Fourier series and Fourier transforms; partial differential equations; introduction to probability and statistics, elementary numerical analysis.

MECH2008. Mechanics of fluids (6 credit-units)

Navier-Stokes equations; pipe and channel viscous flows; lubrication; boundary layer flows; two-dimensional potential flows; water waves; one-dimensional compressible flows; fluid machines.

MECH2010. Properties of materials II (3 credit-units)

Testing and service behaviour of materials, metallurgy of fatigue; theory of creep resistant alloys; the ductile/brittle transition; corrosion resistance; surface treatment; selection criteria for common alloys. Structure of polymers; properties of compounded plastics; service behaviour of plastics.

MECH2011. Engineering economics (3 credit-units)

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.

MECH2013. Integrated computer and laboratory studies II (6 credit-units)

Miscellaneous advanced topics in C++, including aspects of object oriented programming; Windows® programming in C++ with user interface and graphics; communication with electro-mechanical hardware; group project on the application of computing to the solution of an engineering problem; demonstration and experiments in various areas of mechanical engineering.

Level Three

BBSE3005. Inter-disciplinary building services design (6 credit-units)

Inter-disciplinary building services design; design rationales; conceptual design of air conditioning, plumbing and drainage, fire services, electrical power supply, vertical transportation, and lighting systems; detailed design; requirements for teamwork and integration; tectonics considerations.

BBSE3002. Applied research project (12 credit-units)

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.

BBSE3003. Fire protection engineering (6 credit-units)

Fire behaviour and characteristics; compartment fires; fire hazards; automatic fire detection and alarm systems; fire shutters; 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; LPC/FOC rules; FSD and NFPA codes.

BBSE3004. Air conditioning and refrigeration (6 credit-units)

Advanced psychrometry; thermal comfort criteria; cooling load estimation; design of air conditioning systems; design of air ducting and chilled water systems; fresh air requirement, full-load and part-load performance; energy consumption estimation; refrigerating machines, vapour compression and absorption refrigeration cycles; properties and environmental impacts of refrigerants; sizing of refrigeration pipes and coils; interaction between air conditioning and refrigeration systems and building; optimal control strategies.

MECH3001. Acoustics (3 credit-units)

Sources; wave equations; transmission; propagation; environmental noise; effects of noise; machinery noise; legislation.

MECH3002. Air pollution control (6 credit-units)

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.

MECH3004. Automatic control (6 credit-units)

Control of mechanical, hydraulic and pneumatic systems; process modelling and control; linear control system design; computer control systems, state-space analysis of multivariable linear system, controllability and observability, stability analysis; state and output feedback, state observer.

MECH3006. Case studies of failure investigations (3 credit-units)

General introduction to failure investigation procedures, purpose, scope, and limitation; failure mode detected from component examination; cause of failure determination through system case studies; design codes for large structures; fracture mechanics techniques; legislation affecting safety of equipment; roles of a mechanical engineer as an expert witness.

MECH3007. Computer-aided design and manufacture (CAD/CAM) (6 credit-units)

Basic data structuring techniques; transformation techniques; mathematical bases for surface modeling; principles of solid modeling and applications; numerical control; computer-aided production management; computer-integrated manufacturing.

MECH3009. Energy conversion systems (6 credit-units)

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

MECH3010. Engineering and technology management (6 credit-units)

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 application of decision trees; inventory control models; queuing theory; transportation and resource allocation for business operations.

MECH3011. Heat transfer (6 credit-units)

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.

MECH3014. Materials for engineering applications (6 credit-units)

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.

MECH3020. Vibration (6 credit-units)

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.

MECH3021. Viscous flow (6 credit-units)

Eulerian and Lagrangian descriptions; Navier-Stokes equations; low-Reynolds-number flows; laminar boundary layers; laminar stability theory; turbulent flows.

MECH3023. Building energy management and control systems (6 credit-units)

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.

CIVIL ENGINEERING

PROGRAMME STRUCTURE

Loading

The normal load for a student is 30 credit-units of courses in each semester. Students are allowed to overload by no more than 6 credit-units in a semester up to a maximum of 36 credit-units.

Curriculum

The curriculum comprises 186 credit-units of courses as follows:

(a) Core Courses

Students are normally required to take ALL core courses (102 credit-units).

(b) Compulsory Depth Courses

Students are normally required to take ALL compulsory depth courses (45 credit-units).

(c) Elective Civil Engineering Courses

Students are normally required to take 12 credit-units of elective civil engineering courses offered by the Department of Civil Engineering.

(d) Elective course(s)

Students are normally required to take 6 credit-units of elective course(s) offered by either the Department of Civil Engineering or other department(s).

(e) Broadening Courses

1. Students are required to take two English language courses which should be spaced out in the first year of study to accumulate up to a maximum of 6 credit-units.

2. Students are required to take one Chinese language course (3 credit-units) in either semester in the first year of study.

3. Students are required to take a total of 9 credit-units of broadening courses with at least 3 credit-units in Humanities and Social Sciences, and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective.

(f) Industrial Training

Students are required to take and pass Industrial Training (3 credit-units). The training normally takes place after their second year of study.

To complete the curriculum, a candidate is normally required to gain not less than 180 credit-units from the above listed courses.

An example of the programme structure is as follows:

(a) First Year

Computer applications in civil engineering	6
Construction materials	6
Engineering drawing	6
Engineering mathematics I	6
Environmental engineering	6
Fluid mechanics	6
Structural mechanics	6
Theory and design of structures I	6
Practical Chinese language course for engineering students	3
Professional and technical oral communication for engineers	3
Professional and technical written communication for engineers	3
Broadening course	3
Total credit-units	60

(b) Second Year

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
Surveying	6
Theory and design of structures II	6
Transportation engineering	6
Broadening course(s)	6
Total credit-units	60

(c) Third Year

Construction project management	6
Engineering hydraulics	6
Foundation engineering	6
Inter-disciplinary project	6
Management and communication skills for engineers	3
Theory and design of structures III	6
Elective civil engineering course(s)	12
Elective course(s)	6
Industrial Training	3
Project	12
Total credit-units	66

SYLLABUSES

LEVEL ONE

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

Core Courses

CIVL1001. Computer applications in civil engineering (6 credit-units)

Computer fundamentals; basic programming concepts; programming in C/C++; computer graphics; computer-aided drafting; computer software applications.

CIVL1002. Construction materials (6 credit-units)

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

CIVL1003. Engineering drawing (6 credit-units)

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

CIVL1004. Engineering mathematics I (6 credit-units)

Advanced calculus; ordinary differential equations; introduction to probability & statistics.

CIVL1005. Environmental engineering (6 credit-units)

Man and the environment; water quality, resources and treatment; wastewater characteristics and treatment, solid/hazardous waste control; air and noise pollution control; environmental impact assessment to civil engineering works.

CIVL1006. Fluid mechanics (6 credit-units)

Definitions and properties of fluids; fluid statics; kinetics of fluid flow; basic control volume analysis, mass, energy, momentum conservation; dimensional analysis and scale models; flow measurements; flow of an ideal fluid; rotation and vorticity; flow in pipes.

CIVL1007. Principles of civil engineering management (6 credit-units)

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.

CIVL1008. Structural mechanics (6 credit-units)

Static equilibrium, bending moment and shear force diagrams, bending and shear stresses in beams, shear centre, skew bending, transformation of stress and strain and Mohr's circle, energy theorems, slope and deflection of beams, buckling of struts, yield criteria, plastic bending.

CIVL1009. Surveying (6 credit-units)

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. Fieldwork.

CIVL1010. Theory and design of structures I (6 credit-units)

Statically determinate structures; trusses; simply supported and cantilever beams; 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 in timber, steel and concrete.

CIVL1011. Transportation engineering (6 credit-units)

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.

Broadening Courses

ECEN1505. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1506. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations.

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

Broadening course(s)

9 credit-units of broadening courses with at least 3 credit-units in humanities & social sciences, and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective.

LEVEL TWO

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

Core Courses

CIVL2001. Engineering design and communication (6 credit-units)

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.

CIVL2002. Engineering geology and rock mechanics (6 credit-units)

Rocks and minerals; introduction to stratigraphy, structural geology, hydrogeology, geophysics, engineering seismology, marine and Quaternary geology; weathering, erosion, transportation, deposition and lithification; rock and soil types commonly found in Hong Kong; geological and geophysical investigation; stereonets; rock slopes; behaviour and properties of rocks as an engineering material; rock mass classification; 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.

CIVL2003. Engineering mathematics II (6 credit-units)

Complex variables; Linear algebra; Fourier analysis & partial differential equations.

Prerequisite: CIVL1004 Engineering mathematics I

CIVL2004. Hydraulics and hydrology (6 credit-units)

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.

CIVL2006. Soil mechanics (6 credit-units)

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.

CIVL2007. Theory and design of structures II (6 credit-units)

Methods of deformation, energy, slope-deflection and moment distribution for analysis of indeterminate structures; arches and frames; influence lines for indeterminate structures.

Limit state design of reinforced concrete, design of singly and doubly reinforced concrete beams, one-way reinforced concrete slabs, reinforced concrete short columns and pad foundations; design of structural steel members for flexure, tension, compression and combined forces, design of connection; welds and bolts.

Prerequisite: CIVL1010 Theory and design of structures I

Industrial Training

CIVL2005. Industrial training (3 credit-units)

To complete a period of training in industry not less than a total of eight weeks in the summer vacations immediately after the Second and/or the First Year, subject to satisfactory performance in training and the submission of a satisfactory training report.

LEVEL THREE

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

Compulsory Depth Courses

CIVL3003. Construction project management (6 credit-units)

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; alternative procurement strategies; managing design and other consultancy services; value management; ethics and professionalism.

CIVL3006. Engineering hydraulics (6 credit-units)

Non-uniform open channel flow; stormwater drainage and water works design; hydraulics of alluvial channels; subsurface flow, turbulent mixing and transport.

Prerequisite: CIVL2004 Hydraulics and hydrology

CIVL3008. Foundation engineering (6 credit-units)

Site investigation; shallow and deep foundations, soil-structure interaction and settlement analysis; foundation design and construction in difficult grounds; case studies; foundation design and construction in reclamation and saprolite; karst problems.

Prerequisite: CIVL2006 Soil mechanics

CIVL3010. Management and communication skills for engineers (3 credit-units)

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

CIVL3013. Project (12 credit-units)

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

CIVL3018. Theory and design of structures III (6 credit-units)

Matrix method; differential settlements; temperature; shrinkage and other effects; grillage; shearwalls; torsion of thin-wall structures; vibration; stability.

Design of reinforced concrete structures: building frames, two-way floor systems, shearwalls and water retaining structures; building design project.

Prerequisite: CIVL2007 Theory and design of structures II

CIVL3023. Inter-disciplinary project (6 credit-units)

Planning and design of an urban development project of multi-disciplinary nature; inter-disciplinary collaboration to optimise the value of building tectonics, engineering technology, architectural design and common-sense ideas; lateral thinking along with self-motivation to discover unforeseen solutions; conversion of innovative and sustainable ideas to detailed design fruition from cross-disciplinary inputs.

Elective Civil Engineering Courses

CIVL3001. Advanced engineering mechanics (6 credit-units)

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 triangular element; triangular element for heat conduction and seepage problem; plate elements.

CIVL3002. Building planning and construction (6 credit-units)

Feasibility studies, economics and investment aspects of buildings; architect, structural engineer and contractor relationship; planning and design of various types of buildings; site management and supervision; design of shoring, falsework and formwork; excavation procedure and party wall; material handling and testing.

CIVL3004. Earthquake engineering (6 credit-units)

Earthquake hazard and ground motions; site effects; seismic design spectra; earthquake loadings; dynamic earthquake response; design codes; configuration; detailing; strengthening.

CIVL3005. Earthwork engineering (6 credit-units)

Ground modification techniques; deep compaction and vibro-compaction, vertical drains and electro-osmosis; grouting; soil and rock anchors; soil reinforcement; embankments; deep excavation and dewatering; retaining and diaphragm walls; control of underground water; environmental geotechnics (including landfill problems).

Prerequisite: CIVL2006 Soil mechanics

CIVL3007. Environmental impact assessment of civil engineering projects (6 credit-units)

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: CIVL1005 Environmental engineering

CIVL3011. Municipal and industrial wastewater treatment (6 credit-units)

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

CIVL3012. Prestressed concrete structures (6 credit-units)

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

CIVL3014. Slope engineering (6 credit-units)

Introduction; review of shear strength; slope stability analyses; stability charts; selection of methods of analysis and strength parameters; field investigation for landslide problems; design strategies; uncertainties in slope analysis and quantitative risk analysis; landslip preventive and protective measures; geosynthetics, case studies.

Prerequisite: CIVL2006 Soil mechanics

CIVL3015. Solid and hazardous waste management (6 credit-units)

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

CIVL3016. Steel structures (6 credit-units)

Plastic and limit analyses, design of steel structures, design of composite beams.

Prerequisite: CIVL2007 Theory and design of structures II

CIVL3017. Structural dynamics (6 credit-units)

Sources and effects of dynamic response, modelling of structural systems; excitation and damping; resonance; dynamic isolation and vibration transmission; response to simple and complex load forms; vibration shapes and modal response.

CIVL3019. Traffic engineering (6 credit-units)

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

CIVL3020. Transportation infrastructure engineering (6 credit-units)

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

CIVL3021. Water resources engineering (6 credit-units)

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

CIVL3022. Wind engineering (6 credit-units)

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

Elective Course

Elective Course (6 credit-units)

The student is normally expected to select a Level Two course or above offered by either the Department of Civil Engineering or other department(s).

CIVIL ENGINEERING (ENVIRONMENTAL ENGINEERING)

PROGRAMME STRUCTURE

Loading

The normal load for a student is 30 credit-units of courses in each semester. Students are allowed to overload by no more than 6 credit-units in a semester up to a maximum of 36 credit-units.

Curriculum

The curriculum comprises 187 credit-units of courses as follows:

(a) Core Courses

Students are normally required to take ALL of core courses (102 credit-units).

(b) Compulsory Depth Courses

Students are normally required to take ALL compulsory depth courses (45 credit-units).

(c) Elective Civil Engineering (Environmental Engineering) Courses

Students are normally required to take 12 credit-units of elective civil engineering courses offered by the Department of Civil Engineering.

(d) Elective Course (s)

Students are normally required to take 6 credit-units of elective course(s) offered by either the Department of Civil Engineering or other department(s).

(e) Broadening Courses

1. Students are required to take two English language courses which should be spaced out in the first year of study to accumulate up to a maximum of 6 credit-units.

2. Students are required to take one Chinese language course (3 credit-units) in either semester in the first year of study.

3. Students are required to take a total of 9 credit-units of broadening courses with at least 3 credit-units in Humanities and Social Sciences, and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective.

(f) Industrial Training

Students are required to take and pass Industrial Training (3 credit-units). The training normally takes place after their second year of study.

(g) Guest Lecture Series

Students are required to take and pass Guest Lecture Series (1 credit-unit).

To complete the curriculum, a candidate is normally required to gain not less than 180 credit-units from the above listed courses.

An example of the programme structure is as follows:

(a) First Year

Computer applications in civil engineering	6
Construction materials	6
Engineering drawing	6
Engineering mathematics I	6
Environmental engineering	6
Fluid mechanics	6
Structural mechanics	6
Theory and design of structures I	6
Practical Chinese language course for engineering students	3
Professional and technical oral communication for engineers	3
Professional and technical written communication for engineers	3
Broadening course	3
Total credit-units	60

(b) Second Year

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
Surveying	6
Theory and design of structures II	6
Water and air quality: concepts and measurement	6
Broadening course(s)	6
Total credit-units	60

(c) Third Year

Construction project management	6
Engineering hydraulics	6
Foundation engineering	6
Management and communication skills for engineers	3
Municipal and industrial wastewater treatment	6
Theory and design of structures III	6
Elective civil engineering (environmental engineering) course(s)	12
Elective course(s)	6
Guest lecture series	1
Industrial training	3
Project	12
Total credit-units	67

SYLLABUSES

LEVEL ONE

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

Core Courses

CIVL1001. Computer applications in civil engineering (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL1002. Construction materials (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL1003. Engineering drawing (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL1004. Engineering mathematics I (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL1005. Environmental engineering (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL1006. Fluid mechanics (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL1007. Principles of civil engineering management (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL1008. Structural mechanics (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL1009. Surveying (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL1010. Theory and design of structures I (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

Broadening Courses

ECEN1505. Professional and technical written communication for engineers (3 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

ECEN1506. Professional and technical oral communication for engineers (3 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

Broadening course(s)

9 credit-units of broadening courses with at least 3 credit-units in humanities & social sciences, and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective.

LEVEL TWO

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

Core Courses

CIVL2001. Engineering design and communication (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL2002. Engineering geology and rock mechanics (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL2003. Engineering mathematics II (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL2004. Hydraulics and hydrology (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL2006. Soil mechanics (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL2007. Theory and design of structures II (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIME2001. Water and air quality: concepts and measurement (6 credit-units)

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)

Industrial Training

CIVL2005. Industrial training (3 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

LEVEL THREE

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

Compulsory Depth Courses

CIVL3003. Construction project management (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3006. Engineering hydraulics (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3008. Foundation engineering (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3010. Management and communication skills for engineers (3 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3011. Municipal and industrial wastewater treatment (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3013. Project (12 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3018. Theory and design of structures III (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

Elective Civil Engineering (Environmental Engineering) Courses

CIVL3007. Environmental impact assessment of civil engineering projects (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3015. Solid and hazardous waste management (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3021. Water resources engineering (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3022. Wind engineering (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVL3023. Inter-disciplinary project (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

Elective Course (6 credit-units)

The student is normally expected to select a Level Two course or above offered by either the Department of Civil Engineering or other department(s).

Guest Lecture Series

CIVL3009. Guest lecture series (1 credit-unit)

To attend a series of seminars on environmental engineering practice to be given by professionals in academia, industry and government, and to submit a satisfactory seminar report.

COMPUTER ENGINEERING

PROGRAMME STRUCTURE

Definitions and Terminology:

The Level of a course shall be 1, 2 or 3. Each course shall be assigned a Level.

All courses are grouped into the following 7 Subject Groups:

A. Hardware and digital technology
B. Computer architecture and systems
C. System software and programming
D. Computer applications
E. Mathematics
F. Complementary studies
G. Others

A 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 that is offered in one of the subject groups as an optional course for the curriculum. A Depth course is a level 3 course offered in one of the subject groups as an optional course for the curriculum.

Complementary Studies shall include, in addition to those courses listed under group F, all broadening courses as defined by the University but not directly related to the subject area of the programme.

Subject Electives refer to any technical subject offered by the Department of Electrical and Electronic Engineering and the Department of Computer Science and Information Systems, provided it does not overlap significantly with other courses that the student has already enrolled. Courses offered by other Departments will be considered on an individual basis.

The Curriculum

The curriculum comprises 180 credit-units of courses as follows:

(a) 78 credit-units of Core courses from Groups A-E
(b) 36 credit-units of breadth/depth courses comprising
    (i) 12 credit-units of breadth courses selected from Groups A-D;
    (ii) 18 credit-units of depth courses selected from Groups A-D, with at least 6 credit-units from Groups A or B, and at least 6 credit-units from Groups C or D; and
    (iii) further 6 credit-units of breadth or depth course(s) from Groups A-D
(c) Six credit-units in Subject elective (6 credit-units)
(d) Complementary studies courses comprising (Total 36 credit-units):
    (i) Engineering organization and management (3 credit-units)
    (ii) Engineering and society (3 credit-units)
    (iii) Engineering economics and finance (3 credit-units)
    (iv) Professional and technical written communication for engineers (3 credit-units)
    (v) Professional and technical oral communication for engineers (3 credit-units)
    (vi) Practical Chinese language course for engineering students (3 credit-units)
    (vii) A course in language approved by the Department of Electrical and Electronic Engineering (3 credit-units)
    (viii) Additional fifteen credit-units of Complementary Studies courses, including at least three credit-units in Humanities and Social Sciences Studies and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective (15 credit-units)

(e) Integrated project (6 credit-units)
(f) Technical project (12 credit-units)
(g) Workshop training (3 credit-units)
(h) Industrial training (3 credit-units)

To complete the degree requirement, a candidate must pass all the courses specified in the curriculum. In addition, the candidate must pass the IT Proficiency Test and any other requirements as stipulated in the University or Faculty of Engineering regulations.

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 3 courses and core courses should be taken before breadth courses. Course electives in Complementary Studies, including the course in Humanities and Social Sciences/Culture & Value and Language, can be taken in any order.

First Year

The first-year syllabuses shall include the following courses:

Core Courses: (Total 48 credit-units)

CSIS1117	Computer programming
CSIS1119	Introduction to data structures and algorithms
CSIS1121	Discrete mathematics
ELEC1611	Circuit theory and digital logic design
ELEC1613	Assembly language programming and microprocessors
ELEC1614	Electronic devices and circuits
ELEC1623	Computer micro-architecture and system software interfacing
ELEC1801	Engineering mathematics I

Complementary Studies: (Total 12 credit-units)

CENG1001	Practical Chinese language course for engineering students
ECEN1507	Professional and technical written communication for engineers
ECEN1508	Professional and technical oral communication for engineers

Additional 3 credit-units of Complementary Studies course.

Second Year

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

Core Courses: (Total 30 credit-units)

CSIS0230	Principles of operating systems
CSIS0234	Computer and communication networks
CSIS0297	Introduction to software engineering
ELEC1802	Engineering mathematics II
ELEC2302	Digital system design

Breadth Courses (Total 12 credit-units)

Twelve credit-units of Breadth Courses selected from Groups A-D

Complementary Studies: (Total 12 credit-units)

ELEC2802 Engineering organization and management
ELEC2803 Engineering and society
One 3 credit-unit course in Language
Additional 3 credit-units of Complementary Studies course

Project (Total 6 credit-units)

ELEC2806 Integrated project

Training (3 credit-units)

ELEC1803 Workshop training

Third Year

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

Breadth/Depth Courses (Total 24 credit-units)

Eighteen credit-units of Depth courses selected from Groups A-D, with at least six credit-units from Groups A or B, and at least six credit-units from Groups C or D

Six credit-units of Breadth or Depth course selected from Groups A-D

Subject Elective (Total 6 credit-units)

Six credit-units of Subject Elective

Complementary Studies: (Total 12 credit-units)

ELEC2804 Engineering economics and finance
Additional nine credit-units of Complementary Studies courses

Project (Total 12 credit-units)

ELEC3802 Technical project

Training (3 credit-units)

ELEC1804 Industrial training

List of Courses by Subject Groups

Group A: Hardware and Digital Technology

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1611	Circuit theory & digital logic design (core)	6	-	-
1	ELEC1614	Electronic devices & circuits (core)	6	-	-
2	ELEC2201	Signals and linear systems	6	-	-
2	ELEC2202	Communications engineering	6	-	ELEC2201
2	ELEC2204	Digital signal processing	6	ELEC2201	-
2	ELEC2205	Control and instrumentation	6	-	ELEC2201
2	ELEC2302	Digital system design (core)	6	ELEC1611 or (ELEC1301 & ELEC1303)	-
2	ELEC2303	Design of digital integrated circuits	6	ELEC1302 or ELEC1614	
3	ELEC3201	Communication systems	6	ELEC2202	-
3	ELEC3203	Cellular radio and personal communication systems	6	ELEC2202	-
3	ELEC3204	Information theory and coding	3		
3	ELEC3504	Image and speech processing (mutually exclusive with CSIS0317)	6	ELEC2201	-
3	ELEC3219	Data compression	3	ELEC2201	-
3	ELEC3612	VLSI design principles	6	ELEC1302 or ELEC1614	-

Group B: Computer Architecture and Systems

Level	Code	Course title	Credit-units	Prerequisite	Co-requisite
1	ELEC1613	Assembly language programming & microprocessors (core)	6	-	-
1	ELEC1623	Computer micro-architecture & system software interfacing (core) (mutually exclusive with ELEC2401)	6	-	-
2	CSIS0234	Computer and communication networks (core)	6	CSIS0230 (Pre- or Co-requisite)	
2	ELEC2401	Computer architecture (mutually exclusive with ELEC1623)	6	ELEC1613 or ELEC1401 or ELEC1622	-
3	ELEC3401	Advanced internet technologies	6	CSIS0234 or ELEC2701	-
3	ELEC3621	Introduction to parallel programming	3	ELEC2401 or ELEC1623	-

3	ELEC3622	Distributed computing systems	3	(ELEC2501 or CSIS0230) & (ELEC2402 or CSIS0234)	-

The following MSc courses may be selected as a subject elective

MSc	ELEC6036	High performance computer architecture	3	ELEC1623 or ELEC2401
MSc	ELEC6071	Mobile data networks	3	ELEC2402 or CSIS0234

Group C: System Software & Programming

Level	Code	Course title	Credit-units	Prerequisite	Co-requisite
1	CSIS1117	Computer programming (core)	6	-	-
1	CSIS1119	Intro. to data structures and algorithms (core)	6	CSIS1117	-
2	CSIS0230	Principles of operating systems (core)	6	CSIS1117 & CSIS1120; or CSIS1117 & ELEC1622 / ELEC1613	-
2	CSIS0259	Principles of programming languages	6	CSIS1118 / CSIS1121, CSIS1119 & CSIS1120 / ELEC1622 / ELEC1613	-
2	CSIS0278	Introduction to database management systems	6	CSIS1117 & CSIS1119; or CSIS0911 & CSIS0912; or ELEC1501	-
2	CSIS0396	Programming methodology and object-oriented programming	6	CSIS1117 or ELEC1501	-
2	CSIS0297	Introduction to software engineering (core)	6	CSIS1117 or CSIS0911	-
2	ELEC2601	Human computer interaction	6	-	-
3	CSIS0218	Discrete event simulation	6	CSIS1119 or CSIS0912 or ELEC1501	-
3	CSIS0235	Compiling techniques	6	CSIS0259	-
3	CSIS0250	Design and analysis of algorithms	6	(CSIS1117 & CSIS1119) or CSIS0912 or ELEC1501 (Pre- or Co-requisites)	
3	CSIS0323	Advanced database systems	6	CSIS0278	-
3	ELEC3625	Internet systems programming	6	(ELEC2701 or CSIS0234) & (ELEC2501 or CSIS0230)	-

3	ELEC3626	Computer network security	3	ELEC2701 or CSIS0234	-

The following MSc course may be selected as a subject elective

MSc	ELEC6070	Cryptography & network security	3	ELEC2701 or CSIS0234	

Group D: Computer Applications

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
3	CSIS0270	Artificial intelligence	6	CSIS1119 or CSIS0912	-
3	CSIS0271	Computer graphics	6	CSIS1119	-
3	CSIS0315	Multimedia computing and applications	6	-	CSIS0234 or BUSI0073
3	CSIS0317	Computer vision and recognition of patterns and speech (mutually exclusive with ELEC3504)	6	(CSIS1117 & CSIS1119) or CSIS0912 or ELEC1501	-
3	CSIS0320	Electronic commerce technology	6	CSIS1117 & CSIS0230	-
3	CSIS0321	Financial computing	6	CSIS0297 or CSIS1401	-
3	CSIS0325	Topics in Web technologies	6	CSIS0322 or CSIS0234	
3	CSIS0326	Introduction to computational molecular biology	6	CSIS0250	-
3	ELEC3503	Fuzzy systems and neural networks	6	-	-

Group E: Mathematics

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	CSIS1121	Discrete mathematics (core)	6	-	-
1	ELEC1801	Engineering mathematics I (core)	6	-	-
1	ELEC1802	Engineering mathematics II (core)	6	-	-

Group F: Complementary Studies

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	CENG1001	Practical Chinese language course for engineering students	3	-	-
1	ECEN1507	Professional & technical written communication for engineers	3	-	-
1	ECEN1508	Professional & technical oral communication for engineers	3	-	-
1	ELEC1805	English for engineers	3	-	-
2	ELEC2802	Engineering organization and management	3	-	-
2	ELEC2803	Engineering and society	3	-	-
2	ELEC2804	Engineering economics and finance	3	-	-

Group G: Others

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1803	Workshop training	3	-	-
1	ELEC1804	Industrial training	3	-	-
2	ELEC2806	Integrated project	6	-	-
3	ELEC3802	Technical project	12	-	-

SYLLABUSES

LEVEL ONE

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

ECEN1507. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1508. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations.

CSIS1117. Computer programming (6 credit-units)

The goal of this course is for students to learn the general principles of programming, including how to design, implement, document, test, and debug programs.

CSIS1119. Introduction to data structures and algorithms (6 credit-units)

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

Prerequisite: CSIS1117 Computer programming

CSIS1121. Discrete mathematics (6 credit-units)

Sets, logic, basics of counting, permutations and combinations, discrete probability, fundamentals of logic, recurrence relations, relations, graphs, boolean algebra, finite state machines and languages.

ELEC1611. Circuit theory and digital logic design (6 credit-units)

Application of Boolean algebra in combinational logic circuits, combinational logic design, decoders, encoders, multiplexers, adders, subtractors; sequential circuits, latches, flip-flops, sequential circuit analysis, design with D and JK flip-flops, registers and counters, random-access memory, error detection and correction, programmable logic technologies, PLA, VLSI PLA, basic circuit concepts; circuit theorems; circuit response, sinusoidal steady-state analysis.

ELEC1613. Assembly language programming and microprocessors (6 credit-units)

Integer and floating point number representations; instruction set and addressing modes; subroutines; reentrancy; macros; I/O programming; interrupt and exception handling; assembler, linker and loader. Microprocessor system; bus signals, timing, connections and arbitration; memory cells, memory system organization, read/write timing; I/O interface hardware~~;~~.

ELEC1614. Electronic devices and circuits (6 credit-units)

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

ELEC1623. Computer micro-architecture and system software interfacing (6 credit-units)

RISC and CISC CPU designs; Control unit; Pipelining; Memory system; I/O system; System bootstrapping; Implementation of system calls; Fundamentals of language translation; Implementation of high level language constructs; Program optimization by system software and hardware.

(mutually exclusive with ELEC2401 Computer architecture)

ELEC1801. Engineering mathematics I (6 credit-units)

Linear Algebra, multi-variable calculus, ordinary differential equations I.

ELEC1802. Engineering mathematics II (6 credit-units)

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

ELEC1803. Workshop training (3 credit-units)

ELEC1804. Industrial training (3 credit-units)

ELEC1805. English for engineers (3 credit-units)

Business communication, presentation skills, resume and cover letters, interviewing skills, group discussions.

LEVEL TWO

CSIS0230. Principles of operating systems (6 credit-units)

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, network structure, distributed systems, case studies.

Prerequisites: CSIS1117 Computer programming and CSIS1120 Machine organization and assembly language programming; or CSIS1117 Computer programming and ELEC1622 Computer organization and assembly language programming / ELEC1613 Assembly language programming and microprocessors

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CSIS0234. Computer and communication networks (6 credit-units)

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; examples of network protocols.

Pre/Co-requisite: CSIS0230 Principles of operating systems

CSIS0259. Principles of programming languages (6 credit-units)

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: CSIS1118 Foundations of computer science/CSIS1121 Discrete mathematics, CSIS1119 Introduction to data structures and algorithms and CSIS1120 Machine organization and assembly language programming / ELEC1622 Computer organization and assembly language programming / ELEC1613 Assembly language programming and microprocessors

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CSIS0278. Introduction to database management systems (6 credit-units)

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, security, integrity, concurrency control, and contemporary topics in database management systems. This course may not be taken with BUSI0052.

Prerequisites: CSIS1117 Computer programming and CSIS1119 Introduction to data structures and algorithms; or CSIS0911 Computer concepts and programming and CSIS0912 Data structures and programme design; or ELEC1501 Computer programming and data structures.

CSIS0297. Introduction to software engineering (6 credit-units)

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. It also examines contemporary issues such as component-based software engineering and web engineering. The use of CASE tools and the UML are emphasized, particularly in the team-based project in which students apply their new knowledge to the problem of practical software construction. This course is not for students studying the BEng(SE) programme.

Prerequisite: CSIS1117 Computer programming or CSIS0911 Computer concepts and programming

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CSIS0325. Topics in Web technologies (6 credit-units)

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 Computer and communication networks or CSIS0322 Internet and the World Wide Web

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CSIS0396. Programming methodology and object-oriented programming (6 credit-units)

Abstract data types and classes; object-oriented design and object-oriented programming; program development, generation and analysis tools; scripting and command languages; user interfaces and GUIs; program documentation.

Prerequisite: CSIS1117 Computer programming or ELEC1501 Computer programming and data structures.

ELEC2201. Signals and linear systems (6 credit-units)

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; sampling and reconstruction; digital filters.

ELEC2202. Communications engineering (6 credit-units)

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

Co-requisite: ELEC2201 Signals and linear systems

ELEC2204. Digital signal processing (6 credit-units)

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

Prerequisite: ELEC2201 Signals and linear systems

ELEC2205. Control and instrumentation (6 credit-units)

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

ELEC2302. Digital system design (6 credit-units)

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 design or (ELEC1301 Circuits & ELEC1303 Electronics)

ELEC2303. Design of digital integrated circuits (6 credit-units)

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: ELEC1302 Electronic materials and devices or ELEC1614 Electronic devices and circuits.

ELEC2401. Computer architecture (6 credit-units)

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: ELEC1613 Assembly language programming and microprocessors or ELEC1401 Computer organization and microprocessors or ELEC1622 Computer organization and assembly language programming.

(mutually exclusive with ELEC1623 Computer micro-architecture and system software interfacing)

ELEC2601. Human computer interaction (6 credit-units)

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.

ELEC2802. Engineering organization and management (3 credit-units)

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

ELEC2803. Engineering and society (3 credit-units)

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.

ELEC2804. Engineering economics and finance (3 credit-units)

Macroeconomics; financial instruments; accounting concepts and financial statements; cost and profit; economic evaluation.

ELEC2806. Integrated project (6 credit-units)

LEVEL THREE

CSIS0218. Discrete event simulation (6 credit-units)

Topics include: monte carlo methods, discrete event simulation, elements of simulation models, data collection and analysis, simulation language for modeling, random number generation, queuing models, and output analysis.

Prerequisite: CSIS1119 Introduction to data structures and algorithms or CSIS0912 Data structures and programme design or ELEC1501 Computer programming and data structures.

CSIS0235. Compiling techniques (6 credit-units)

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

Prerequisite: CSIS0259 Principles of programming languages

CSIS0250. Design and analysis of algorithms (6 credit-units)

The course studies various algorithms 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.

Pre/Co-requisites: CSIS1117 Computer programming and CSIS1119 Introduction to data structures and algorithms; or CSIS0912 Data structures and programme design; or ELEC1501 Computer programming and data structures.

CSIS0270. Artificial intelligence (6 credit-units)

AI programming languages; logic; theorem proving; searching; problem solving.

Prerequisite: CSIS1119 Introduction to data structures and algorithms or CSIS0912 Data structures and programme design.

CSIS0271. Computer graphics (6 credit-units)

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 Introduction to data structures and algorithms

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CSIS0315. Multimedia computing and applications (6 credit-units)

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, compression techniques such as predictive coding and transform coding, video compression techniques, standards, current multimedia technologies, storage, data placement, and scheduling.

Co-requisite: CSIS0234 Computer and communication networks or BUSI0073

CSIS0317. Computer vision and recognition of patterns and speech (6 credit-units)

Students taking this course will learn how image and speech are represented inside a computer; how their characteristics are extracted, represented and described; and finally, how recognition can be performed.

(mutually exclusive with ELEC3504 Image and speech processing)

Prerequisites: CSIS1117 Computer programming and CSIS1119 Introduction to data structures and algorithms; or CSIS0912 Data structures and programme design; or ELEC1501 Computer programming and data structures

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CSIS0320. Electronic commerce technology (6 credit-units)

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 information security technologies, Internet security, public-key crypto-systems, public-key infrastructure, Internet-based electronic commerce, consumer-oriented electronic commerce, electronic payment systems, and intraorganizational electronic commerce.

Prerequisite: CSIS1117 Computer programming and CSIS0230 Principles of operating systems

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CSIS0321. Financial computing (6 credit-units)

The objective of this course is to introduce to students the pricing of financial derivatives using such fundamental engineering methodologies as probabilistic modeling and analysis. This course discusses basic security valuation theories and portfolio management. Emphasis is placed on fundamental common stock analysis, capital market theory, analysis of portfolio performance, market efficiency, and behavior of stock prices.

Prerequisite: CSIS0297 Introduction to software engineering or CSIS1401 Software engineering process I: analysis and design

CSIS0323. Advanced database systems (6 credit-units)

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: overview of data mining; the KDD process and system architecture; example applications; DSS, data warehouse, data cube, and OLAP; mining binary association rules; mining association rules with quantitative attributes; mining sequential patterns; decision tree classifiers; neural network classifier; cluster analysis; text mining; web mining.

Prerequisite: CSIS0278 Introduction to database management systems

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CSIS0326. Introduction to computational molecular biology (6 credit-units)

A major problem in Computational Molecular Biology is to determine the structures of a genome which is a set of DNA molecules that encode the entire genetic information of a species. Because of the vast amounts of data involved in sequencing and analysing DNA at various levels, we need novel and special computational techniques to process these data efficiently. This course will cover some of these techniques and show how they are used to solve problems in bioinformatics. Topics include: DNA sequence similarity and alignment; phylogenetic inference; gene recognition; gene analysis; structure prediction.

Prerequisite: CSIS0250 Design and analysis of algorithms

ELEC3201. Communication systems (6 credit-units)

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

ELEC3203. Cellular radio and personal communications systems (6 credit-units)

Cellular mobile communications systems; personal communications systems; cordless telephone systems.

Prerequisite: ELEC2202 Communications engineering

ELEC3204. Information theory and coding (3 credit-units)

Measure of information, source entropy, Shannon's theorems, channel capacity. Noiseless source coding, error control coding, block codes, cyclic codes, BCH codes, Reed-Solomon code, convolution code, coding performance, trellis coded modulation, applications.

ELEC3401. Advanced internet technologies (6 credit-units)

Overview of computer network, fiber optics, broadband integrated networking and ATM, technologies of cell networking, gigabit packet networks, design and performance issues of high-speed networking.

Prerequisite: CSIS0234 Computer and communication networks or ELEC2701 Internet technologies and applications

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ELEC3503. Fuzzy systems and neural networks (6 credit-units)

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.

ELEC3504. Image and speech processing (6 credit-units)

Image Characterization : preliminary photometry and colorimetry, 2D continuous-time and discrete-time signals and systems, sampling and quantization issues; image enhancement and restoration, image segmentation, possible applications. Models for speech signals, digital representation of speech waveforms, speech processing and analysis methods. Pattern recognition techniques, hidden Markov models, speech recognition systems and applications.

(mutually exclusive with CSIS0317 Computer vision and recognition of patterns and speech)

Prerequisite: ELEC2201 Signals and linear systems

ELEC3219. Data compression (3 credit-units)

Lossless data compression: Huffman and arithmetic codes, run-length code; signal decorrelation and quantization techniques; image coding: discrete cosine transformed based coding, vector quantization and subband coding; video coding: motion estimation/compensation, quantization techniques, rate control; audio and speech coding.

Prerequisite: ELEC2201 Signals and linear systems

ELEC3612. VLSI design principles (6 credit-units)

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.

Prerequisite: ELEC1302 Electronic materials and devices or ELEC1614 Electronic devices and circuits

ELEC3621. Introduction to parallel programming (3 credit-units)

Overview of parallel architectures; parallel programming paradigms; parallel programming languages and libraries; parallel computing models; parallel algorithms; performance analysis.

Prerequisite: ELEC2401 Computer architecture or ELEC1623 Computer micro-architecture and system software interfacing.

ELEC3622. Distributed computing systems (3 credit-units)

Network architecture based on the ISO reference model; general theory of distributed computing systems; modeling of distributed computing systems; distributed operating systems; distributed database systems.

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

ELEC3625. Internet systems programming (6 credit-units)

This course aims to provide students with solid background on systems programming, in particular, Internet and Web programming. The course covers traditional distributed programming (sockets, RPC), state-of-the-art distributed programming (CORBA), and Web programming (cgi scripts, JavaScript, XML, DOM).

Prerequisite: (ELEC2701 Internet technologies and applications or CSIS0234 Computer and communication networks) and (ELEC2501 Software engineering and operating systems or CSIS0230 Principles of operating systems).

ELEC3626. Computer network security (3 credit-units)

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: ELEC2701 Internet technologies and applications or CSIS0234 Computer and communication networks

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ELEC3802. Technical project (12 credit-units)

ELECTRICAL ENGINEERING[2]
ELECTRICAL ENERGY SYSTEMS ENGINEERING[3]

PROGRAMME STRUCTURE

Definitions and Terminology:

The Level of a course shall be 1, 2 or 3. Each course shall be assigned a Level.

All courses are grouped into the following 8 Subject Groups:

A. Electrical Energy
B. Signals, Communications & Systems
C. Circuits & Electronics
D. Computer Systems
E. Software & IT Applications
F. Mathematics
G. Complementary Studies
H. Others

A 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 which is offered in one of the subject groups as an optional course for the curriculum. A Depth course is a level 3 course offered in one of the subject groups as an optional course for the curriculum.

Complementary Studies shall include, in addition to those courses listed under group G, all broadening courses as defined by the University but not directly related to the subject area of the programme.

Subject Electives refer to any technical subject offered by the Department of Electrical and Electronic Engineering to the BEng degree programmes, provided it does not overlap significantly with other courses the student has already enrolled. Courses offered by other departments and courses offered to other degree programmes will be considered on an individual basis.

The Curriculum

The curriculum comprises 180 credit-units of courses as follows:

(a) 54 credit-units of Core courses of the curriculum from groups A-F
(b) 54 credit-units of Breadth/Depth courses comprising:
    (i) 30 credit-units of breadth courses from groups A-E, of which at least 12 credit-units are chosen from Group A, and at least 6 credit-units are chosen from Group B
    (ii) 6 credit-units of breadth courses from group F
    (iii) 18 credit-units of depth courses from groups A-E, of which at least 12 credit-units are chosen from Group A
(c) 12 credit-units in Subject Electives
(d) 36 credit-units of complementary studies courses comprising:
    (i) Engineering organization and management (3 credit-units)
    (ii) Engineering and society (3 credit-units)
    (iii) Engineering economics and finance (3 credit-units)
    (iv) Professional and technical written communication for engineers (3 credit-units)
    (v) Professional and technical oral communication for engineers (3 credit-units)
    (vi) Practical Chinese language course for engineering students (3 credit-units)

[2] for student intake in/after 2002-2003
[3] for student intake in/before 2001-2002

(vii) A course in language approved by the Department of Electrical and Electronic Engineering (3 credit-units)
(viii) Additional fifteen credit-units of Complementary Studies courses, including at least 3 credit-units in Humanities and Social Sciences studies and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective (15 credit-units)

(e) Integrated project (6 credit-units)
(f) Technical project (12 credit-units)
(g) Workshop training (3 credit-units)
(h) Industrial training (3 credit-units)

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

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 3 courses and core courses should be taken before breadth courses. Course electives in Complementary Studies can be taken in any order.

First Year

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

Core Courses: (Total 48 credit-units)

ELEC1101	Fundamentals of electrical engineering
ELEC1102	Fundamentals of electrical energy systems
ELEC1301	Circuits
ELEC1303	Electronics
ELEC1401	Computer organization and microprocessors
ELEC1501	Computer programming and data structures
ELEC1801	Engineering mathematics I
ELEC1802	Engineering mathematics II

Complementary Studies: (Total 12 credit-units)

CENG1001	Practical Chinese language course for engineering students
ECEN1507	Professional and technical written communication for engineers
ECEN1508	Professional and technical oral communication for engineers

Additional 3 credit-units of Complementary Studies course

Second Year

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

Core Courses: (Total 6 credit-units)

ELEC2201	Signals and linear systems

Breadth/Depth Courses (Total 36 credit-units)

Thirty credit-units of Breadth Courses from groups A-E, at least 12 credit-units from Group A and 6 credit-units from Group B
Six credit-units of Breadth Courses from group F.

Complementary Studies: (Total 12 credit-units)

ELEC2802 Engineering organization and management
ELEC2803 Engineering and society
One 3 credit-unit course in language
Additional 3 credit-units of Complementary Studies course

Project (Total 6 credit-units)

ELEC2805 Integrated project

Training (3 credit-units)

ELEC1803 Workshop training

Third Year

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

Depth Courses (Total 18 credit-units)

Eighteen credit-units of depth courses from groups A-E, at least twelve credit-units from Group A (18 credit-units)

Subject Electives (Total 12 credit-units)

Twelve credit-units of Subject Electives

Complementary Studies: (Total 12 credit-units)

ELEC2804 Engineering economics and finance
Additional nine credit-units of Complementary Studies courses

Project (Total 12 credit-units)

ELEC3801 Technical project

Training (3 credit-units)

ELEC1804 Industrial training

List of Courses by Subject Groups

Group A Electrical Energy

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1101	Fundamentals of electrical engineering (core)	6	-	-
1	ELEC1102	Fundamentals of electrical energy systems (core)	6	-	-
2	ELEC2101	Power transmission and distribution	6	-	ELEC1101
2	ELEC2102	Electric energy conversion	6	-	ELEC1101
2	ELEC2103	Power electronics	6	-	ELEC1101
3	ELEC3104	Electric vehicle technology	6	-	-
3	ELEC3105	Building services - electrical services	6	-	-
3	ELEC3106	Building services - electrical installations	6	ELEC1101	-
3	ELEC3107	Power system analysis and control	6	ELEC2101	-
3	ELEC3108	Power system protection	3	ELEC2101	-
3	ELEC3109	Electric drives	3	ELEC1101	-
3	ELEC3110	Electric traction	3	ELEC1101	-

Group B Signals, Communications and Systems

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
2	ELEC2201	Signals and linear systems (core)	6	-	-
2	ELEC2202	Communications engineering	6	-	ELEC2201
2	ELEC2203	Electromagnetic theory	6	ELEC1101	-
2	ELEC2204	Digital signal processing	6	ELEC2201	-
2	ELEC2205	Control and instrumentation	6	-	ELEC2201
3	ELEC3201	Communication systems	6	ELEC2202	-
3	ELEC3203	Cellular radio and personal communication systems	6	ELEC2202	-
3	ELEC3204	Information theory and coding	3		
3	ELEC3206	Control systems	6	ELEC2205	-
3	ELEC3214	Microwave engineering	3	ELEC2203	
3	ELEC3215	Fibre optics	3	ELEC2203	
3	ELEC3216	Robotics	3	ELEC2205	-
3	ELEC3217	Mechatronics	3	-	-
3	ELEC3218	Communication signal processing	3	ELEC2204	-
3	ELEC3219	Data Compression	3	ELEC2201	-

Group C Circuits and Electronics

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1301	Circuits (core)	6	-	-
1	ELEC1302	Electronic materials and devices	6	-	-
1	ELEC1303	Electronics (core)	6	ELEC1301	-
2	ELEC2301	Analogue electronics	6	ELEC1303	-
2	ELEC2302	Digital system design	6	ELEC1611 or (ELEC1301 & ELEC1303)	-
2	ELEC2303	Design of digital integrated circuits	6	ELEC1302 or ELEC1614	-

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Group D Computer Systems

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1401	Computer organization and Microprocessors (core)	6	-	-
2	ELEC2401	Computer architecture (mutually exclusive with ELEC1623)	6	ELEC1613 or ELEC1401 or ELEC1622	-
2	ELEC2402	Computer communications	6	-	-
2	ELEC2701	Internet technologies and applications	6	ELEC2402	-
3	ELEC3401	Advanced internet technologies	6	CSIS0234 or ELEC2701	-
3	ELEC3621	Introduction to parallel programming	3	ELEC2401 or ELEC1623	-
3	ELEC3622	Distributed computing systems	3	(ELEC2501 or CSIS0230) & (ELEC2402 or CSIS0234)	-

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Group E Software and Information Technology Applications

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1501	Computer programming and data structures (core)	6	-	-
2	CSIS0278	Introduction to database management systems	6	CSIS1117 & CSIS1119; or CSIS0911 & CSIS0912; or ELEC1501	-
2	CSIS0396	Programming methodology and object-oriented programming	6	CSIS1117 or ELEC1501	-

2	ELEC2501	Software engineering and operating systems	6	-	-
3	ELEC3503	Fuzzy systems and neural networks	6	-	-
3	ELEC3504	Image and speech processing	6	ELEC2201	-

Group F Mathematics

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1801	Engineering mathematics I (core)	6	-	-
1	ELEC1802	Engineering mathematics II (core)	6	-	-
2	ELEC2808	Differential equations	3	ELEC1801 & ELEC1802	-
2	ELEC2809	Numerical methods	3	ELEC1801 & ELEC1802	-
2	ELEC2810	Optimization methods	3	-	-
2	ELEC2811	Probability and statistics	3	-	-

Group G Complementary studies

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	CENG1001	Practical Chinese language course for engineering students	3	-	-
1	ECEN1507	Professional & technical written communication for engineers	3	-	-
1	ECEN1508	Professional & technical oral communication for engineers	3	-	-
1	ELEC1805	English for engineers	3	-	-
2	ELEC2802	Engineering organization and management	3	-	-
2	ELEC2803	Engineering and society	3	-	-
2	ELEC2804	Engineering economics and finance	3	-	-

Group H Others

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1803	Workshop training	3	-	-
1	ELEC1804	Industrial training	3	-	-
2	ELEC2805	Integrated project	6	-	-
3	ELEC3801	Technical project	12	-	-

SYLLABUSES

LEVEL ONE

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

ECEN1507. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1508. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations. Assessment is wholly by coursework.

ELEC1101. Fundamentals of electrical engineering (6 credit-units)

Electrostatic and magnetostatic fields, magnetic properties of materials and magnetic circuits, electromagnetic induction, electromagnetic radiation, electrical energy transmission, power transformer, basic electrical instrumentation.

ELEC1102. Fundamentals of electrical energy systems (6 credit-units)

Energy fundamentals, engineering thermodynamics, hydroelectric power plants, thermal power plants, nuclear power plants, transmission and distribution of electrical energy, energy management, the local industry.

ELEC1301. Circuits (6 credit-units)

Kirchhoff's laws, node and mesh analyses, Thevenin and Norton equivalence, operational amplifiers, AC steady-state analysis, phasors, power and power factor, harmonic analysis, transient analysis of RL, RC and RLC circuits, resonance, Laplace transform. Boolean algebra and logic simplifications, combinational logic, flip-flops, counters and shift registers.

ELEC1302. Electronic materials and devices (6 credit-units)

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.

ELEC1303. Electronics (6 credit-units)

Introduction to amplifiers; diode circuits and applications; DC and AC analyses of BJT and FET circuits and amplifiers; power amplifiers; digital circuits; D/A and A/D conversion

Prerequisite: ELEC1301 Circuits

ELEC1401. Computer organization and microprocessors (6 credit-units)

Integer and floating point representations, control unit and data path, instruction set and addressing modes, subroutines, reentrancy, I/O programming, interrupt and exception handling, modern processors. Microprocessor system, interface hardware, memory system, displays and mass storage devices.

ELEC1501. Computer programming and data structures (6 credit-units)

Overview of computer software; operating systems (PC and Unix); compilers and loaders; high-level languages; structured programming; C language; elementary data structures; algorithms; object-oriented programming; C++; introduction to database.

ELEC1801. Engineering mathematics I (6 credit-units)

Linear Algebra, multi-variable calculus, ordinary differential equations I.

ELEC1802. Engineering mathematics II (6 credit-units)

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

ELEC1803. Workshop training (3 credit-units)

Selected training on the following:
Design, construct and assemble simple electrical and electronic systems; practice of computer aided design (CAD) of PCB and application specific integrated circuit (ASIC); CAD drawing and drafting practice; CAD tools for electronic circuits and systems; practical work in manufacturing processes; the use of hand and machine tools; plastic processing.

ELEC1804. Industrial training (3 credit-units)

Either one year (study/work programme) or six to twelve weeks of industrial training.

ELEC1805. English for engineers (3 credit-units)

Business communication, presentation skills, resume and cover letters, interviewing skills, group discussions.

LEVEL TWO

CSIS0278. Introduction to database management systems (6 credit-units)

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, security, integrity, concurrency control, and contemporary topics in database management systems. This course may not be taken with BUSI0052.

Prerequisites: CSIS1117 Computer programming and CSIS1119 Introduction to data structures and algorithms; or CSIS0911 Computer concepts and programming and CSIS0912 Data structures and programme design; or ELEC1501 Computer programming and data structures.

CSIS0396. Programming methodology and object-oriented programming (6 credit-units)

Abstract data types and classes; object-oriented design and object-oriented programming; program development, generation and analysis tools; scripting and command languages; user interfaces and GUIs; program documentation.

Prerequisites: CSIS1117 Computer programming or ELEC1501 Computer programming and data structures

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ELEC2101. Power transmission and distribution (6 credit-units)

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: ELEC1101 Fundamentals of electrical engineering

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ELEC2102. Electric energy conversion (6 credit-units)

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: ELEC1101 Fundamentals of electrical engineering

ELEC2103. Power electronics (6 credit-units)

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

Co-requisite: ELEC1101 Fundamentals of electrical engineering

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ELEC2201. Signals and linear systems (6 credit-units)

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; sampling and reconstruction; digital filters.

ELEC2202. Communications engineering (6 credit-units)

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

Co-requisite: ELEC2201 Signals and linear systems

ELEC2203. Electromagnetic theory (6 credit-units)

Review of time harmonic vectors and fields; Maxwell's equations; uniform plane waves; reflection and transmission of waves; transmission lines; introduction to waveguides and antennas; radio-wave propagation.

Prerequisite: ELEC1101 Fundamentals of electrical engineering

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ELEC2204. Digital signal processing (6 credit-units)

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

Prerequisite: ELEC2201 Signals and linear systems

ELEC2205. Control and instrumentation (6 credit-units)

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

ELEC2301. Analogue electronics (6 credit-units)

Frequency responses of amplifiers; differential and multistage amplifiers; feedback amplifiers; active filters and tuned amplifiers; oscillators; regulators; A/D and D/A converters; electronic systems design

Prerequisite: ELEC1303 Electronics

ELEC2302. Digital system design (6 credit-units)

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 design or (ELEC1301 Circuits & ELEC1303 Electronics)

ELEC2303. Design of digital integrated circuits (6 credit-units)

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: ELEC1302 Electronic materials and devices or ELEC1614 Electronic devices and circuits.

ELEC2401. Computer architecture (6 credit-units)

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: ELEC1613 Assembly language programming and microprocessors or ELEC1401 Computer organization and microprocessors or ELEC1622 Computer organization and assembly language programming.

(mutually exclusive with ELEC1623 Computer micro-architecture and system software interfacing)

ELEC2402. Computer communications (6 credit-units)

Data communication networks and facilities; network structures; protocols; local area networks; wide area networks; network trends; data security.

ELEC2501. Software engineering and operating systems (6 credit-units)

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.

ELEC2701. Internet technologies and applications (6 credit-units)

Internet architecture overview. IP addressing, internetworking concepts, routing in the internet. TCP, UDP and Sockets. Conventional Internet application protocols. Multimedia network applications: data-compression, audio/ video streaming, real-time support. Quality-of-service support for the Internet.

Prerequisite: ELEC2402 Computer communications

ELEC2802. Engineering organization and management (3 credit-units)

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

ELEC2803. Engineering and society (3 credit-units)

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.

ELEC2804. Engineering economics and finance (3 credit-units)

Macroeconomics; financial instruments; accounting concepts and financial statements; cost and profit; economic evaluation.

ELEC2805. Integrated project (6 credit-units)

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.

ELEC2808. Differential equations ((3 credit-units)

Ordinary differential equations, partial differential equations, and boundary value problems.

Prerequisites: ELEC1801 Engineering mathematics I and ELEC1802 Engineering mathematics II

ELEC2809. Numerical methods ((3 credit-units)

Initial value problems, numerical methods in linear algebra.

Prerequisites: ELEC1801 Engineering mathematics I and ELEC1802 Engineering mathematics II

ELEC2810. Optimization methods ((3 credit-units)

Unconstrained optimization, Linear programming, Nonlinear constrained optimization.

ELEC2811. Probability and statistics ((3 credit-units)

Estimations, Testing hypothesis, Correlation and regression, Curve fitting, Non-parametric methods, Analysis of variance, and Markov process.

LEVEL THREE

ELEC3104. Electric vehicle technology (6 credit-units)

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

ELEC3105. Building services - electrical services (6 credit-units)

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.

ELEC3106. Building services - electrical installations (6 credit-units)

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.

Prerequisite: ELEC1101 Fundamentals of electrical engineering

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ELEC3107. Power system analysis and control (6 credit-units)

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

ELEC3108. Power system protection (3 credit-units)

Protective relays; protection transformers; protection of transmission lines, rotating machines, transformers and busbars; travelling waves, overvoltages.

Prerequisite: ELEC2101 Power transmission and distribution

ELEC3109. Electric drives (3 credit-units)

Introduction to motor drives; dc motor drives; induction motor drives; synchronous motor drives; special motor drives.

Prerequisite: ELEC1101 Fundamentals of electrical engineering

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ELEC3110. Electric traction (3 credit-units)

DC/AC electrification systems; control and protection systems; speed control; electromechanical subsystems; magnetic levitation systems.

Prerequisite: ELEC1101 Fundamentals of electrical engineering

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ELEC3201. Communication systems (6 credit-units)

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

ELEC3203. Cellular radio and personal communications systems (6 credit-units)

Cellular mobile communications systems; personal communications systems; cordless telephone systems.

Prerequisite: ELEC2202 Communications engineering

ELEC3204. Information theory and coding (3 credit-units)

Measure of information, source entropy, Shannon's theorems, channel capacity. Noiseless source coding, error control coding, block codes, cyclic codes, BCH codes, Reed-Solomon code, convolution code, coding performance, trellis coded modulation, applications.

ELEC3206. Control systems (6 credit-units)

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

ELEC3214. Microwave engineering (3 credit-units)

Guided wave transmission; waveguides; microwave circuits; scattering matrix formulation; passive and active microwave components; atmospheric propagation and microwave antennas.

Prerequisite: ELEC2203 Electromagnetic theory

ELEC3215. Fibre optics (3 credit-units)

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

Prerequisite: ELEC2203 Electromagnetic theory

ELEC3216. Robotics (3 credit-units)

Introduction to robot configurations; robot kinematics; robot dynamics and control; robot programming and applications.

Prerequisite: ELEC2205 Control and instrumentation

ELEC3217. Mechatronics (3 credit-units)

Introduction to mechatronics; various types of sensors, actuators and controllers in mechatronic systems.

ELEC3218. Communication signal processing (3 credit-units)

Basic probability and stochastic processes, linear estimation and prediction; adaptive filters : least mean squares and recursive least squares algorithms. Structures of digital transmitters and receivers, channel models, Nyquist channel and pulse shaping; channel coding; equalization techniques; other applications.

Prerequisite: ELEC2204 Digital signal processing

ELEC3219. Data Compression (3 credit-units)

Lossless data compression: Huffman and arithmetic codes, run-length code; signal decorrelation and quantization techniques; image coding: discrete cosine transformed based coding, vector quantization and subband coding; video coding: motion estimation/compensation, quantization techniques, rate control; audio and speech coding.

Prerequisite: ELEC2201 Signals and linear systems

ELEC3401. Advanced internet technologies (6 credit-units)

Overview of computer network, fiber optics, broadband integrated networking and ATM, technologies of cell networking, gigabit packet networks, design and performance issues of high-speed networking.

Prerequisites: CSIS0234 Computer and communication networks or ELEC2701 Internet technologies and applications

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ELEC3503. Fuzzy systems and neural networks (6 credit-units)

The mathematics of fuzzy systems; linguistic variables; fuzzy rules; fuzzy inference; fuzzifiers and defuzzifiers; approximation properties 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.

ELEC3504. Image and speech processing (6 credit-units)

Image Characterization: preliminary photometry and colorimetry, 2D continuous-time and discrete-time signals and systems, sampling and quantization issues; image enhancement and restoration, image segmentation, possible applications. Models for speech signals, digital representation of speech waveforms, speech processing and analysis methods. Pattern recognition techniques, hidden Markov models, speech recognition systems and applications.

Prerequisite: ELEC2201 Signals and linear systems

ELEC3621. Introduction to parallel programming (3 credit-units)

Overview of parallel architectures; parallel programming paradigms; parallel programming languages and libraries; parallel computing models; parallel algorithms; performance analysis.

Prerequisites: ELEC2401 Computer architecture or ELEC2621 Computer architectures or ELEC1623 Computer micro-architecture and system software interfacing

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ELEC3622. Distributed computing systems (3 credit-units)

Network architecture based on the ISO reference model; general theory of distributed computing systems; modeling of distributed computing systems; distributed operating systems; distributed database systems.

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

ELEC3801. Technical project (12 credit-units)

ELECTRONIC AND COMMUNICATIONS ENGINEERING[4]
ELECTRICAL AND ELECTRONIC ENGINEERING[5]

PROGRAMME STRUCTURE

Definitions and Terminology:

The Level of a course shall be 1, 2 or 3. Each course shall be assigned a Level.

All courses are grouped into the following 6 Subject Groups:

A. Electronics and Communications
B. Signal Processing and Systems
C. Computer Systems, Software & IT Applications
D. Mathematics
E. Complementary Studies
F. Others

A 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 which is offered in one of the subject groups as an optional course for the curriculum. A Depth course is a level 3 course offered in one of the subject groups as an optional course for the curriculum.

Complementary Studies shall include, in addition to those courses listed under Group E, all broadening courses as defined by the University but not directly related to the subject area of the programme.

Subject Electives refer to any technical subject offered by the Department of Electrical and Electronic Engineering provided it does not overlap significantly with other courses the student has already enrolled. Courses offered by other departments will be considered on an individual basis.

The Curriculum

The curriculum comprises 180 credit-units of courses as follows:

(a) 66 credit-units of Core courses from Groups A-D
(b) 48 credit-units of breadth and depth courses comprising:
  (i) 18 credit-units of breadth courses selected from Groups A-C
  (ii) 6 credit-units of breadth courses from Group D
  (iii) 18 credit-units of depth courses selected from Groups A-C with at least 12 credit-units selected from Group A and/or Group B
  (iv) further 6 credit-units of breadth or depth course(s) selected from Groups A-C
(c) 36 credit-units of complementary studies courses comprising:
  (i) Engineering organization and management (3 credit-units)
  (ii) Engineering and society (3 credit-units)
  (iii) Engineering economics and finance (3 credit-units)
  (iv) Professional and technical written communication for engineers (3 credit-units)
  (v) Professional and technical oral communication for engineers (3 credit-units)
  (vi) Practical Chinese language course for engineering students (3 credit-units)
  (vii) A course in language approved by the Department of Electrical and Electronic Engineering (3 credit-units)

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[4] for student intake in/after 2000-2001
[5] for student intake in/before 1999-2000

(viii) Additional 15 credit-units of Complementary Studies courses, including at least 3 credit-units in Humanities and Social Sciences studies and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective (15 credit-units)

(d) 6 credit-units in Subject Electives (6 credit-units)
(e) Integrated project (6 credit-units)
(f) Technical project (12 credit-units)
(g) Workshop training (3 credit-units)
(h) Industrial training (3 credit-units)

To complete the degree requirement, a candidate must pass all the courses specified in the curriculum. In addition, the candidate must pass the IT Proficiency Test and any other requirements as stipulated in the University or Faculty of Engineering regulations.

Order of Study

Order of study is dictated by prerequisite and co-requisite requirements. Generally, level 1 courses should be taken before level two courses, level 2 courses should be taken before level 3 courses and core courses should be taken before breadth courses. Course electives in Complementary Studies can be taken in any order.

First Year

The first-year syllabuses shall include the following courses:

Core Courses: (Total 48 credit-units)

ELEC1101	Fundamentals of electrical engineering
ELEC1301	Circuits
ELEC1302	Electronic materials and devices
ELEC1303	Electronics
ELEC1401	Computer organization and microprocessors
ELEC1501	Computer programming and data structures
ELEC1801	Engineering mathematics I
ELEC1802	Engineering mathematics II

Complementary Studies: (Total 12 credit-units)

CENG1001	Practical Chinese language course for engineering students
ECEN1507	Professional and technical written communication for engineers
ECEN1508	Professional and technical oral communication for engineers
Additional 3 credit-units of Complementary Studies course	

Second Year

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

Core Courses: (Total 18 credit-units)

ELEC2201	Signals and linear systems
ELEC2202	Communications engineering
ELEC2501	Software engineering and operating systems

Breadth/Depth Courses (Total 24 credit-units)

Eighteen credit-units of Breadth Courses from Groups A-C
Six credit-units of Breadth Courses from Group D

Complementary Studies: (Total 12 credit-units)

ELEC2802 Engineering organization and management
ELEC2803 Engineering and society
One 3 credit-unit course in Language
Additional 3 credit-units of Complementary Studies course

Project (Total 6 credit-units)

ELEC2805 Integrated project

Training (3 credit-units)

ELEC1803 Workshop training

Third Year

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

Breadth/Depth Courses (Total 24 credit-units)

Six credit-units of Breadth/Depth course in Groups A-C (6 credit-units)
Eighteen credit-units of Depth courses in Groups A-C (18 credit-units)
(with at least 12 credit-units chosen from Group A and/or Group B)

Subject Elective (Total 6 credit-units)

Six credit-units of Subject Electives

Complementary Studies: (Total 12 credit-units)

ELEC2804 Engineering economics and finance
Additional 9 credit-units of Complementary Studies courses

Project (Total 12 credit-units)

ELEC3801 Technical project (12 credit-units)

Training (3 credit-units)

ELEC1804 Industrial training

List of Courses by Subject Groups

Group A Electronics and Communications

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1301	Circuits (core)	6	-	-
1	ELEC1302	Electronic materials and devices (core)	6	-	-
1	ELEC1303	Electronics (core)	6	ELEC1301	-
2	ELEC2103	Power Electronics	6	-	ELEC1101
2	ELEC2202	Communications engineering (core)	6	-	ELEC2201
2	ELEC2203	Electromagnetic theory	6	ELEC1101	-
2	ELEC2301	Analogue electronics	6	ELEC1303	-
2	ELEC2302	Digital system design	6	ELEC1611 or (ELEC1301 & ELEC1303)	-
2	ELEC2303	Design of digital integrated circuits	6	ELEC1302 or ELEC1614	
3	ELEC3201	Communication systems	6	ELEC2202	-
3	ELEC3203	Cellular radio and personal communication systems	6	ELEC2202	-
3	ELEC3204	Information theory and coding	3		
3	ELEC3214	Microwave engineering	3	ELEC2203	-
3	ELEC3215	Fibre optics	3	ELEC2203	-
3	ELEC3612	VLSI design principles	6	ELEC1302 or ELEC1614	-

Group B Signal Processing and Systems

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
2	ELEC2201	Signals and linear systems (core)	6	-	-
2	ELEC2204	Digital signal processing	6	ELEC2201	-
2	ELEC2205	Control and instrumentation	6	-	ELEC2201
3	ELEC3206	Control systems	6	ELEC2205	-
3	ELEC3219	Data Compression	3	ELEC2201	-
3	ELEC3216	Robotics	3	ELEC2205	-
3	ELEC3217	Mechatronics		-	-
3	ELEC3218	Communication signal processing	3	ELEC2204	-
3	ELEC3504	Image and speech processing	6	ELEC2201	-

Group C Computer Systems, Software and IT applications

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1401	Computer organization and microprocessors (core)	6	-	-
1	ELEC1501	Computer programming and data structures (core)	6	-	-

2	CSIS0278	Introduction to database management systems	6	CSIS1117 & CSIS1119; or CSIS0911 & CSIS0912; or ELEC1501	-
2	CSIS0396	Programming methodology and object-oriented programming	6	CSIS1117 or ELEC1501	-
2	ELEC2401	Computer architecture (mutually exclusive with ELEC1623)	6	ELEC1613 or ELEC1401 or ELEC1622	-
2	ELEC2402	Computer communications	6	-	-
2	ELEC2501	Software engineering and operating systems (core)	6	-	-
2	ELEC2701	Internet technologies and applications	6	ELEC2402	-
3	ELEC3401	Advanced internet technologies	6	CSIS0234 or ELEC2701	-
3	ELEC3503	Fuzzy systems and neural networks	6	-	-
3	ELEC3625	Internet systems programming	6	(ELEC2701 or CSIS0234) & (ELEC2501 or CSIS0230)	-

Group D Mathematics

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1801	Engineering mathematics I (core)	6	-	-
1	ELEC1802	Engineering mathematics II (core)	6	-	-
2	ELEC2808	Differential equations	3	ELEC1801 & ELEC1802	-
2	ELEC2809	Numerical methods	3	ELEC1801 & ELEC1802	-
2	ELEC2810	Optimization methods	3	-	-
2	ELEC2811	Probability and statistics	3	-	-

Group E Complementary studies

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	CENG1001	Practical Chinese language course for engineering students	3	-	-
1	ECEN1507	Professional & technical written communication for engineers	3	-	-
1	ECEN1508	Professional & technical oral communication for engineers	3	-	-
1	ELEC1805	English for engineers	3	-	-
2	ELEC2802	Engineering organization and management	3	-	-
2	ELEC2803	Engineering and society	3	-	-
2	ELEC2804	Engineering economics and finance	3	-	-

Group F Others

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1101	Fundamentals of electrical engineering (core)	6	-	-
1	ELEC1803	Workshop training	3	-	-
1	ELEC1804	Industrial training	3	-	-
2	ELEC2805	Integrated project	6	-	-
3	ELEC3801	Technical project	12	-	-

SYLLABUSES

LEVEL ONE

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

ECEN1507. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1508. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations. Assessment is wholly by coursework.

ELEC1101. Fundamentals of electrical engineering (6 credit-units)

Electrostatic and magnetostatic fields, magnetic circuits, magnetic properties of materials, electromagnetic induction, electromagnetic radiation, electric machinery, electrical energy transmission, basic electrical instrumentation.

ELEC1301. Circuits (6 credit-units)

Kirchhoff's laws, node and mesh analyses, Thevenin and Norton equivalence, operational amplifiers, AC steady-state analysis, phasors, power and power factor, harmonic analysis, transient analysis of RL, RC and RLC circuits, resonance, Laplace transform. Boolean algebra and logic simplifications, combinational logic, flip-flops, counters and shift registers.

ELEC1302. Electronic materials and devices (6 credit-units)

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.

ELEC1303. Electronics (6 credit-units)

Introduction to amplifiers; diode circuits and applications; DC and AC analyses of BJT and FET circuits and amplifiers; power amplifiers; digital circuits; D/A and A/D conversion

Prerequisite: ELEC1301 Circuits

ELEC1401. Computer organization and microprocessors (6 credit-units)

Integer and floating point representations, control unit and data path, instruction set and addressing modes, subroutines, reentrancy, I/O programming, interrupt and exception handling, modern processors. Microprocessor system, interface hardware, memory system, displays and mass storage devices.

ELEC1501. Computer programming and data structures (6 credit-units)

Overview of computer software; operating systems (PC and Unix); compilers and loaders; high-level languages; structured programming; C language; elementary data structures; algorithms; object-oriented programming; C++; introduction to database.

ELEC1801. Engineering mathematics I (6 credit-units)

Linear Algebra, multi-variable calculus, ordinary differential equations I.

ELEC1802. Engineering mathematics II (6 credit-units)

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

ELEC1803. Workshop training (3 credit-units)

ELEC1804. Industrial training (3 credit-units)

ELEC1805. English for engineers (3 credit-units)

Business communication, presentation skills, resume and cover letters, interviewing skills, group discussions.

LEVEL TWO

CSIS0278. Introduction to database management systems (6 credit-units)

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, security, integrity, concurrency control, and contemporary topics in database management systems. This course may not be taken with BUSI0052.

Prerequisites: CSIS1117 Computer programming and CSIS1119 Introduction to data structures and algorithms; or CSIS0911 Computer concepts and programming and CSIS0912 Data structures and programme design; or ELEC1501 Computer programming and data structures.

CSIS0396. Programming methodology and object-oriented programming (6 credit-units)

Abstract data types and classes; object-oriented design and object-oriented programming; program development, generation and analysis tools; scripting and command languages; user interfaces and GUIs; program documentation.

Prerequisites: CSIS1117 Computer programming or ELEC1501 Computer programming and data structures

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ELEC2103. Power electronics (6 credit-units)

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

Co-requisite: ELEC1101 Fundamentals of electrical engineering

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ELEC2201. Signals and linear systems (6 credit-units)

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; sampling and reconstruction; digital filters.

ELEC2202. Communications engineering (6 credit-units)

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

ELEC2203. Electromagnetic theory (6 credit-units)

Review of time harmonic vectors and fields; Maxwell’s equations; uniform plane waves; reflection and transmission of waves; transmission lines; introduction to waveguides and antennas; radio-wave propagation.

Prerequisite: ELEC1101 Fundamentals of electrical engineering

ELEC2204. Digital signal processing (6 credit-units)

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

Prerequisite: ELEC2201 Signals and linear systems

ELEC2205. Control and instrumentation (6 credit-units)

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

ELEC2301. Analogue electronics (6 credit-units)

Frequency responses of amplifiers; differential and multisatge amplifiers; feedback amplifiers; active filters and tuned amplifiers; oscillators; regulators; A/D and D/A converters; electronic systems design

Prerequisite: ELEC1303 Electronics

ELEC2302. Digital system design (6 credit-units)

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 design or (ELEC1301 Circuits & ELEC1303 Electronics)

ELEC2303. Design of digital integrated circuits (6 credit-units)

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: ELEC1302 Electronic materials and devices or ELEC1614 Electronic devices and circuits.

ELEC2401. Computer architecture (6 credit-units)

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: ELEC1613 Assembly language programming and microprocessors or ELEC1401 Computer organization and microprocessors or ELEC1622 Computer organization and assembly language programming.

(mutually exclusive with ELEC1623 Computer micro-architecture and system software interfacing)

ELEC2402. Computer communications (6 credit-units)

Data communication networks and facilities; network structures; protocols; local area networks; wide area networks; network trends; data security.

ELEC2501. Software engineering and operating systems (6 credit-units)

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.

ELEC2701. Internet technologies and applications (6 credit-units)

Internet architecture overview. IP addressing, internetworking concepts, routing in the internet. TCP, UDP and Sockets. Conventional Internet application protocols. Multimedia network applications: data-compression, audio/ video streaming, real-time support. Quality-of-service support for the Internet.

Prerequisite: ELEC2402 Computer communications

ELEC2802. Engineering organization and management (3 credit-units)

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

ELEC2803. Engineering and society (3 credit-units)

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.

ELEC2804. Engineering economics and finance (3 credit-units)

Macroeconomics; financial instruments; accounting concepts and financial statements; cost and profit; economic evaluation.

ELEC2808. Differential equations ((3 credit-units)

Ordinary differential equations, partial differential equations, and boundary value problems.

Prerequisites: ELEC1801 Engineering mathematics I and ELEC1802 Engineering mathematics II

ELEC2809. Numerical methods ((3 credit-units)

Initial value problems, numerical methods in linear algebra.

Prerequisites: ELEC1801 Engineering mathematics I and ELEC1802 Engineering mathematics II

ELEC2810. Optimization methods ((3 credit-units)

Unconstrained optimization, Linear programming, Nonlinear constrained optimization.

ELEC2811. Probability and statistics ((3 credit-units)

Estimations, Testing hypothesis, Correlation and regression, Curve fitting, Non-parametric methods, Analysis of variance, and Markov process.

ELEC2805. Integrated project (6 credit-units)

LEVEL THREE

ELEC3201. Communication systems (6 credit-units)

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

ELEC3203. Cellular radio and personal communications systems (6 credit-units)

Cellular mobile communications systems; personal communications systems; cordless telephone systems.

Prerequisite: ELEC2202 Communications engineering

ELEC3204. Information theory and coding (3 credit-units)

Measure of information, source entropy, Shannon's theorems, channel capacity. Noiseless source coding, error control coding, block codes, cyclic codes, BCH codes, Reed-Solomon code, convolution code, coding performance, trellis coded modulation, applications.

ELEC3206. Control systems (6 credit-units)

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

ELEC3214. Microwave engineering (3 credit-units)

Guided wave transmission; waveguides; microwave circuits; scattering matrix formulation; passive and active microwave components; atmospheric propagation and microwave antennas.

Prerequisite: ELEC2203 Electromagnetic theory

ELEC3215. Fibre optics (3 credit-units)

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

Prerequisite: ELEC2203 Electromagnetic theory

ELEC3216. Robotics (3 credit-units)

Introduction to robot configurations; robot kinematics; robot dynamics and control; robot programming and applications.

Prerequisite: ELEC2205 Control and instrumentation

ELEC3217. Mechatronics (3 credit-units)

Introduction to mechatronics; various types of sensors, actuators and controllers in mechatronic systems.

ELEC3218. Communication signal processing (3 credit-units)

Basic probability and stochastic processes, linear estimation and prediction; adaptive filters: least mean squares and recursive least squares algorithms. Structures of digital transmitters and receivers, channel models, Nyquist channel and pulse shaping; channel coding; equalization techniques; other applications.

Prerequisite: ELEC2204 Digital signal processing

ELEC3219 Data Compression (3 credit-units)

Lossless data compression: Huffman and arithmetic codes, run-length code; signal decorrelation and quantization techniques; image coding: discrete cosine transformed based coding, vector quantization and subband coding; video coding: motion estimation/compensation, quantization techniques, rate control; audio and speech coding.

Prerequisite: ELEC2201 Signals and linear systems

ELEC3401. Advanced internet technologies (6 credit-units)

Overview of computer network, fiber optics, broadband integrated networking and ATM, technologies of cell networking, gigabit packet networks, design and performance issues of high-speed networking.

Prerequisite: CSIS0234 Computer and communication networks or ELEC2701 Internet technologies and applications

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ELEC3503. Fuzzy systems and neural networks (6 credit-units)

The mathematics of fuzzy systems; linguistic variables; fuzzy rules; fuzzy inference; fuzzifiers and defuzzifiers; approximation properties 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.

ELEC3504. Image and speech processing (6 credit-units)

Image Characterization : preliminary photometry and colorimetry, 2D continuous-time and discrete-time signals and systems, sampling and quantization issues; image enhancement and restoration, image segmentation, possible applications. Models for speech signals, digital representation of speech waveforms, speech processing and analysis methods. Pattern recognition techniques, hidden Markov models, speech recognition systems and applications.

Prerequisite: ELEC2201 Signals and linear systems

ELEC3612. VLSI design principles (6 credit-units)

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

Prerequisites: ELEC1302 Electronic materials and devices or ELEC1614 Electronic devices and circuits

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ELEC3625. Internet systems programming (6 credit-units)

This course aims to provide students with solid background on systems programming, in particular, Internet and Web programming. The course covers traditional distributed programming (sockets, RPC), state-of-the-art distributed programming (CORBA), and Web programming (cgi scripts, JavaScript, XML, DOM).

Prerequisites: (ELEC2701 Internet technologies and applications or CSIS0234 Computer and communication networks) and (ELEC2501 Software engineering and operating systems or CSIS0230 Principles of operating systems).

ELEC3801. Technical project (12 credit-units)

INFORMATION ENGINEERING[6]
ELECTRICAL AND ELECTIONIC ENGINEERING
- INFORMATION ENGINEERING STREAM[7]

PROGRAMME STRUCTURE

Definitions and Terminology:

The Level of a course shall be 1, 2 or 3. Each course shall be assigned a Level.

All subject-related courses are grouped into the following 8 Subject Groups:

A. Communications Systems
B. Signal Processing and Systems
C. Circuits & Electronics
D. Computer Systems, Software & IT Applications
E. Business and Management for the IT Industry
F. Mathematics
G. Complementary Studies
H. Others

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

Complementary Studies shall include, in addition to those courses listed under Group G, all broadening courses as defined by the University but not directly related to the subject area of the programme.

Subject Electives refer to any technical subject offered by the Department of Electrical and Electronic Engineering provided it does not overlap significantly with other courses the student has already enrolled. Courses offered by other departments will be considered on an individual basis.

The Curriculum

The curriculum comprises of 180 credit-units of courses as follows:

(a) 78 credit-units of Core courses from groups A-F
(b) 36 credit-units of breadth and depth courses selected from groups A-E.
(c) 12 credit-units of courses in business and related studies selected from group E.
(d) 24 credit-units of complementary studies courses comprising:
    (i) Engineering and society (3 credit-units)
    (ii) Professional and technical written communication for engineers (3 credit-units)
    (iii) Professional and technical oral communication for engineers (3 credit-units)
    (iv) Practical Chinese language course for engineering students (3 credit-units)
    (v) A course in Language or Complementary Studies (3 credit-units)
    (v) Additional 9 credit-units of Complementary Studies, at least 3 credit-units in Humanities & Social Sciences, and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective (9 credit-units)

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[6] for student intake in/after 2000-2001
[7] for student intake in 1999-2000

(e) 6 credit-units in Subject Electives
(f) Integrated project (6 credit-units)
(g) Technical project (12 credit-units)
(h) Workshop training (3 credit-units)
(i) Industrial training (3 credit-units)

To complete the degree requirement, a candidate must pass all the courses specified in the curriculum. In addition, the candidate must pass the IT Proficiency Test and any other requirements as stipulated in the University or Faculty of Engineering regulations.

Order of Study

Order of study is dictated by prerequisite and co-requisite requirements. Generally, level 1 courses should be taken before level two courses, level 2 courses should be taken before level 3 courses and core courses should be taken before breadth courses. Course electives in Complementary Studies can be taken in any order.

First Year

The first-year syllabuses shall include the following courses:

Core Courses: (Total 42 credit-units)

ELEC1301	Circuits
ELEC1303	Electronics
ELEC1401	Computer organization and microprocessors
ELEC1501	Computer programming and data structures
ELEC1701	Introduction to information engineering
ELEC1801	Engineering mathematics I
ELEC1802	Engineering mathematics II

Business and Related Courses: (Total 6 credit-units)

BUSI1006	Introduction to modern business
BUSI1007	Principles of management

Complementary Studies: (Total 12 credit-units)

CENG1001	Practical Chinese language course for engineering students
ECEN1507	Professional and technical written communication for engineers
ECEN1508	Professional and technical oral communication for engineers
Additional 3 credit-units of Complementary Studies course	

Second Year

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

Core Courses: (Total 36 credit-units)

ELEC2201	Signals and linear systems
ELEC2202	Communications engineering

ELEC2402 Computer communications
ELEC2501 Software engineering and operating systems
ELEC2701 Internet technologies and applications
ELEC2811 Probability and statistics

Choose one out of the following:
ELEC2808 Differential equations
ELEC2809 Numerical methods
ELEC2810 Optimization methods

Breadth/Depth Courses (Total 6 credit-units)

Six credit-units of Breadth Course from Groups A-D

Business and Related Studies (Total 6 credit-units)

Six credit-units of Course from Group E

Complementary Studies: (Total 6 credit-units)

ELEC2803 Engineering and society
One three credit-unit course in Language or Complementary Studies

Project (Total 6 credit-units)

ELEC2807 Integrated project

Training (3 credit-units)

ELEC1803 Workshop training

Third Year

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

Breadth/Depth Courses (Total 30 credit-units)

Thirty credit-units of Breadth/Depth courses in Groups A, B, C, D or E (30 credit-units).
No more than 12 credit-units should be allocated to Breadth courses.
No more than 18 credit-units should be allocated to a single group in the 3rd year.
No more than 6 credit-units should be allocated to group E in the 3rd year.

Subject Elective (Total 6 credit-units)

Six credit-units of Subject Electives

Complementary Studies: (Total 6 credit-units)

Additional 6 credit-units of Complementary Studies courses

Project (Total 12 credit-units)

ELEC3801 Technical project (12 credit-units)

Training (3 credit-units)

ELEC1804 Industrial training

List of Courses by Subject Groups

Group A : Communications Systems

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1701	Introduction to information engineering (core)	6	-	-
2	ELEC2202	Communications engineering (core)	6	-	ELEC2201
2	ELEC2701	Internet technologies and applications (core)	6	ELEC2402	-
3	ELEC3201	Communication systems	6	ELEC2202	-
3	ELEC3203	Cellular radio and personal communication systems	6	ELEC2202	-
3	ELEC3204	Information theory and coding	3		

Group B : Signal Processing and Systems

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
2	ELEC2201	Signals and linear systems (core)	6	ELEC1301 or ELEC1611	-
2	ELEC2204	Digital signal processing	6	ELEC2201	-
3	ELEC3212	Speech recognition	6	ELEC2204	-
3	ELEC3218	Communication signal processing	3	ELEC2204	-
3	ELEC3219	Data compression	3	ELEC2201	-

Group C : Circuits and Electronics

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1301	Circuits (core)	6	-	-
1	ELEC1303	Electronics (core)	6	ELEC1301	-
2	ELEC2301	Analogue electronics	6	ELEC1303	-
2	ELEC2302	Digital system design	6	ELEC1611 or (ELEC1301 & ELEC1303)	-
2	ELEC2303	Design of digital integrated circuits	6	ELEC1302 or ELEC1614 or (ELEC1301 & ELEC1303)	-

3	ELEC3612	VLSI design principles	6	ELEC1302 or ELEC1614 or (ELEC1301 & ELEC1303)	-

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Group D : Computer Systems, Software and IT Applications

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1401	Computer organization and microprocessor (core)	6	-	-
1	ELEC1501	Computer programming and data structure (core)	6	-	-
2	CSIS0278	Introduction to database management systems	6	CSIS1117 & CSIS1119; or CSIS0911 & CSIS0912; or ELEC1501	-
2	CSIS0396	Programming methodology and object oriented programming	6	CSIS0117 or ELEC1501	-
2	ELEC2401	Computer architecture (mutually exclusive with ELEC1623)	6	ELEC1613 or ELEC1401 or ELEC1622	-
2	ELEC2402	Computer communications (core)	6	-	-
2	ELEC2501	Software engineering and operating systems (core)	6	-	-
2	ELEC2701	Internet technologies and applications (core)	6	ELEC2402	-
3	CSIS0218	Discrete event simulation	6	CSIS1119 or CSIS0912 or ELEC1501	-
3	CSIS0250	Design and analysis of algorithms	6	(CSIS1117 & CSIS1119) or CSIS0912 or ELEC1501 (Pre- or Co-requisites)	
3	CSIS0323	Advanced database Systems	6	CSIS0278	-
3	ELEC3401	Advanced internet technologies	6	CSIS0234 or ELEC2701	-
3	ELEC3503	Fuzzy systems and neural networks	6	-	-
3	ELEC3504	Image and speech processing	6	ELEC2201	-
3	ELEC3621	Introduction to parallel programming	3	ELEC2401 or ELEC1623	-
3	ELEC3622	Distributed computing systems	3	(ELEC2501 or CSIS0230) & (ELEC2402 or CSIS0234)	-
3	ELEC3625	Internet systems programming	6	(ELEC2701 or CSIS0234) & (ELEC2501 or CSIS0230)	-
3	ELEC3626	Computer network security	3	ELEC2701 or CSIS0234	-

Group E: Business and Management in IT-Industry

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	BUSI1006	Introduction to modern business (core)	3	-	-
1	BUSI1007	Principles of management (core)	3	-	-
2	BUSI0016	Introduction to finance	6	Background on Accounting	-
2	BUSI0023	Operations and quality management	6		-
2	BUSI1001	Business law	6	-	-
3	ELEC3701	Telecommunication policy and regulations	6	-	-

Group F Mathematics

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1801	Engineering mathematics I (core)	6	-	-
1	ELEC1802	Engineering mathematics II (core)	6	-	-
2	ELEC2808	Differential equations	3	ELEC1801 & ELEC1802	-
2	ELEC2809	Numerical methods	3	ELEC1801 & ELEC1802	-
2	ELEC2810	Optimization methods	3	-	-
2	ELEC2811	Probability and statistics (core)	3	-	-
3	ELEC3703	Queuing theory	3	ELEC2801 (?)	
3	ELEC3704	System modeling and performance analysis	3	ELEC3703	

Group G Complementary studies

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	CENG1001	Practical Chinese language course for engineering students	3	-	-
1	ECEN1507	Professional & technical written communication for engineers	3	-	-
1	ECEN1508	Professional & technical oral communication for engineers	3	-	-
1	ELEC1805	English for engineers	3	-	-
2	ELEC2803	Engineering and society	3	-	-

Group H Others

Level	Code	Course Title	Credit-units	Prerequisite	Co-requisite
1	ELEC1803	Workshop training	3	-	-
1	ELEC1804	Industrial training	3	-	-
2	ELEC2807	Integrated project	6	-	-
3	ELEC3801	Technical project	12	-	-

SYLLABUSES

LEVEL ONE

BUSI1006. Introduction to modern business (3 credit-units)

Globalization, de-regulation, digitalization, new paradigms of business configurations. Traditional modes of cooperation and business practice. Managing knowledge-intensive and creativity-intensive collaboration.

BUSI1007. Principles of management (3 credit-units)

Evolution of management, Classical school, Systems school, contingency management, planning for productivity, organizing for effectiveness and efficiency, leadership in the new millenium, control in organizational life, social responsibility.

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

ECEN1507. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1508. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations. Assessment is wholly by coursework.

ELEC1301. Circuits (6 credit-units)

Kirchhoff's laws, node and mesh analyses, Thevenin and Norton equivalence, operational amplifiers, AC steady-state analysis, phasors, power and power factor, harmonic analysis, transient analysis of RL, RC and RLC circuits, resonance, Laplace transform. Boolean algebra and logic simplifications, combinational logic, flip-flops, counters and shift registers.

ELEC1303. Electronics (6 credit-units)

Introduction to amplifiers; diode circuits and applications; DC and AC analyses of BJT and FET circuits and amplifiers; power amplifiers; digital circuits; D/A and A/D conversion

Prerequisite: ELEC1301 Circuits

ELEC1401. Computer organization and microprocessors (6 credit-units)

Integer and floating point representations, control unit and data path, instruction set and addressing modes, subroutines, reentrancy, I/O programming, interrupt and exception handling, modern processors. Microprocessor system, interface hardware, memory system, displays and mass storage devices.

ELEC1501. Computer programming and data structures (6 credit-units)

Overview of computer software; operating systems (PC and Unix); compilers and loaders; high-level languages; structured programming; C language; elementary data structures; algorithms; object-oriented programming; C++; introduction to database.

ELEC1701. Introduction to information engineering (6 credit-units)

An introduction to the fundamental concepts of information engineering. Information representation and processing. Information transmission: transmission media, basic transmission methods, communication networks. Introduction to information systems.

ELEC1801. Engineering mathematics I (6 credit-units)

Linear Algebra, multi-variable calculus, ordinary differential equations I.

ELEC1802. Engineering mathematics II (6 credit-units)

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

ELEC1803. Workshop training (3 credit-units)

ELEC1804. Industrial training (3 credit-units)

LEVEL TWO

BUSI0016. Introduction to finance (6 credit-units)

An introduction to finance with emphasis on the decisions and issues faced by the firm. The course will also cover the interrelated topics of individuals choosing between different investment alternatives, and the functioning of capital markets in equating the supply and demand of capital. Specific areas covered include: the basics of valuation using discounted cash flows, valuation of stocks and bonds, valuation and choosing between competing projects, risk and return, the cost of capital, and financial planning and forecasting. Throughout the course emphasis will be placed on the basic paradigms in finance including net present value, the capital asset pricing model and market efficiency. Remarks: It is advisable to take BUSI1002 Introduction to accounting prior to this course.

Prerequisite: Background on Accounting

BUSI0023. Operations and quality management (6 credit-units)

A general introduction to the basic concepts and principles of management of manufacturing and service operations. Emphasis will be on both the quantitative and qualitative aspects of operations management and the intention is to give students moderate exposure to the major topics in operations management.

BUSI1001. Business law (6 credit-units)

An introduction to the Hong Kong legal system, the fundamentals and general principles of Hong Kong law. Other legal concepts which a manager may be expected to encounter in the business environment.

CSIS0278. Introduction to database management systems (6 credit-units)

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, security, integrity, concurrency control, and contemporary topics in database management systems. This course may not be taken with BUSI0052.

Prerequisites: CSIS1117 Computer programming and CSIS1119 Introduction to data structures and algorithms; or CSIS0911 Computer concepts and programming and CSIS0912 Data structures and programme design; or ELEC1501 Computer programming and data structures.

CSIS0396. Programming methodology and object-oriented programming (6 credit-units)

Abstract data types and classes; object-oriented design and object-oriented programming; program development, generation and analysis tools; scripting and command languages; user interfaces and GUIs; program documentation.

Prerequisites: CSIS1117 Computer programming or ELEC1501 Computer programming and data structures.

ELEC2201. Signals and linear systems (6 credit-units)

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; sampling and reconstruction; digital filters.

Prerequisites: ELEC1301 Circuits or ELEC1611 Digital logic design and circuits

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ELEC2202. Communications engineering (6 credit-units)

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

Co-requisite: ELEC2201 Signals and linear systems

ELEC2303. Design of digital integrated circuits (6 credit-units)

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: ELEC1302 Electronic materials and devices or ELEC1614 Electronic devices and circuits or (ELEC1301 Circuits & ELEC1303 Electronics).

ELEC2204. Digital signal processing (6 credit-units)

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

Prerequisite: ELEC2201 Signals and linear systems

ELEC2301. Analogue electronics (6 credit-units)

Frequency responses of amplifiers; differential and multistage amplifiers; feedback amplifiers; active filters and tuned amplifiers; oscillators; regulators; A/D and D/A converters; electronic systems design

Prerequisite: ELEC1303 Electronics

ELEC2302. Digital system design (6 credit-units)

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 design or (ELEC1301 Circuits & ELEC1303 Electronics)

ELEC2401. Computer architecture (6 credit-units)

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

Prerequisites: ELEC1613 Assembly language programming and microprocessors or ELEC1401 Computer organization and microprocessors or ELEC1622 Computer organization and assembly language programming.

(mutually exclusive with ELEC1623 Computer micro-architecture and system software interfacing)

ELEC2402. Computer communications (6 credit-units)

Data communication networks and facilities; network structures; protocols; local area networks; wide area networks; network trends; data security.

ELEC2501. Software engineering and operating systems (6 credit-units)

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.

ELEC2701. Internet technologies and applications (6 credit-units)

Internet architecture overview. IP addressing, internetworking concepts, routing in the internet. TCP, UDP and Sockets. Conventional Internet application protocols. Multimedia network applications: data-compression, audio/ video streaming, real-time support. Quality-of-service support for the Internet.

Prerequisite: ELEC2402 Computer communications

ELEC2802. Engineering organization and management (3 credit-units)

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

ELEC2803. Engineering and society (3 credit-units)

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.

ELEC2808. Differential equations ((3 credit-units)

Ordinary differential equations, partial differential equations, and boundary value problems.

Prerequisites: ELEC1801 Engineering mathematics I and ELEC1802 Engineering mathematics II

ELEC2809. Numerical methods ((3 credit-units)

Initial value problems, numerical methods in linear algebra.

Prerequisites: ELEC1801 Engineering mathematics I and ELEC1802 Engineering mathematics II

ELEC2810. Optimization methods ((3 credit-units)

Unconstrained optimization, Linear programming, Nonlinear constrained optimization.

ELEC2811. Probability and statistics ((3 credit-units)

Estimations, Testing hypothesis, Correlation and regression, Curve fitting, Non-parametric methods, Analysis of variance, and Markov process.

ELEC2807. Integrated project (6 credit-units)

LEVEL THREE

CSIS0218. Discrete event simulation (6 credit-units)

Topics include: monte carlo methods, discrete event simulation, elements of simulation models, data collection and analysis, simulation language for modeling, random number generation, queuing models, and output analysis.

Prerequisites: CSIS1119 Introduction to data structures and algorithms or CSIS0912 Data structures and programme design or ELEC1501 Computer programming and data structures.

CSIS0250. Design and analysis of algorithms (6 credit-units)

The course studies various algorithms 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.

Pre/Co-requisites: CSIS1117 Computer programming and CSIS1119 Introduction to data structures and algorithms; or CSIS0912 Data structures and programme design; or ELEC1501 Computer programming and data structures.

CSIS0323. Advanced database systems (6 credit-units)

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: overview of data mining; the KDD process and system architecture; example applications; DSS, data warehouse, data cube, and OLAP; mining binary association rules; mining association rules with quantitative attributes; mining sequential patterns; decision tree classifiers; neural network classifier; cluster analysis; text mining; web mining.

Prerequisite: CSIS0278 Introduction to database management systems

ELEC3201. Communication systems (6 credit-units)

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

ELEC3203. Cellular radio and personal communications systems (6 credit-units)

Cellular mobile communications systems; personal communications systems; cordless telephone systems.

Prerequisite: ELEC2202 Communications engineering

ELEC3204. Information theory and coding (3 credit-units)

Measure of information, source entropy, Shannon's theorems, channel capacity. Noiseless source coding, error control coding, block codes, cyclic codes, BCH codes, Reed-Solomon code, convolution code, coding performance, trellis coded modulation, applications.

ELEC3212. Speech recognition (6 credit-units)

An introduction to the technologies of speech recognition (e.g. voice recognition). Theoretical background and real-life practical systems will be introduced. It serves as an entry-level course to those interested in advance studies in the area. Introduction to speech models, introduction to voice recognition, interactive voice response systems.

Prerequisite: ELEC2204 Digital signal processing

ELEC3218. Communication signal processing (3 credit-units)

Basic probability and stochastic processes, linear estimation and prediction; adaptive filters : least mean squares and recursive least squares algorithms. Structures of digital transmitters and receivers, channel models, Nyquist channel and pulse shaping; channel coding; equalization techniques; other applications.

Prerequisite: ELEC2204 Digital signal processing

ELEC3219. Data compression (3 credit-units)

Lossless data compression: Huffman and arithmetic codes, run-length code; signal decorrelation and quantization techniques; image coding: discrete cosine transformed based coding, vector quantization and subband coding; video coding: motion estimation/compensation, quantization techniques, rate control; audio and speech coding.

Prerequisite: ELEC2201 Signals and linear systems

ELEC3401. Advanced internet technologies (6 credit-units)

Overview of computer network, fiber optics, broadband integrated networking and ATM, technologies of cell networking, gigabit packet networks, design and performance issues of high-speed networking.

Prerequisite: CSIS0234 Computer and communication networks or ELEC2701 Internet technologies and applications

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ELEC3503. Fuzzy systems and neural networks (6 credit-units)

The mathematics of fuzzy systems; linguistic variables; fuzzy rules; fuzzy inference; fuzzifiers and defuzzifiers; approximation properties 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.

ELEC3504. Image and speech processing (6 credit-units)

Image Characterization: preliminary photometry and colorimetry, 2D continuous-time and discrete-time signals and systems, sampling and quantization issues; image enhancement and restoration, image segmentation, possible applications. Models for speech signals, digital representation of speech waveforms, speech processing and analysis methods. Pattern recognition techniques, hidden Markov models, speech recognition systems and applications.

Prerequisite: ELEC2201 Signals and linear systems

ELEC3612. VLSI design principles (6 credit-units)

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

Prerequisites: ELEC1302 Electronic materials and devices or ELEC1614 Electronic devices and circuits or (ELEC1301 Circuits & ELEC1303 Electronics).

ELEC3621. Introduction to parallel programming (3 credit-units)

Overview of parallel architectures; parallel programming paradigms; parallel programming languages and libraries; parallel computing models; parallel algorithms; performance analysis.

Prerequisites: ELEC2401 Computer architecture or ELEC2621 Computer architectures or ELEC1623 Computer micro-architecture and system software interfacing

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ELEC3622. Distributed computing systems (3 credit-units)

Network architecture based on the ISO reference model; general theory of distributed computing systems; modeling of distributed computing systems; distributed operating systems; distributed database systems.

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

ELEC3625. Internet systems programming (6 credit-units)

This course aims to provide students with solid background on systems programming, in particular, Internet and Web programming. The course covers traditional distributed programming (sockets, RPC), state-of-the-art distributed programming (CORBA), and Web programming (cgi scripts, JavaScript, XML, DOM).

Prerequisites: (ELEC2701 Internet technologies and applications or CSIS0234 Computer and communication networks) and (ELEC2501 Software engineering and operating systems or CSIS0230 Principles of operating systems).

ELEC3626. Computer network security (3 credit-units)

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.).

Prerequisites: ELEC2701 Internet technologies and applications or CSIS0234 Computer and communication networks

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ELEC3701. Telecommunication policy and regulations (6 credit-units)

An introduction to the characteristics and operation of the telecommunication industry worldwide. History of telecommunication, monopolies in telecommunications, competition, general model for telecommunication industry, International standardization organizations (ITU, ISO, ANSI, ETSI), regulatory bodies in various countries (FCC for US, OFTEL for HK), telecom industry in the US, telecom industry in Europe, telecom industry in Japan, telecom industry in HK.

ELEC3703. Queuing theory (3 credit-units)

Basic notation, discrete and continuous time Markov chains, birth-death processes, elementary queuing systems (M/M/m/A/B queuing systems), Erlangian distribution.

Prerequisite: ELEC2801 Engineering mathematics III (?)

ELEC3704. System modeling and performance analysis (3 credit-units)

Queuing networks, M/G/1, G/M/m and G/G/1 queues, priority queuing, time-sharing systems, multi-access systems, event-driven simulation.

Prerequisite: ELEC3703 Queuing theory

ELEC3801. Technical project (12 credit-units)

INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT

PROGRAMME STRUCTURE

Definitions and Terminology

The Level of a course shall be 1, 2 or 3. Each course offered by the Department of Industrial and Manufacturing Systems Engineering shall be assigned a Level, which 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 1 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 Compulsory course is a course in the curriculum that a candidate must take. A Breadth course is a Level 1 or Level 2 course offered as an elective course in the curriculum. A Depth course is a Level 3 course offered as an elective course in the curriculum. Elective Courses refer to any optional subjects offered by the Department, provided that it does not overlap significantly with the other courses that the student has already enrolled in.

Complementary Studies shall include language enhancement courses, all the broadening courses offered by the Department and/or by the University. A list of the broadening courses approved for enrollment by the Department will be provided in the beginning of the academic year. Broadening courses are courses that are not directly related to the subject area of the major programme, but are to be taken as part of the general education requirement in university education.

The Curriculum

The curriculum comprises 186 credit-units of courses as follows:

(a) 63 credit-units of Core courses of the curriculum, including:
  (i) Integrative project (6 credit-units)
  (ii) Technical project (12 credit-units)
(b) 18 credit-units of Compulsory courses of the curriculum
(c) 69 credit-units of Breadth/Depth Elective courses
(d) 30 credit-units of complementary studies courses, comprising:
  (i) Professional and technical written communication for engineers (3 credit-units)
  (ii) Professional and technical oral communication for engineers (3 credit-units)
  (iii) Practical Chinese language course for engineering students (3 credit-units)
  (iv) Additional 21 credit-units of Complementary Studies courses, including 3 credit-units in Humanities and Social Sciences Studies and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective.
(e) Workshop training (3 credit-units)
(f) Industrial training (3 credit-units)

To complete the degree requirement, a candidate must enroll in all the courses specified in the curriculum, and must pass the courses listed under (a) and (d) (i) (ii) (iii), and a combination of other courses totaling to at least 180 credit-units. In addition, the candidate must complete the workshop training (3 credit-units) and industrial training (3 credit-units), as well as satisfy the IT Proficiency Test and any other requirements as stipulated in the University or Faculty of Engineering regulations.

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 3 courses and core courses should be taken before breadth courses. Courses under the category of Complementary Studies can be taken in any order.

Level One

Loading

The normal loading is 60 credit-units of courses for the Level One, with 30 credit-units of courses in each semester. Students are allowed to increase the loading by not more than 6 credit-units in each semester. Students are required to do Workshop Training (3 credit-units) in addition to the 60 credit-units of courses.

Courses

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

(a) 4 Core courses (24 credit-units)
(b) 4 Breadth Elective courses (24 credit-units)
(c) 4 Broadening / Complementary courses (12 credit-units) consisting of
  (i) 2 English Communications courses (6 credit-units)
  (ii) 1 Chinese Language course (3 credit-units)
  (iii) 1 Broadening course on the approved list (3 credit-units)

Core Courses			
Code	Title	Credit-units	Length (Sem)
IMSE1003	Introduction to business and management	6	1
IMSE1004	Mathematics	6	1
IMSE1008	Computer applications for engineers	6	2
IMSE1009	Fundamentals of engineering design	6	2
Required credit-units		24	

Breadth Elective Courses			
Code	Title	Credit-units	Length (Sem)
IMSE1012	Engineering technology	6	1
IMSE1013	Introduction to information systems	6	1
IMSE1014	Product development	6	1
IMSE1015	Systems modeling and simulation	6	1
Required credit-units		24	

Broadening / Complementary Studies courses			
Code	Title	Credit-units	Length (Sem)
ECEN1509	Professional and technical written communication for engineers	3	1
ECEN1510	Professional and technical oral communication for engineers	3	1
CENG1001	Practical Chinese language course for engineering students	3	1
	Broadening elective course	3	1
Required credit-units		12	

An example of Level One programme structure for Industrial Engineering and Technology Management Programme is as follows:

1st Sem	Mathematics (6)	Computer applications for engineers (6)	Breadth Elective (6)	Introduction to business and management (6)	Professional & technical written comm. for engineers (3)	Practical Chinese language course for engineering Students (3)
2nd Sem	Breadth Elective (6)	Fundamentals of engineering design (6)	Breadth Elective (6)	Breadth Elective (6)	Professional & technical oral comm. for engineers (3)	Broadening elective (3)
IMSE1010 Workshop Training (3)						
Required credit-units 63						

Level Two

Loading

The normal loading for a student is 60 credit-units of courses for the Level Two, with 30 credit-units of courses in each semester. Students are allowed to increase the loading by not more than 6 credit-units in each semester. Students are required to do Industrial Training (3 credit-units) in addition to the 60 credit-units of courses.

Courses

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

(a) 5 Core courses (27 credit-units)
(b) A combination of Breadth Elective courses totaling to 21 credit-units
(c) 4 Broadening / Complementary Studies courses (12 credit-units) consisting of
  (i) 3 Broadening courses on the approved list (9 credit-units)
  (ii) 1 Humanities Broadening course on the approved list (3 credit-units)

Core Courses			
Code	Title	Credit-units	Length (Sem)
IMSE2005	Managerial accounting and finance	6	1
IMSE2006	Manufacturing technology	6	1
IMSE2008	Operational research techniques	6	1
IMSE2009	Quality management	6	1
IMSE2014	Applied statistics	3	1
Required credit-units		27	

Breadth Elective Courses			
Code	Title	Credit-units	Length (Sem)
IMSE2003	Industrial automation	6	1
IMSE2010	Integrative studies	3	1
IMSE2012	Maintenance and reliability engineering	6	1
IMSE2013	Manufacturing systems design	6	1

IMSE2015	Man-machine systems	6	1
IMSE2016	Internet technology for e-commerce	6	1
IMSE2017	Management of information and information technology	6	1
IMSE2018	Industrial organisation and management	6	1
IMSE2019	Stochastic decision systems	6	1
IMSE2020	Purchasing and supply management	3	1
Required credit-units		21	

Broadening / Complementary Studies elective courses			
Code	Title	Credit-units	Length (Sem)
	Broadening elective course (Humanities)	3	1
	Broadening elective course	3	1
	Broadening elective course	3	1
	Broadening elective course	3	1
Required credit-units		12	

An example of Level Two programme structure for the Industrial Engineering and Technology Management Programme is shown below:

1st Sem	Quality management (6)	Operational research (6)	Breadth Elective (6)	Applied statistics (3) Breadth Elective (3)	Broadening elective (3)	Broadening elective (Humanities) (3)
2nd Sem	Manufacturing Technology (6)	Managerial accounting & finance (6)	Breadth Elective (6)	Breadth Elective (6)	Broadening elective (3)	Broadening elective (3)
IMSE2011 Industrial Training (3)						
Required credit-units						63

Level Three[8]

Loading

The normal loading for a student is 60 credit-units of courses for the Level Three, with 30 credit-units of courses in each semester. Students are allowed to increase the loading by not more than 6 credit-units in each semester.

Courses

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

(a) Core courses (18 credit-units), comprising:
  (i) Technical Project - IMSE 3014 Project (12 credit-units)
  (ii) Integrative project - IMSE3015 Industrial systems integration (6)
(b) Compulsory courses (12 credit-units)
(c) A combination of Depth Elective courses totaling to 24 credit-units

[8] Level 3 students may elect Level 2 elective courses, upon consulting the Course Tutor.

(d) 1 Broadening / Complementary Studies course (6 credit-units) elected from the following:
- (i) IMSE3008 Applied artificial intelligence (6 credit-units) or
- (ii) IMSE3028 Innovation and entrepreneurship (6 credit-units) or
- (iii) Broadening courses on the approved list (6 credit-units)

Core Courses			
Code	Title	Credit-units	Length (Sem)
IMSE3014	Project	12	2
IMSE3015	Industrial systems integration	6	2
Required credit-units		18	

Compulsory Courses			
Code	Title	Credit-units	Length (Sem)
IMSE3002	Engineering project management	6	1
IMSE3016	Operations planning and control	6	1
Required credit-units		12	

Depth Elective Courses			
Code	Title	Credit-units	Length (Sem)
IMSE0201	Supply chain design and development	6	1
IMSE3001	Computer integrated manufacturing	6	1
IMSE3009	Advanced industrial automation	6	1
IMSE3010	Financial engineering	6	1
IMSE3011	Facilities design	6	1
IMSE3017	Advanced electronic manufacturing technology	6	1
IMSE3018	Advanced manufacturing technology	6	1
IMSE3019	Digital enterprises and e-commerce	6	1
IMSE3020	Technology marketing	3	1
IMSE3021	Strategic management of business and technology	3	1
Required credit-units		24	

Broadening / Complementary elective Courses			
Code	Title	Credit-units	Length (Sem)
IMSE3008	Applied artificial intelligence	6	1
IMSE3028	Innovation and entrepreneurship	6	1
	Broadening elective course	6	1
Required credit-units		6	

An example of the Level Three programme structure for Industrial Engineering and Technology Management Programme is shown below:

1st Sem.	Operations planning and control (6)	Broadening elective (6)	Depth Elective (6)	Project (12)	Depth Elective (6)
2nd Sem.	Engineering project management (6)		Depth Elective (6)	Industrial systems integration (6)	Depth Elective (6)
Required credit-units :					60

Summary of the prerequisite relationship for enrollment of courses of Levels 1, 2, and 3

Level 1

Code	Title	Prerequisite
Core courses		
IMSE1003	Introduction to business and management	None
IMSE1004	Mathematics	None
IMSE1008	Computer applications for engineers	None
IMSE1009	Fundamentals of engineering design	None
Breadth Elective Courses %		
IMSE1012	Engineering technology	None
IMSE1013	Introduction to information systems	None
IMSE1014	Product development	None
IMSE1015	Systems modelling and simulation	None

% Level 1 students may elect Level 2 Breath Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE2xxx courses.

Level 2

Code	Title	Prerequisite
Core Courses		
IMSE2005	Managerial accounting and finance	IMSE1003 Introduction to business and management
IMSE2006	Manufacturing technology	None
IMSE2008	Operational research techniques	IMSE1004 Mathematics
IMSE2009	Quality management	None
IMSE2014	Applied statistics	IMSE1004 Mathematics
Breadth Elective Courses *		
IMSE2003	Industrial automation	IMSE1004 Mathematics
IMSE2010	Integrative studies	None
IMSE2012	Maintenance and reliability engineering	IMSE1004 Mathematics
IMSE2013	Manufacturing systems design	None
IMSE2015	Man-machine systems	None
IMSE2016	Internet technology for e-commerce	None
IMSE2017	Management of information and information technology	IMSE1013 Introduction to information systems
IMSE2018	Industrial organisation and management	IMSE1003 Introduction to business and management
IMSE2019	Stochastic decision systems	IMSE1004 Mathematics
IMSE2020	Purchasing and supply management	None

* Level 2 students may elect Level 1 Breath Elective courses or Level 3 Depth Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE1xxx or IMSE3xxx courses.

Level 3

Code	Title	Prerequisite
Core Courses		
IMSE3014	Project	None
IMSE3015	Industrial systems integration	None
Compulsory courses		
IMSE3002	Engineering project management	IMSE2008 Operational research techniques
IMSE3016	Operations planning and control	IMSE2008 Operational research techniques
Depth Elective Courses ^		
IMSE0201	Supply chain design and development	IMSE2020 Purchasing and supply management
IMSE3001	Computer integrated manufacturing	IMSE1009 Fundamentals of engineering design
IMSE3009	Advanced industrial automation	IMSE2003 Industrial automation
IMSE3010	Financial engineering	IMSE2005 Managerial accounting and finance
IMSE3011	Facilities design	IMSE2008 Operational research techniques
IMSE3017	Advanced electronic manufacturing technology	None
IMSE3018	Advanced manufacturing technology	IMSE2006 Manufacturing technology
IMSE3019	Digital enterprises and e-commerce	IMSE2016 Internet technology for e-commerce
IMSE3020	Technology marketing	IMSE1003 Introduction to business and management
IMSE3021	Strategic management of business and technology	IMSE1003 Introduction to business and management

^ Level 3 students may elect Level 2 Breath Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE2xxx courses.

SYLLABUSES

LEVEL ONE

The Level One syllabuses shall be as follows:

A1. Core Courses

IMSE1003. Introduction to business and management (6 credit-units)

Business of production; business environment; 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; development of technology and interaction between societies and technology; the environment and safety.

IMSE1004. Mathematics (6 credit-units)

Advanced calculus; Laplace transform, Fourier transform; numerical methods; difference equations; functions of complex variables; matrices and determinants, eigenvalues, systems of linear equations; differential equations.

A2. Breadth Elective Courses

- Level 1 students may elect Level 2 Breath Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE2xxx courses.

IMSE1012. Engineering technology (6 credit-units)

Laws of motion; conservation of energy; kinematics and dynamics of rigid bodies; applications and simulation of 4-bar mechanisms; gear trains; vibrations; fundamental electric circuit analysis; alternating currents and voltages; A.C. circuits and phasors; three-phase circuits.

IMSE1013. Introduction to information systems (6 credit-units)

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

IMSE1014. Product development (6 credit-units)

Organisation and management, performance measurement; market research, product design specification, 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.

IMSE1015. Systems modelling and simulation (6 credit-units)

Basic concepts of modelling and simulation; different types of modelling orientations, discrete-event simulation techniques vs. continuous; use of simulation packages; methodology of simulation study; model development for industrial systems, analysis of system configurations; model validation and analysis of simulation output.

B. Complementary Studies Courses – Language enhancement courses

ECEN1509. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1510. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations.

CENG1001. Professional Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

C. Broadening / Complementary Studies Courses

Broadening Elective Course (3 credit-units)

D. The following 2-semester Core courses are assessed based on coursework and/or continuous assessment.

IMSE1008. Computer applications for engineers (6 credit-units)

Fundamentals of computer hardware, operating systems and information technology; compilers; programming in C; algorithms and software design; numerical methods for simulation and engineering problems.

IMSE1009. Fundamentals of engineering design (6 credit-units)

General principles of engineering drawing practice; dimensioning and tolerancing; assembly drawing; design of components; general principles of tool design; jig and fixture design; computer aided drafting.

E. Workshop Training

IMSE1010. Workshop training (3credit-units)

Practical work in manufacturing processes; the use of hand and machine tools; joining and fastening of metals; construction, assembly and appreciation of electrical and mechanical systems; plastic processing; CNC programming and machining; work studies.

LEVEL TWO

The Level Two syllabuses shall be as follows:

A1. Core Courses

IMSE2005. Managerial accounting and finance (6 credit-units)

Cost accounting - procedures; direct costs, absorption costing; marginal costing. Planning and control - budgetary planning systems; standard costing systems; capital expenditure and investment; 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

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IMSE2006. Manufacturing technology (6 credit-units)

Introduction to manufacturing processes; material and process selection; plastic materials and processing methods; machining, cutting conditions; joining, mechanical fastening, welding, soldering, adhesive bonding; casting, bulk deformation, sheet metal working; finishing processes; powder processing; metrology, measurement of dimensional and geometric tolerances, principles of gauging.

IMSE2008. Operational research techniques (6 credit-units)

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: IMSE1004 Mathematics

IMSE2009. Quality management (6 credit-units)

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.

IMSE2014. Applied statistics (3 credit-units)

Probability and probability laws; binomial, Poisson and normal distributions; estimation and hypothesis testing; Type I and Type II errors; regression analysis, experiments with mixtures, ANOVA; non-parametric methods.

Prerequisite: IMSE1004 Mathematics

A2. Breadth Elective Courses

- Level 2 students may elect Level 1 Breath Elective courses or Level 3 Depth Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE1xxx or IMSE3xxx courses.

IMSE2003. Industrial automation (6 credit-units)

Conditions and justification for automation; basic components of industrial automation; numerical control, part programming, pneumatic, programmable logic control; electro-pneumatic systems design; open-loop and closed-loop control; stability; analogue and digital control.

Prerequisite: IMSE1004 Mathematics

IMSE2010. Integrative studies (3 credit-units)

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.

IMSE2012. Maintenance and reliability engineering (6 credit-units)

Survivor function, hazard function, bathtub-shape failure rate; system reliability, parallel and series systems, importance measures; life testing, accelerated stress testing; counting processes; maintenance policy; warranty models; reliability improvement, failure mode and effect analysis, fault tree analysis.

Prerequisite: IMSE1004 Mathematics

IMSE2013. Manufacturing systems design (6 credit-units)

Types of manufacturing systems; elements of integrated manufacturing systems; design for system reliability and maintainability; group technology; discrete-event simulation techniques; flexible manufacturing system; plant layout; material flow analysis; system analysis and design of automated manufacturing systems; structured system analysis and design (SSAD), object-oriented analysis and design (OOAD); artificial intelligence techniques in manufacturing system design.

IMSE2015. Man-machine systems (6 credit-units)

Ergonomics and systems, people in systems; the man-machine interface; anthropometry and biomechanics; physical work and workplace design; information processing; input and output; models of the sensory-motor system; skills and learning; environmental design, illumination, noise, thermal; applications, job design, inspection; health and safety; shift work.

IMSE2016. Internet technology for e-commerce (6 credit-units)

Internet and intranets, extranets, business-business versus business-consumer e-commerce; client/server architecture and connection; strategic corporate web presence; design and security issues; client-side and server-side scripting; database integration; virtual reality; asynchronous versus synchronous web applications; case studies on industrial applications of e-commerce in manufacturing and service supply chain.

IMSE2017. Management of information and information technology (6 credit-units)

Database management; knowledge management; management information systems; decision support systems; approaches to information systems development; system development life cycle; database design; user interface design; distributed systems.

Prerequisite: IMSE1013 Introduction to information systems

IMSE2018. Industrial organisation and management (6 credit-units)

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

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IMSE2019. Stochastic decision systems (6 credit-units)

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: IMSE1004 Mathematics

IMSE2020. Purchasing and supply management (3 credit-units)

Definition, importance and objectives of purchasing; strategic aspects of purchasing; purchasing variables – price, time and quality; source decision making; purchasing negotiations; make or buy decisions; supplier selection; supplier development; buying internationally.

B. Broadening / Complementary Studies Courses

Broadening Elective (Humanities) (3 credit-units)

Broadening Elective Course (3 credit-units)

Broadening Elective Course (3 credit-units)

Broadening Elective Course (3 credit-units)

C. Industrial Training

IMSE2011. Industrial training (3 credit-units)

LEVEL THREE

The Level Three syllabuses shall be as follows:

A1. Core Courses

Technical project

IMSE3014. Project (12 credit-units)

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

Integrative project

IMSE3015. Industrial systems integration (6 credit-units)

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.

A2. Compulsory Courses

IMSE3002. Engineering project management (6 credit-units)

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

Prerequisite: IMSE2008 Operational research techniques

IMSE3016. Operations planning and control (6 credit-units)

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

A3. Depth Elective Courses

- Level 3 students may elect Level 2 Breath Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE2xxx courses.

IMSE0201. Supply chain design and development (6 credit-units)

Supply chain overview; operating objectives; barriers to internal integration; supply chain performance cycles; logistics positioning; supply chain environmental assessment; time-based supply chains; 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: IMSE2020 Purchasing and supply management

IMSE3001. Computer integrated manufacturing (6 credit-units)

CAD/CAM functions and systems; computer graphics, graphics packages and standards; geometric modelling in CAD - principles of surface and solid modelling; CNC applications in CAM; computer aided process planning, automated process planning; rapid prototyping, virtual prototyping; CAD and CAM integration; CIM system design and implementation.

Prerequisite: IMSE1009 Fundamentals of Engineering Design

IMSE3009. Advanced industrial automation (6 credit-units)

Mechanised and flexible assembly systems, parts handling and feeding, parts mating theory; real-time control software; network communication in CIM, TCP/IP reference model; fundamentals of industrial robotics; robot motion and control; object and task-based programming; machine vision, techniques and industrial applications; robotic cell design; robots in industry and their social implications.

Prerequisite: IMSE2003 Industrial automation

IMSE3010. Financial engineering (6 credit-units)

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

IMSE3011. Facilities design (6 credit-units)

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.

Prerequisite: IMSE2008 Operational research techniques

IMSE3017. Advanced electronic manufacturing technology (6 credit-units)

Wafer production, monolithic processes and technology; chip to module packaging technology; hybrid mircocircuits, printed circuit board fabrication, electronic assembly technology; electrical noises and other quality and problem issues related to electronic packaging and products.

IMSE3018. Advanced manufacturing technology (6 credit-units)

Melt rheology and mixing characteristics of plastic materials; principles of plastics manufacturing technology; characteristics of plastics manufacturing systems and equipment; simple model flows for plastics processing; analysis of metal forming processes; CADCAM for mould and dies, applications of computers and rapid prototyping technologies in metal industry.

Prerequisite: IMSE2006 Manufacturing technology

IMSE3019. Digital enterprises and e-commerce (6 credit-units)

Enterprise resource management; EDI applications; data mining and warehousing; virtual enterprises; advanced Internet and web applications in product development; electronic product and component cataloguing; order taking and processing; electronic payment systems; contract negotiation and bid preparation; rapid quotation and cost estimation, product data management.

Prerequisite: IMSE2016 Internet technology for e-commerce

IMSE3020. Technology marketing (3 credit-units)

Market planning process, performance/price trade-off, end-user groups, distribution channels, marketing position; industry analysis; competitive analysis, competitive advantage, technological market strategy and models.

Prerequisite: IMSE1003 Introduction to business and management

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IMSE3021. Strategic management of business and technology (3 credit-units)

Analysis of the industry environment; competitive strategy; organisational implications of different strategies; analysis of the organisation; management of the strategic change; corporate strategy and global strategy; Governments' technology policies.

Prerequisite: IMSE1003 Introduction to business and management

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B. Broadening / Complementary Studies Courses

IMSE3008. Applied artificial intelligence (6 credit-units)

Genetic algorithms and evolution strategies; fuzzy sets, fuzzy rules, fuzzy inference; artificial neural networks including backpropagation algorithm; evolutionary optimisation of manufacturing systems with application to group technology, process planning and facilities design; fuzzy logic control of manufacturing systems.

IMSE3028. Innovation and entrepreneurship (6 credit-units)

Entrepreneurship in the new economy; general characteristics of entrepreneurs; enterprise formation, organizational structure, new economy business models; enterprise resources, initial 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.

Broadening / Complementary Elective Course (6 credit-units)

INDUSTRIAL MANAGEMENT AND MANUFACTURING SYSTEMS ENGINEERING[9]

PROGRAMME STRUCTURE

Definitions and Terminology

The Level of a course shall be 1, 2 or 3. Each course offered by the Department of Industrial and Manufacturing Systems Engineering shall be assigned a Level, which 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 1 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 Compulsory course is a course in the curriculum that a candidate must take. A Breadth course is a Level 1 or Level 2 course offered as an elective course in the curriculum. A Depth course is a Level 3 course offered as an elective course in the curriculum. Elective Courses refer to any optional subjects offered by the Department, provided that it does not overlap significantly with the other courses that the student has already enrolled in.

Complementary Studies shall include language enhancement courses, all the broadening courses offered by the Department and/or by the University. A list of the broadening courses approved for enrolment by the Department will be provided in the beginning of the academic year. Broadening courses are courses that are not directly related to the subject area of the major programme, but are to be taken as part of the general education requirement in university education.

The Curriculum

The curriculum comprises 186 credit-units of courses as follows:

(a) 114 credit-units of Core courses of the curriculum, including:
  (i) Integrative project (6 credit-units)
  (ii) Technical project (12 credit-units)
(b) 24 credit-units of Compulsory courses
(c) 18 credit-units of Depth Elective courses
(d) 24 credit-units of complementary studies courses comprising:
  (i) Professional and technical written communication for engineers (3 credit-units)
  (ii) Professional and technical oral communication for engineers (3 credit-units)

[9] For 2000-2001 intake only

(iii) Practical Chinese language course for engineering students (3 credit-units)
(iv) IMSE1007 The engineer in society (3 credit-units)
(v) IMSE2010 Integrative studies (3 credit-units)
(vi) Additional 9 credit-units of Complementary Studies courses, including 3 credit-units in Humanities and Social Sciences Studies and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective.

(e) Workshop training (3 credit-units)
(f) Industrial training (3 credit-units)

To complete the degree requirement, a candidate must enroll in all the courses specified in the curriculum and must pass the courses listed under (a) and (d) (i) (ii) (iii) (iv), and a combination of other courses totaling to at least 180 credit-units. In addition, the candidate must complete the workshop training (3 credit-units) and industrial training (3 credit-units) as well as satisfy the IT Proficiency Test and any other requirements as stipulated in the University or Faculty of Engineering regulations.

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 3 courses and core courses should be taken before breadth courses. Courses under the category of Complementary Studies can be taken in any order.

Level One

Loading

The normal load is 60 credit-units of courses for the Level One, with 30 credit-units of courses in each semester. Students are allowed to increase the loading by not more than 6 credit-units in each semester. Students are required to do Workshop Training (3 credit-units) in addition to the 60 credit-units of courses.

Courses

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

(a) 8 Core courses (48 credit-units)
(b) 4 Broadening / Complementary courses (12 credit-units) consisting of
  (i) 2 English Communications courses (6 credit-units)
  (ii) 1 Chinese Language course (3 credit-units)
  (iii) IMSE1007 The engineer in society (3 credit-units)

Core Courses			
Code	Title	Credit-units	Length (Sem)
IMSE1001	Electrical engineering science	6	1
IMSE1003	Introduction to business and management	6	1
IMSE1004	Mathematics	6	1
IMSE1005	Manufacturing processes	6	1
IMSE1006	Product engineering	6	1
IMSE1008	Computer applications for engineers	6	2
IMSE1009	Fundamentals of engineering design	6	2
IMSE1011	Mechanical engineering science	6	1
Required credit-units			48

Broadening / Complementary Studies courses			
Code	Title	Credit-units	Length (Sem)
ECEN1509	Professional and technical written communication for engineers	3	1
ECEN1510	Professional and technical oral communication for engineers	3	1
CENG1001	Practical Chinese language course for engineering students	3	1
IMSE1007	The engineer in society	3	1
Required credit-units		12	

An example of Level One Programme Structure for Industrial Management and Manufacturing Systems Engineering is as follows:

1st Sem	Mathematics (6)	Computer applications for engineers (6)	Product engineering (6)	Introduction to business and management (6)	Professional & technical written comm. for engineers (3)	Practical Chinese language course for engineering students (3)
2nd Sem	Mechanical engineering science (6)	Fundamentals of engineering design (6)	Manufacturing processes (6)	Electrical engineering science (6)	Professional & technical oral comm. for engineers (3)	The engineer in society (3)
IMSE1010 Workshop Training (3)						
Required credit-units						63

Level Two

Loading

The normal load for a student is 60 credit-units of courses for the Level Two with 30 credit-units of courses in each semester. Students are allowed to increase the loading by not more than 6 credit-units in each semester. Students are required to do Industrial Training (3 credit-units) in addition to the 60 credit-units of courses.

Courses

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

(a) 8 Core courses (48 credit-units)
(b) 4 Broadening / Complementary Studies courses (12 credit-units) consisting of
  (i) 2 Broadening courses on the approved list (6 credit-units)
  (ii) 1 Humanities Broadening course on the approved list (3 credit-units)
  (iii) IMSE2010 Integrative studies (3 credit-units)

Core Courses			
Code	Title	Credit-units	Length (Sem)
IMSE2002	Ergonomics	6	1
IMSE2003	Industrial automation	6	1
IMSE2005	Managerial accounting and finance	6	1
IMSE2006	Manufacturing technology	6	1
IMSE2008	Operational research techniques	6	1
IMSE2009	Quality management	6	1
IMSE2012	Maintenance and reliability engineering	6	1
IMSE2013	Manufacturing systems design	6	1
Required credit-units		48	

Broadening / Complementary Studies courses			
Code	Title	Credit-units	Length (Sem)
	Humanities	3	1
	Broadening elective course	3	1
	Broadening elective course	3	1
IMSE2010	Integrative studies	3	1
Required credit-units		12	

An example of Level Two programme structure for the Industrial Management and Manufacturing Systems Engineering Programme is shown below :

1st Sem	Manufacturing systems design (6)	Operational research (6)	Manufacturing technology (6)	Managerial accounting & finance (6)	Broadening elective (3)	Humanities (3)
2nd Sem	Industrial automation (6)	Maintenance & reliability engineering (6)	Quality management (6)	Ergonomics (6)	Broadening elective (3)	Integrative studies (3)
IMSE2011 Industrial Training (3)						
Total credit-units						63

Level Three[10]

Loading

The normal load for a student is 60 credit-units of courses for the Level Three with 30 credit-units of courses in each semester. Students are allowed to increase the loading by not more than 6 credit-units in each semester.

[10] Some Depth Elective courses in Group 1 and Group 2 may be changed or may not be offered in the academic year 2002-2003. Students should seek advice from the Department of Industrial and Manufacturing Systems Engineering in selecting these courses.

Courses

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

(a) Core courses (18 credit-units), comprising:
    (i) Technical Project - IMSE 3014 Project (12 credit-units)
    (ii) Integrative project - IMSE3015 Industrial systems integration (6)
(b) 4 Compulsory courses (24 credit-units)
(c) 1 Depth Elective course elected from Depth Elective Courses [Group 1] (6 credit-units)
(d) 2 Depth Elective courses elected from Depth Elective Courses [Group 2] (12 credit-units)

Core Courses			
Code	Title	Credit-units	Length (Sem)
IMSE3014	Project	12	2
IMSE3015	Industrial systems integration	6	2
Required credit-units		18	

Compulsory Courses			
Code	Title	Credit-units	Length (Sem)
IMSE3001	Computer integrated manufacturing	6	1
IMSE3002	Engineering project management	6	1
IMSE3003	Industrial organisation and management	6	1
IMSE3004	Production planning and control	6	1
Required credit-units		24	

Depth Elective Courses [Group 1]			
Code	Title	Credit-units	Length (Sem)
IMSE3005	Electronics manufacturing technology	6	1
IMSE3006	Metal working technology	6	1
IMSE3007	Plastics manufacturing technology	6	1
Required credit-units		6	

Depth Elective Courses [Group 2]			
Code	Title	Credit-units	Length (Sem)
IMSE3008	Applied artificial intelligence	6	1
IMSE3009	Advanced industrial automation	6	1
IMSE3010	Financial engineering	6	1
IMSE3011	Facilities design	6	1
IMSE3012	Logistics engineering and supply chain management	6	1
IMSE3013	Transportation and distribution management	6	1
Required credit-units		12	

An example of Level Three programme structure for Industrial Management and Manufacturing Systems Engineering is shown below:

1st Sem.	Production planning and control (6)	Computer integrated manufacturing (6)	Industrial organisation and management (6)	Project (12)	Depth Elective (6) *
2nd Sem.	Engineering project management (6)		Depth Elective (6) *	Industrial systems integration (6)	Depth Elective (6) *
Required credit-units :					60

* One elective to be chosen from Group 1 and two from Group 2.

Summary of the prerequisite relationship between Level 1, 2 and 3 courses

Level 1

Code	Title	Prerequisite
IMSE1001	Electrical engineering science	None
IMSE1003	Introduction to business and management	None
IMSE1004	Mathematics	None
IMSE1005	Manufacturing processes	None
IMSE1006	Product engineering	None
IMSE1007	The engineer in society	None
IMSE1008	Computer applications for engineers	None
IMSE1009	Fundamentals of engineering design	None
IMSE1011	Mechanical engineering science	None

Level 2

Code	Title	Prerequisite
IMSE2002	Ergonomics	None
IMSE2003	Industrial automation	IMSE1004 Mathematics
IMSE2005	Managerial accounting and finance	None
IMSE2006	Manufacturing technology	None
IMSE2008	Operational research techniques	IMSE1004 Mathematics
IMSE2009	Quality management	None
IMSE2010	Integrative studies	None
IMSE2012	Maintenance and reliability engineering	IMSE1004 Mathematics
IMSE2013	Manufacturing systems design	None

Level 3

Code	Title	Prerequisite
Core courses		
IMSE3014	Project	None
IMSE3015	Industrial systems integration	None
Compulsory courses		
IMSE3001	Computer integrated manufacturing	IMSE1005 Manufacturing processes
IMSE3002	Engineering project management	None
IMSE3003	Industrial organisation and management	IMSE1003 Introduction to business and management
IMSE3004	Production planning and control	IMSE2008 Operational research techniques
Depth Elective Courses [Group 1]		
IMSE3005	Electronics manufacturing technology	None
IMSE3006	Metal working technology	IMSE2006 Manufacturing technology
IMSE3007	Plastics manufacturing technology	IMSE1011 Mech. engg. science
Depth Elective Courses [Group 2]		
IMSE3008	Applied artificial intelligence	IMSE2008 Operational research techniques
IMSE3009	Advanced industrial automation	IMSE2003 Industrial automation
IMSE3010	Financial engineering	IMSE2005 Managerial accounting and finance; IMSE2008 Operational research techniques
IMSE3011	Facilities design	IMSE2008 Operational research techniques; IMSE2013 Manufacturing systems design
IMSE3012	Logistics engineering and supply chain management	None
IMSE3013	Transportation and distribution management	None

SYLLABUSES

LEVEL ONE

The Level One syllabuses shall be as follows:

A1. Core Courses

IMSE1001. Electrical engineering science (6 credit-units)

Fundamental electric circuit analysis; signal representation; frequency response of RLC networks; resonance; transfer functions; poles and zeros; diode, transistor, operational amplifier and their applications; amplifier; digital circuits; Boolean algebra; logic gates; sequential circuits; applications of digital circuits.

IMSE1003. Introduction to business and management (6 credit-units)

Business of production; business environment; 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.

IMSE1004. Mathematics (6 credit-units)

Advanced calculus; Laplace transform, Fourier transform; numerical methods; difference equations; functions of complex variables; matrices and determinants, eigenvalues, system of linear equations; differential equations.

IMSE1005. Manufacturing processes (6 credit-units)

Introduction to manufacturing processes; properties of materials, material and process selection; plastic materials and processing methods; machining, cutting and grinding operations, machine tools, cutting tool and work holding, cutting conditions; joining processes, mechanical fastening, liquid and solid states welding, brazing, soldering, adhesive bonding.

IMSE1006. Product engineering (6 credit-units)

Product development: organisation and management, performance measurement; market research, product design specification, concept generation and selection, design review and improvements; product appraisal from functional, ergonomics and aesthetic, manufacturing and economical aspects; information / literature search.

IMSE1011. Mechanical engineering science (6 credit-units)

Laws of thermodynamics and engineering cycles; fluid flow; laws of motion; conservation of energy; kinematics and dynamics of particles and rigid bodies; mechanisms; vibrations; stress analysis.

B. Complementary Studies Courses – Language enhancement courses

ECEN1509. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1510. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations.

CENG1001. Professional Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

C. Broadening/complementary studies courses offered to all IMSE students and non-IMSE students by the Department of Industrial and Manufacturing Systems Engineering.

IMSE1007. The engineer in society (3 credit-units)

Development of technology and interaction between societies and technology; complaints against technology; current issues; the environment; role, responsibilities and development of professional engineers; ethics; occupational health and safety issues.

D. The following 2-semester Core courses are assessed based on coursework and/or continuous assessment.

IMSE1008. Computer applications for engineers (6 credit-units)

Fundamentals of computer hardware, operating systems and information technology; programming in C; algorithms and software design; numerical methods for simulation and engineering problems.

IMSE1009. Fundamentals of engineering design (6 credit-units)

General principles of engineering drawing practice; dimensioning and tolerancing; assembly drawing; design of components; general principles of tool design; jig and fixture design; computer aided drafting.

E. Workshop Training

IMSE1010. Workshop training (3credit-units)

Practical work in manufacturing processes; the use of hand and machine tools; joining and fastening of metals; construction, assembly and appreciation of electrical and mechanical systems; plastic processing; CNC programming and machining; work studies.

LEVEL TWO

The Level Two syllabuses shall be as follows:

A1. Core Courses

IMSE2002. Ergonomics (6 credit-units)

Ergonomics and systems, people in systems; the man-machine interface; anthropometry and biomechanics; physical work and workplace design; information processing; input and output; models of the sensory-motor system; skills and learning; environmental design, illumination, noise, thermal; applications, job design, inspection; health and safety; shift work.

IMSE2003. Industrial automation (6 credit-units)

Conditions and justification for automation; basic components of industrial automation; numerical control, part programming, pneumatic, programmable logic control; electro-pneumatic systems design; open-loop and closed-loop control; stability; analogue and digital control.

Prerequisite: IMSE1004 Mathematics

IMSE2005. Managerial accounting and finance (6 credit-units)

Cost accounting - procedures; direct costs, absorption costing; marginal costing. Planning and control - budgetary planning systems; standard costing systems; capital expenditure and investment; 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.

IMSE2006. Manufacturing technology (6 credit-units)

Metrology, interferometry, measurement of dimensional and geometric tolerances, limits and fits, principles of gauging; casting processes, permanent and non-permanent moulds; forming processes, principles of rolling, forging, extrusion, wire drawing, shearing, bending, and deep drawing; finishing processes; powder processing.

IMSE2008. Operational research techniques (6 credit-units)

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: IMSE1004 Mathematics

IMSE2009. Quality management (6 credit-units)

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

IMSE2012. Maintenance and reliability engineering (6 credit-units)

Basic probability and statistics; hazard function; system reliability, reliability testing, accelerated life testing; maintenance policy; reliability improvement; warranty models.

Prerequisite: IMSE1004 Mathematics

IMSE2013. Manufacturing systems design (6 credit-units)

Types of manufacturing systems; elements of integrated manufacturing systems; design for system reliability and maintainability; group technology; discrete-event simulation techniques; flexible manufacturing system; plant layout; material flow analysis; system analysis and design of automated manufacturing systems; structured system analysis and design (SSAD), object-oriented analysis and design (OOAD); artificial intelligence techniques in manufacturing system design.

B. Broadening / Complementary Studies Courses

Broadening Elective (Humanities) (3 credit-units)

Broadening Elective Course (3 credit-units)

Broadening Elective Course (3 credit-units)

C. Broadening/complementary studies courses offered by the Department of Industrial and Manufacturing Systems Engineering. Assessment is based on coursework and/or continuous assessment.

IMSE2010. Integrative study (3 credit-units)

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.

D. Industrial Training

IMSE2011. Industrial training (3 credit-units)

LEVEL THREE

The Level Three syllabuses shall be as follows:

A1. Core Courses

Technical project

IMSE3014. Project (12 credit-units)

A dissertation or report on a topic consisting of design, experimental or analytical investigation in the field of industrial management and manufacturing systems engineering.

Integrative project

IMSE3015. Industrial systems integration (6 credit-units)

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.

A2. Compulsory Courses

IMSE3001. Computer integrated manufacturing (6 credit-units)

CAD/CAM functions and systems; computer graphics, 2D and 3D transformations, graphics packages and standards; geometric modelling in CAD - principles of surface and solid modelling; CNC applications in CAM - CNC tool path generation, process optimisation in CNC machining; computer aided process planning, automated process planning; rapid prototyping, virtual prototyping; CAD and CAM integration; CIM system design and implementation.

Prerequisite: IMSE1005 Manufacturing processes

IMSE3002. Engineering project management (6 credit-units)

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

IMSE3003. Industrial organisation and management (6 credit-units)

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

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IMSE3004. Production planning and control (6 credit-units)

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 manufacturing; balancing of assembly lines; information reporting and processing; supply chain management.

Prerequisite: IMSE2008 Operational research techniques

A3. Depth Elective Courses [Group 1]

IMSE3005. Electronics manufacturing technology (6 credit-units)

Wafer production, monolithic processes and technology; chip to module packaging technology; hybrid mircocircuits, printed circuit board fabrication, electronic assembly technology; electrical noises and other quality and problem issues related to electronic packaging and products.

IMSE3006. Metal working technology (6 credit-units)

Metal cutting and machining; analysis of cutter geometry and materials; analysis of metal forming processes; CADCAM for mould and dies, applications of computers and rapid prototyping technologies in metal industry.

Prerequisite: IMSE2006 Manufacturing technology

IMSE3007. Plastics manufacturing technology (6 credit-units)

Melt rheology; mixing characteristics; elementary steps in processing; functional and geometrical characteristics of processing equipment; control and flow design of flow processes; processing factors.

Prerequisite: IMSE1011 Mechanical engineering science

A4. Depth Elective Courses [Group 2]

IMSE3008. Applied artificial intelligence (6 credit-units)

Genetic algorithms and evolution strategies; fuzzy sets, fuzzy rules, fuzzy inference; artificial neural networks including backpropagation algorithm; evolutionary optimisation of manufacturing systems with application to group technology, process planning and facilities design; fuzzy logic control of manufacturing systems.

Prerequisite: IMSE2008 Operational research techniques

IMSE3009. Advanced industrial automation (6 credit-units)

Mechanised and flexible assembly systems, parts handling and feeding, parts mating theory; real-time control software; network communication in CIM, ISO OSI reference model; fundamentals of industrial robotics; robot motion and control; object and task-based programming; machine vision, techniques and industrial applications; robotic cell design; robots in industry and their social implications.

Prerequisite: IMSE2003 Industrial automation

IMSE3010. Financial engineering (6 credit-units)

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.

Prerequisites: IMSE2005 Managerial accounting and finance
IMSE2008 Operational research techniques

IMSE3011. Facilities design (6 credit-units)

Types of production; plant layout design, systematic layout planning, computer-based layout planning, quantitative approaches; materials handling system design and analysis; storage and warehouse operations; fire safety and security; plant location; plant location and layout in the information age; study cases from the manufacturing and service industries.

Prerequisites: IMSE2008 Operational research techniques;
IMSE2013 Manufacturing systems design

IMSE3012. Logistics engineering and supply chain management (6 credit-units)

The evolution of logistics; the role of logistics in business; logistics performance analysis; customer service and order processing; strategic purchasing; supply chain management – make or buy, supplier selection and supplier development; logistics information systems; international sourcing strategies; logistics organisation design.

IMSE3013. Transportation and distribution management (6 credit-units)

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.

LOGISTICS ENGINEERING AND SUPPLY CHAIN MANAGEMENT

PROGRAMME STRUCTURE

Definitions and Terminology

The Level of a course shall be 1, 2 or 3. Each course offered by the Department of Industrial and Manufacturing Systems Engineering shall be assigned a Level, which 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 1 course shall read < IMSE1xxx >.

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Complementary Studies shall include language enhancement courses, all the broadening courses offered by the Department and/or by the University. A list of the broadening courses approved for enrollment by the Department will be provided in the beginning of the academic year. Broadening courses are courses that are not directly related to the subject area of the major programme, but are to be taken as part of the general education requirement in university education.

The Curriculum

The curriculum comprises 186 credit-units of courses as follows:

(a) 81 credit-units of Core courses of the curriculum, including
    (i) Integrative project (6 credit-units)
    (ii) Technical project (12 credit-units)
(b) 12 credit-units of Compulsory course of the curriculum
(c) 57 credit-units of Breadth/Depth Elective courses
(d) 30 credit-units of complementary studies courses comprising:
    (i) Professional and technical written communication for engineers (3 credit-units)
    (ii) Professional and technical oral communication for engineers (3 credit-units)
    (iii) Practical Chinese language course for engineering students (3 credit-units)
    (iv) Additional 21 credit-units of Complementary Studies courses, including 3 credit-units in Humanities and Social Sciences Studies and at least 3 credit-units in Culture and Value Studies or an area of studies outside this degree curriculum as an elective.
(e) Workshop training (3 credit-units)
(f) Industrial training (3 credit-units)

To complete the degree requirement, a candidate must enroll in all the courses specified in the curriculum and must pass the courses listed under (a) and (d) (i) (ii) (iii), and a combination of other courses totaling to at least 180 credit-units. In addition, the candidate must complete the workshop training (3 credit-units) and industrial training (3 credit-units) as well as satisfy the IT Proficiency Test and any other requirements as stipulated in the University or Faculty of Engineering regulations.

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 3 courses and core courses should be taken before breadth courses. Courses under the category of Complementary Studies can be taken in any order.

Level One

Loading

The normal loading is 60 credit-units of courses for the Level One, with 30 credit-units of courses in each semester. Students are allowed to increase the loading by not more than 6 credit-units in each semester. Students are required to do Workshop Training (3 credit-units) in addition to the 60 credit-units of courses.

Courses

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

(a) 5 Core courses (30 credit-units)
(b) 3 Breadth Elective courses (18 credit-units)
(c) 4 Broadening / Complementary courses (12 credit-units) consisting of
    (i) 2 English Communications courses (6 credit-units)
    (ii) 1 Chinese Language course (3 credit-units)
    (iii) 1 Broadening course on the approved list (3 credit-units)

Core Courses			
Code	Title	Credit-units	Length (Sem)
IMSE1003	Introduction to business and management	6	1
IMSE1004	Mathematics	6	1
IMSE1008	Computer applications for engineers	6	2
IMSE1009	Fundamentals of engineering design	6	2
IMSE1016	Fundamentals of business logistics	6	1
Required credit-units			30

Breadth Elective Courses			
Code	Title	Credit-units	Length (Sem)
IMSE1012	Engineering technology	6	1
IMSE1013	Introduction to information systems	6	1
IMSE1014	Product development	6	1
IMSE1015	Systems modelling and simulation	6	1
IMSE1017	Engineering systems analysis	6	1
Required credit-units			18

Broadening / Complementary Studies courses			
Code	Title	Credit-units	Length (Sem)
ECEN1509	Professional and technical written communication for engineers	3	1
ECEN1510	Professional and technical oral communication for engineers	3	1
CENG1001	Practical Chinese language course for engineering students	3	1
	Broadening elective course	3	1
Required credit-units			12

An example of Level One programme structure for Logistics Engineering and Supply Chain Management Programme is as follows:

1st Sem	Mathematics (6)	Computer applications for engineers (6)	Breadth Elective (6)	Introduction to business and management (6)	Professional & technical written comm. for engineers (3)	Practical Chinese language course for engineering Students (3)
2nd Sem	Fundamentals of business logistics (6)	Fundamentals of engineering design (6)	Breadth Elective (6)	Breadth Elective (6)	Professional & technical oral comm. for engineers (3)	Broadening elective (3)
IMSE1010 Workshop Training (3)						
Required credit-units						63

Level Two

Loading

The normal loading is 60 credit-units of courses for the Level Two, with 30 credit-units of courses in each semester. Students are allowed to increase the loading by not more than 6 credit-units in each semester. Students are required to do Workshop Training (3 credit-units) in addition to the 60 credit-units of courses.

Courses

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

(a) 5 Core courses (27 credit-units)
(b) A combination of Breadth Elective courses totaling to 21 credit-units
(c) 4 Broadening / Complementary Studies courses (12 credit-units) consisting of
  (i) 3 Broadening courses on the approved list (9 credit-units)
  (ii) 1 Humanities Broadening course on the approved list (3 credit-units)

Core Courses			
Code	Title	Credit-units	Length (Sem)
IMSE0201	Supply chain design and development	6	1
IMSE2005	Managerial accounting and finance	6	1
IMSE2008	Operational research techniques	6	1
IMSE2014	Applied statistics	3	1
IMSE2021	Transportation and distribution planning	6	1
Required credit-units			27

Broadening Elective Courses			
Code	Title	Credit-units	Length (Sem)
IMSE2003	Industrial automation	6	1
IMSE2009	Quality management	6	1
IMSE2010	Integrative studies	3	1
IMSE2012	Maintenance and reliability engineering	6	1
IMSE2015	Man-machine systems	6	1
IMSE2016	Internet technology for e-commerce	6	1
IMSE2017	Management of information and information technology	6	1
IMSE2018	Industrial organisation and management	6	1
IMSE2019	Stochastic decision systems	6	1
IMSE2022	Strategic purchasing	3	1
IMSE2023	Plant layout and materials handling	3	1
Required credit-units			21

Broadening / Complementary Studies elective courses			
Code	Title	Credit-units	Length (Sem)
	Humanities	3	1
	Broadening elective course	3	1
	Broadening elective course	3	1
	Broadening elective course	3	1
Required credit-units			12

An example of the Level Two programme structure for the Logistics Engineering and Supply Chain Management Programme is shown below:

1st Sem	Transportation and distribution planning (6)	Operational research (6)	Breadth Elective (6)	Applied statistics (3) Breadth Elective (3)	Broadening elective (3)	Broadening elective (Humanities) (3)
2nd Sem	Supply chain design and development (6)	Breadth Elective (6)	Breadth Elective (6)	Managerial accounting & finance (6)	Broadening elective (3)	Broadening elective (3)
IMSE2011 Industrial Training (3)						
Required credit-units						63

Level Three[11]

Loading

The normal loading for a student is 60 credit-units of courses for the Level Three (excluding summer vacation) with 30 credit-units of courses in each semester. Students are allowed to increase the loading by not more than 6 credit-units in each semester.

Courses

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

(a) Core courses (24 credit-units) comprising
  (i) IMSE3023 Warehousing and terminal operations (6 unit)
  (ii) Technical Project - IMSE 3024 Project (12 credit-units)
  (iii) Integrative project - IMSE3025 Industrial systems integration (6)
(b) One compulsory course (12 credit-units)
(c) A combination of Depth Elective courses totaling to 18 credit-units
(d) 1 Broadening / Complementary Studies course (6 credit-units) elected from the following:
  (i) IMSE3008 Applied artificial intelligence (6 credit-units)
  (ii) IMSE3028 Innovation and entrepreneurship (6 credit-units)
  (iii) Broadening courses on the approved list (6 credit-units)

Core Courses			
Code	Title	Credit-units	Length (Sem)
IMSE3023	Warehousing and terminal operations	6	1
IMSE3024	Project (Logistics engineering related)	12	2
IMSE3025	Logistics systems integration	6	2
Required credit-units		24	

[11] Level 3 students may elect Level 2 elective courses, upon consulting the Course Tutor.

Compulsory Course			
Code	Title	Credit-units	Length (Sem)
IMSE3016	Operations planning and control	6	1
IMSE3002	Engineering project management	6	1
Required credit-units		12	

Depth Elective Courses			
Code	Title	Credit-units	Length (Sem)
IMSE3010	Financial engineering	6	1
IMSE3019	Digital enterprises and e-commerce	6	1
IMSE3020	Technology marketing	3	1
IMSE3021	Strategic management of business and technology	3	1
IMSE3022	Global logistics systems	6	1
IMSE3026	Automated warehousing design	6	1
IMSE3027	Supply chain modelling and simulation	6	1
Required credit-units		18	

Broadening / Complementary Studies elective courses			
Code	Title	Credit-units	Length (Sem)
IMSE3008	Applied artificial intelligence	6	1
IMSE3028	Innovation and entrepreneurship	6	1
	Broadening elective course	6	1
Required credit-units		6	

An example of Level Three programme structure for Logistics Engineering and Supply Chain Management Programme is shown below:

1st Sem.	Operations planning and control (6)	Warehousing and terminal operations (6)	Broadening Elective (6)	Project (12)	Depth Elective (6)
2nd Sem.	Engineering project management (6)		Depth Elective (6)	Logistics systems integration (6)	Depth Elective (6)
Required credit-units :					60

Summary of the prerequisite relationship between Level 1, 2 and 3 courses

Level 1

Code	Title	Prerequisite
Core Courses		
IMSE1003	Introduction to business and management	None
IMSE1004	Mathematics	None
IMSE1008	Computer applications for engineers	None
IMSE1009	Fundamentals of engineering design	None
IMSE1016	Fundamentals of business logistics	None

Breadth Elective Courses %		
IMSE1012	Engineering technology	None
IMSE1013	Introduction to information systems	None
IMSE1014	Product development	None
IMSE1015	Systems modelling and simulation	None
IMSE1017	Engineering systems analysis	None

% Level 1 students may elect Level 2 Breath Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE2xxx courses.

Level 2

Code	Title	Prerequisite
Core Courses		
IMSE0201	Supply chain design and development	IMSE1016 Fundamentals of business logistics
IMSE2005	Managerial accounting and finance	IMSE1003 Introduction to business and management
IMSE2008	Operational research techniques	IMSE1004 Mathematics
IMSE2014	Applied statistics	IMSE1004 Mathematics
IMSE2021	Transportation and distribution planning	IMSE1016 Fundamentals of business logistics
Breadth Elective Courses @		
IMSE2003	Industrial automation	IMSE1004 Mathematics
IMSE2009	Quality management	None
IMSE2010	Integrative studies	None
IMSE2012	Maintenance and reliability engineering	IMSE1004 Mathematics
IMSE2015	Man-machine systems	None
IMSE2016	Internet technology for e-commerce	None
IMSE2017	Management of information and information technology	IMSE1013 Introduction to information systems
IMSE2018	Industrial organisation and management	IMSE1003 Introduction to business and management
IMSE2019	Stochastic decision systems	IMSE1004 Mathematics
IMSE2022	Strategic purchasing	IMSE1016 Fundamentals of business logistics
IMSE2023	Plant layout and materials handling	None

@ Level 2 students may elect Level 1 Breath Elective courses or Level 3 Depth Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE1xxx or IMSE2xxx courses.

Level 3

Code	Title	Prerequisite
Core Courses		
IMSE3023	Warehousing and terminal operations	IMSE1016 Fundamentals of business logistics
IMSE3024	Project	None
IMSE3025	Logistics systems integration	None
Compulsory Course		
IMSE3016	Operations planning and control	IMSE2008 Operational research techniques
IMSE3002	Engineering project management	IMSE2008 Operational research techniques
Depth Elective Courses ^		
IMSE3010	Financial engineering	IMSE2005 Managerial accounting and finance
IMSE3019	Digital enterprises and e-commerce	IMSE2016 Internet technology for e-commerce
IMSE3020	Technology marketing	IMSE1003 Introduction to business and management
IMSE3021	Strategic management of business and technology	IMSE1003 Introduction to business and management
IMSE3022	Global logistics systems	IMSE1016 Fundamentals of business logistics
IMSE3026	Automated warehousing design	IMSE2003 Industrial automation
IMSE3027	Supply chain modelling and simulation	IMSE1004 Mathematics

^ Level 3 students may elect Level 2 Breath Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE2xxx courses.

SYLLABUSES

LEVEL ONE

The Level One syllabuses shall be as follows:

A1. Core Courses

IMSE1003. Introduction to business and management (6 credit-units)

Business of production; business environment; 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; development of technology and interaction between societies and technology; the environment and safety.

IMSE1004. Mathematics (6 credit-units)

Advanced calculus; Laplace transform, Fourier transform; numerical methods; difference equations; functions of complex variables; matrices and determinants, eigenvalues, systems of linear equations; differential equations.

IMSE1016. Fundamentals of business logistics (6 credit-units)

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.

A2. Breadth Elective Courses

- Level 1 students may elect Level 2 Breath Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE2xxx courses.

IMSE1012. Engineering technology (6 credit-units)

Laws of motion; conservation of energy; kinematics and dynamics of rigid bodies; applications and simulation of 4-bar mechanisms; gear trains; vibrations; fundamental electric circuit analysis; alternating currents and voltages; A.C. circuits and phasors; three-phase circuits.

IMSE1013. Introduction to information systems (6 credit-units)

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

IMSE1014. Product development (6 credit-units)

Organisation and management, performance measurement; market research, product design specification, 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.

IMSE1015. Systems modelling and simulation (6 credit-units)

Basic concepts of modelling and simulation; different types of modelling orientations, discrete-event simulation techniques vs. continuous; use of simulation packages; methodology of simulation study; model development for industrial systems, analysis of system configurations; model validation and analysis of simulation output.

IMSE1017. Engineering systems analysis (6 credit-units)

Fundamentals and elements of engineering systems; systems analysis and design principles; group technology; material flow analysis; structured system analysis and design method (SSADM), object-oriented analysis and design (OOAD); artificial intelligence techniques for system analysis and solution generation.

B. Complementary Studies Courses – Language enhancement courses

ECEN1509. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1510. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations.

CENG1001. Professional Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

C. Broadening / Complementary Studies Courses

Broadening Elective Course (3 credit-units)

D. The following 2-semester Core courses are assessed based on coursework and/or continuous assessment.

IMSE1008. Computer applications for engineers (6 credit-units)

Fundamentals of computer hardware, operating systems and information technology; compilers; programming in C; algorithms and software design; numerical methods for simulation and engineering problems.

IMSE1009. Fundamentals of engineering design (6 credit-units)

General principles of engineering drawing practice; dimensioning and tolerancing; assembly drawing; design of components; general principles of tool design; jig and fixture design; computer aided drafting.

E. Workshop Training

IMSE1010. Workshop training (3credit-units)

Practical work in manufacturing processes; the use of hand and machine tools; joining and fastening of metals; construction, assembly and appreciation of electrical and mechanical systems; plastic processing; CNC programming and machining; work studies.

LEVEL TWO

The Level Two syllabuses shall be as follows:

A1. Core Courses

IMSE0201. Supply chain design and development (6 credit-units)

Supply chain overview; operating objectives; barriers to internal integration; supply chain performance cycles; logistics positioning; supply chain environmental assessment; time-based supply chains; 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: IMSE1016 Fundamentals of business logistics

IMSE2005. Managerial accounting and finance (6 credit-units)

Cost accounting - procedures; direct costs, absorption costing; marginal costing. Planning and control - budgetary planning systems; standard costing systems; capital expenditure and investment; 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

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IMSE2008. Operational research techniques (6 credit-units)

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: IMSE1004 Mathematics

IMSE2014. Applied statistics (3 credit-units)

Probability and probability laws; binomial, Poisson and normal distributions; estimation and hypothesis testing; Type I and Type II errors; regression analysis, experiments with mixtures, ANOVA; non-parametric methods.

Prerequisite: IMSE1004 Mathematics

IMSE2021. Transportation and distribution planning (6 credit-units)

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

IMSE2022. Strategic purchasing (3 credit-units)

Evolution of purchasing function; customer-supplier relationships; four phase relationship model; partnership and relationship sourcing; network sourcing; outsourcing decisions and subcontracting; core competency development; supplier selection models; supplier development; information systems in purchasing.

Prerequisite: IMSE1016 Fundamentals of business logistics

A2. Breadth Elective Courses

- Level 2 students may elect Level 1 Breath Elective courses or Level 3 Depth Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE1xxx or IMSE2xxx courses.

IMSE2003. Industrial automation (6 credit-units)

Conditions and justification for automation; basic components of industrial automation; numerical control, part programming, pneumatic, programmable logic control; electro-pneumatic systems design; open-loop and closed-loop control; stability; analogue and digital control.

Prerequisite: IMSE1004 Mathematics

IMSE2009. Quality management (6 credit-units)

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.

IMSE2010. Integrative studies (3 credit-units)

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.

IMSE2012. Maintenance and reliability engineering (6 credit-units)

Survivor function, hazard function, bathtub-shape failure rate; system reliability, parallel and series systems, importance measures; life testing, accelerated stress testing; counting processes; maintenance policy; warranty models; reliability improvement, failure mode and effect analysis, fault tree analysis.

Prerequisite: IMSE1004 Mathematics

IMSE2015. Man-machine systems (6 credit-units)

Ergonomics and systems, people in systems; the man-machine interface; anthropometry and biomechanics; physical work and workplace design; information processing; input and output; models of the sensory-motor system; skills and learning; environmental design, illumination, noise, thermal; applications, job design, inspection; health and safety; shift work.

IMSE2016. Internet technology for e-commerce (6 credit-units)

Internet and intranets, extranets, business-business versus business-consumer e-commerce; client/server architecture and connection; strategic corporate web presence; design and security issues; client-side and server-side scripting; database integration; virtual reality; asynchronous versus synchronous web applications; case studies on industrial applications of e-commerce in manufacturing and service supply chain.

IMSE2017. Management of information and information technology (6 credit-units)

Database management; knowledge management; management information systems; decision support systems; approaches to information systems development; system development life cycle; database design; user interface design; distributed systems.

Prerequisite: IMSE1013 Introduction to information systems

IMSE2018. Industrial organisation and management (6 credit-units)

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

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IMSE2019. Stochastic decision systems (6 credit-units)

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: IMSE1004 Mathematics

IMSE2023. Plant layout and materials handling (3 credit-units)

Types of production; plant layout design, systematic layout planning, computer-based layout planning, and quantitative approaches; materials handling system design and analysis; storage and warehousing operations; introduction to digital factory.

B. Broadening / Complementary Studies Courses

Broadening Elective Course (Humanities) (3 credit-units)

Broadening Elective Course (3 credit-units)

Broadening Elective Course (3 credit-units)

Broadening Elective Course (3 credit-units)

C. Industrial Training

IMSE2011. Industrial training (3 credit-units)

LEVEL THREE

The Level Three syllabuses shall be as follows:

A1. Core Courses

IMSE3023. Warehousing and terminal operations (6 credit-units)

Principal functions and roles of warehousing; planning of warehouse operations; productivity and quality control; computers and warehouse management; applications of EDI and communication networks; warehouse automation; advanced materials handling systems; automated storage and distribution systems; case studies drawn from local and international cargo terminals.

Prerequisite: IMSE1016 Fundamentals of business logistics

Technical project

IMSE3024. Project (12 credit-units)

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

Integrative project

IMSE3025. Logistics systems integration (6 credit-units)

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.

A2. Compulsory Courses

IMSE3016. Operations planning and control (6 credit-units)

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

IMSE3002. Engineering project management (6 credit-units)

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

Prerequisite: IMSE2008 Operational research techniques

A3. Depth Elective Courses

- Level 3 students may elect Level 2 Breath Elective courses, but prior consultation and approval from the Course Tutor must be obtained before enrolling in IMSE2xxx courses.

IMSE3010. Financial engineering (6 credit-units)

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

IMSE3019. Digital enterprises and e-commerce (6 credit-units)

Enterprise resource management; EDI applications; data mining and warehousing; virtual enterprises; advanced Internet and web applications in product development; electronic product and component cataloguing; order taking and processing; electronic payment systems; contract negotiation and bid preparation; rapid quotation and cost estimation, product data management.

Prerequisite: IMSE2016 Internet technology for e-commerce

IMSE3020. Technology marketing (3 credit-units)

Market planning process, performance/price trade-off, end-user groups, distribution channels, marketing position; industry analysis; competitive analysis, competitive advantage, technological market strategy and models.

Prerequisite: IMSE1003 Introduction to business and management

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IMSE3021. Strategic management of business and technology (3 credit-units)

Analysis of the industry environment; competitive strategy; organisational implications of different strategies; analysis of the organisation; management of the strategic change; corporate strategy and global strategy; Governments' technology policies.

Prerequisite: IMSE1003 Introduction to business and management

IMSE3022. Global logistics systems (6 credit-units)

International trade environment; Governments' policies in global logistics; logistics and transportation in different localities; ocean ships and shipping; chartering bulk ocean carriers; the Ocean Liner alliance system; international air transportation; land transport to and from ports; seaports, airports, canals and tunnels; international logistics functions and intermediaries; terms of sales and terms of payment; documentation and insurance; international distribution channels; international sourcing; logistics as a tool for integrating international operations.

Prerequisite: IMSE1016 Fundamentals of business logistics

IMSE3026. Automated warehousing design (6 credit-units)

Evolution of warehousing functions; elements of warehouse management: information system, packaging and identification, auditing warehouse performance, equipment and space utilization; warehouse planning and design; materials handling: warehouse automation techniques, reverse logistics; applications of virtual reality systems in warehouse simulation: optimisation of materials handling, materials and information flow, layout design and redesign.

Prerequisite: IMSE2003 Industrial automation

IMSE3027. Supply chain modelling and simulation (6 credit-units)

Industrial dynamics: exponential lags, finite time delays, oscillatory and chaotic behaviour, feedback control; dynamics and control of supply chains: inventory levels, supply lines, demand estimation, crisp-logic and fuzzy-logic control rules, performance measures; flows of goods, orders, and cash in supply chains; co-operation and competition in supply chains, strategic alliances; simulation of multi-sector supply chains: case studies, including MIT 'beer game'.

Prerequisite: IMSE1004 Mathematics

B. Broadening / Complementary Studies Courses

IMSE3008. Applied artificial intelligence (6 credit-units)

Genetic algorithms and evolution strategies; fuzzy sets, fuzzy rules, fuzzy inference; artificial neural networks including backpropagation algorithm; evolutionary optimisation of manufacturing systems with application to group technology, process planning and facilities design; fuzzy logic control of manufacturing systems.

IMSE3028. Innovation and entrepreneurship (6 credit-units)

Entrepreneurship in the new economy; general characteristics of entrepreneurs; enterprise formation, organizational structure, new economy business models; enterprise resources, initial 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.

Broadening / Complementary Elective Course (6 credit-units)

MECHANICAL ENGINEERING
(with optional Environmental Engineering Stream and Building Services Engineering Stream)

PROGRAMME STRUCTURE

Definitions and Terminology

The Level of a course shall be 1, 2 or 3. Each course offered by the Department shall be assigned a Level, which is indicated by the left-most digit of the number in the course code.

A Compulsory course is a course which a student must study. A Core course is a compulsory course which a student must pass in the manner as stipulated in the Regulations. A Breadth course is a Level 2 or Level 3 course offered as a compulsory or optional course for the curriculum. A Depth course is a Level 3 course offered as a compulsory or optional course for the curriculum. A Complementary Studies course is either a Level 1, Level 2 or Level 3 course offered as a compulsory or optional course for the curriculum by the Department. It also includes broadening courses on a list approved by the Department which would normally be considered as Level 1 courses.

The Curriculum

The curriculum comprises of 186 credit-units of courses as follows:

(a) Eighteen Core courses (96 credit-units)
(b) Six to Seven Compulsory/Elective Depth/Breadth courses (36 credit-units)
(c) Nine Complementary Studies courses (30 credit-units) **
(d) Project and Design (18 credit-units)
(e) Workshop training (3 credit-units)
(f) Industrial training (3 credit-units)

There are no course prerequisites but there is a course co-requisite structure so that lower level courses should preferably be taken before higher level courses. To complete the curriculum, a candidate must take all the courses listed under (a) to (f) and obtain at least 180 credit-units including all courses listed under (a) , (c)** and (d).

** Students must pass the English and Chinese language courses (9 credit-units), at least a pass in a broadening course (3 credit-units) in Humanities and Social Sciences Studies, and at least a pass in a broadening course (3 credit-units) in Culture and Value Studies or an area of study outside this degree curriculum as an elective.

First Year

Loading

The normal load for a student is 60 credit-units of courses (excluding summer vacation) with 30 credit-units in each semester. Students are allowed to increase the loading by not more than 6 credit-units in a semester.

Courses

Students must take the examination/coursework in the following courses and pass the courses listed under (a), (b)(i) and (b)(ii).

(a) 8 Core courses (45 credit-units)

(b) 5 Complementary Studies courses (15 credit-units) consisting of
  (i) 2 English Communications courses (6 credit-units)
  (ii) 1 Chinese Language course (3 credit-units)
  (iii) "Engineer in Society" (3 credit-units)
  (iv) 1 Broadening courses on the approved list (3 credit-units)

Core Courses		
Code	Title	Credit-units
MECH1004	Drawing and elements of design and manufacture	6
MECH1005	Fundamentals of electrical and electronic engineering	6
MECH1006	Mathematics I	6
MECH1009	Properties of materials I	3
MECH1012	Foundations of engineering mechanics	6
MECH1013	Engineering mechanics	6
MECH1014	Thermofluids	6
MECH1015	Integrated computer and laboratory studies I	6
Total credit-units		45

Complementary Studies Courses		
Code	Title	Credit-units
ECEN1509	Professional and technical written communication for engineers	3
ECEN1510	Professional and technical oral communication for engineers	3
CENG1001	Practical Chinese language course for engineering students	3
MECH1010	Engineer in society	3
Xxxxx	Broadening course	3
Total credit-units		15

Second Year

Loading

The normal load for a student is 60 credit-units of courses (excluding summer vacation) with 30 credit-units in each semester. Students are allowed to increase the loading by not more than 6 credit-units in a semester or decrease the loading by the equivalent number of credit-units which they have previously taken as additional loading and passed. Students are required to take the additional course of "Workshop training" (3 credit-units) in the First Year's summer vacation.

Courses

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

(a) 10 core courses (51 credit-units)
(b) 3 Complementary Studies Courses (9 credit-units)
(c) "Workshop training" (3 credit-units)

Courses for Main Stream and Building Services Engineering Stream students

Core Courses		
Code	Title	Credit-units
MECH2001	Applied dynamics	3
MECH2002	Engineering thermodynamics	6

MECH2004	Control	3
MECH2005	Design and manufacture	6
MECH2006	Electrical and electronic engineering	6
MECH2007	Mathematics II	6
MECH2008	Mechanics of fluids	6
MECH2009	Mechanics of solids	6
MECH2010	Properties of materials II	3
MECH2013	Integrated computer and laboratory studies II	6
Total credit-units		51

Complementary Studies Courses		
Code	Title	Credit-units
MECH2011	Engineering economics	3
Xxxxx	Broadening course	3
Xxxxx	Broadening course	3
Total credit-units		9

Training		
Code	Title	Credit-units
MECH1011	Workshop training	3
Total credit-units		3

Courses for Environmental Engineering students

Core Courses		
Code	Title	Credit-units
MECH2001	Applied dynamics	3
MECH2002	Engineering thermodynamics	6
MECH2004	Control	3
MECH2005	Design and manufacture	6
MECH2007	Mathematics II	6
MECH2008	Mechanics of fluids	6
MECH2009	Mechanics of solids	6
MECH2010	Properties of materials II	3
CIME2001	Water and air quality: concepts and measurement	6
MECH2013	Integrated computer and laboratory studies II	6
Total credit-units		51

Complementary Studies Courses		
Code	Title	Credit-units
MECH2011	Engineering Economics	3
Xxxxx	Broadening course	3
Xxxxx	Broadening course	3
Total credit-units		9

Training		
Code	Title	Credit-units
MECH1011	Workshop training	3

Third Year

Loading

The normal load for a student is 60 credit-units of courses with 30 credit-units in each semester. Students are allowed to increase the loading by up to 6 credit-units in a semester or decrease the loading by the equivalent number of credit-units which they have previously taken as additional loading and passed. Students are required to take the additional course of "Industrial training" (3 credit-units) in the Second Year's summer vacation.

Courses

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

(a) Design and Project (18 credit-units)
(b) 6 to 7 Compulsory/Elective Depth/Breadth courses (36 credit-units)
(c) 1 Complementary Studies course "Engineering and technology management" (6 credit-units)
(d) "Industrial training" (3 credit-units)

Compulsory Courses for all students		
Code	Title	Credit-units
MECH3008	Design	6
MECH3022	Project	12
Total credit-units		18

Complementary Studies Course for all students		
Code	Title	Credit-units
MECH3010	Engineering and technology management	6
Total credit-units		6

Training		
Code	Title	Credit-units
MECH2012	Industrial training	3
Total credit-units		3

Courses for Main Stream students

Elective Depth/ Breadth Courses

Students will have to take 6 to 8 Depth/Breadth courses (36 credit-units) from the following list including at least one Depth/Breadth course (with #).

Code	Title	Credit-units
MECH3001	Acoustics	3
MECH3002	Air pollution control	6
MECH3004	Automatic control	6
MECH3005	Building services	6
MECH3006	Case studies of failure investigations	3
MECH3007	Computer-aided design and manufacture (CAD/CAM) #	6

MECH3009	Energy conversion systems	6
MECH3011	Heat transfer #	6
MECH3012	Product design and development	6
MECH3013	Marine propulsion systems	6
MECH3014	Materials for engineering applications	6
MECH3015	Applied stress and strength analysis #	6
MECH3016	Waves in fluids	3
MECH3017	Mechatronic design methodology and robotics	6
MECH3020	Vibration #	6
MECH3021	Viscous flow #	6
BBSE3005	Inter-disciplinary building services design	6
Total credit-units		36

Courses for Environmental Engineering Stream students

Depth & Breadth Courses

Students will have to take the following 2 Compulsory Depth/Breadth courses (12 credit-units)

Compulsory Breadth/Depth Courses		
Code	Title	Credit-units
MECH3002	Air pollution control	6
MECH2006	Electrical and electronic engineering[@]	6
Total credit-units		12

[@] Level 2 Breadth course

In addition, they have to take 4 to 6 Elective Depth/Breadth/Complementary Studies courses (24 credit-units) from the following list.

Depth/Breadth Courses		
Code	Title	Credit-units
MECH3001	Acoustics	3
MECH3005	Building services	6
MECH3009	Energy conversion systems	6
MECH3011	Heat transfer	6
MECH3013	Marine propulsion systems	6
MECH3016	Waves in fluids	3
MECH3021	Viscous flow	6
MECH3006	Case studies of failure investigations	3
MECH3020	Vibration	6
BBSE3005	Inter-disciplinary building services design	6
CIVE3002	Wind engineering	6
CIVE3005	Solid and hazardous waste management	6
CIVE3006	Municipal and industrial wastewater treatment	6
Total credit-units		24

* Complementary Studies course

Courses for Building Services Engineering Stream students

Depth & Breadth Courses

Students will have to take the following 2 Compulsory Depth/Breadth courses (12 credit-units)

Compulsory Breadth/Depth Courses		
Code	Title	Credit-units
MECH3005	Building services	6
MECH3023	Building energy management and control systems	6
Total credit-units		12

In addition, they have to take 4 or 5 Elective Depth/Breadth/Complementary Studies courses (24 credit-units) from the following list.

Depth/Breadth Courses		
Code	Title	Credit-units
MECH3001	Acoustics	3
MECH3002	Air pollution control	6
MECH3004	Automatic control	6
MECH3006	Case studies of failure investigations	3
MECH3007	Computer-aided design and manufacture (CAD/CAM)	6
MECH3009	Energy conversion systems	6
MECH3011	Heat transfer	6
MECH3014	Materials for engineering applications	6
MECH3020	Vibration	6
MECH3021	Viscous flow	6
BBSE3005	Inter-disciplinary building services design	6
Total credit-units		24

SYLLABUSES

Level 1

MECH1004. Drawing and elements of design and manufacture (6 credit-units)

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.

MECH1005. Fundamentals of electrical and electronic engineering (6 credit-units)

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.

MECH1006. Mathematics I (6 credit-units)

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

MECH1009. Properties of materials I (3 credit-units)

Elements of atomic structure and bonding; crystal structure; defect theory; solidification; plastic deformation; recrystallization; phase diagrams; alloy properties; TTT diagrams; heat treatment.

MECH1010. Engineer in society (3 credit-units)

Perceptions of engineering; historical development of engineering design; risk awareness, safety issues; green and environmental issues.

MECH1011. Workshop training (3 credit-units)

Practical work in manufacturing processes; the use of hand and machine tools; joining and fastening of metals; construction, assembly and appreciation of electrical and mechanical systems; principles of foundry and heat treatment practice; plastic processing.

MECH1012. Foundations of engineering mechanics (6 credit-units)

Force systems and equilibrium; moments of mass and area; introduction to stress and strain; kinematics of particules; Newton's 2^{nd} law and dynamics of particles; dynamics of bodies; energy; impulse and momentum; hydrostatics; fluid in motion.

MECH1013. Engineering Mechanics (6 credit-units)

Stress and strain; bending of beams; deflection of beams; torsion of shafts; thin-wall pressure vessels; kinematics of linkage mechanisms; gear trains; dynamics of particles and bodies under velocity-dependent forces; undamped and damped free vibration.

MECH1014. Thermofluids (6 credit-units)

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; pipe flow analysis.

MECH1015. Integrated computer and laboratory studies I (6 credit-units)

Introduction to computer hardware and operating systems; Internet access and e-mail; standard computational packages for symbolic mathematics and numerical calculations; programming in C and C++; use of mathematical subroutine libraries; application of programming to mathematical and engineering problems; experimental and analytical techniques; safety issues; demonstrations and experiments in applied mechanics, thermofluids, properties of materials and electrical engineering.

ECEN1509. Professional and technical written communication for engineers (3 credit-units)

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.

ECEN1510. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations.

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

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xxxxx Broadening course in humanities and social sciences (3 credit-units)

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xxxxx Broadening course in culture & value studies or an area of studies outside this degree curriculum as an elective (3 credit-units)

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xxxxx Broadening course on the approved list (3 credit-units)

Level 2

MECH2001. Applied dynamics (3 credit-units)

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.

MECH2002. Engineering thermodynamics (6 credit-units)

Steam power cycles, refrigeration cycles, gas power cycles, jet propulsion cycles, gas mixture, combustion, turbomachineries, Psychrometry and air-conditioning, introduction to heat transfer.

MECH2004. Control (3 credit-units)

Frequency response methods; feedback control systems; control system design and applications; stability; root locus method; analogue computer programming.

MECH2005. Design and manufacture (6 credit-units)

Materials selection; joining and fastening; mechanism design; tooling system design; power transmission systems; CNC machining; rapid prototyping.

MECH2006. Electrical and electronic engineering (6 credit-units)

Analog electronics; sequential logic circuits; 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.

MECH2007. Mathematics II (6 credit-units)

Complex variables; Fourier series and Fourier transforms; partial differential equations; introduction to probability and statistics; elementary numerical analysis.

MECH2008. Mechanics of fluids (6 credit-units)

Navier-Stokes equations; pipe and channel viscous flows; lubrication; boundary layer flows; two-dimensional potential flows; water waves; one-dimensional compressible flows; fluid machines.

MECH2009. Mechanics of solids (6 credit-units)

Two-dimensional theory of elasticity; thermal stress and rotating disks; energy methods; introduction to the finite element method; experimental methods; bending of circular plate.

MECH2010. Properties of materials II (3 credit-units)

Testing and service behaviour of materials, metallurgy of fatigue; theory of creep resistant alloys; the ductile/brittle transition; corrosion resistance; surface treatment; selection criteria for common alloys. Structure of polymers; properties of compounded plastics; service behaviour of plastics.

MECH2011. Engineering economics (3 credit-units)

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.

MECH 2013. Integrated computer and laboratory studies II (6 credit-units)

Miscellaneous advanced topics in C++, including aspects of object oriented programming; Windows® programming in C++ with user interface and graphics; communication with electro-mechanical hardware; group project on the application of computing to the solution of an engineering problem; demonstrations and experiments in various areas of mechanical engineering.

MECH2012. Industrial training (3 credit-units)

CIME2001. Water and air quality: concepts and measurement (6 credit-units)

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

Level 3

MECH3001. Acoustics (3 credit-units)

Sources; wave equations; transmission; propagation; environmental noise; effects of noise; machinery noise; legislation.

MECH3002. Air pollution control (6 credit-units)

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.

MECH3004. Automatic control (6 credit-units)

Control of mechanical, hydraulic and pneumatic systems; process modelling and control; linear control system design; computer control systems, state-space analysis of multivariable linear system, controllability and observability, stability analysis; state and output feedback, state observer.

MECH3005. Building services (6 credit-units)

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.

MECH3006. Case studies of failure investigations (3 credit-units)

General introduction to failure investigation procedures, purpose, scope, and limitation; failure mode detected from component examination; cause of failure determination through system case studies; design codes for large structures; fracture mechanics techniques; legislation affecting safety of equipment; roles of a mechanical engineer as an expert witness.

MECH3007. Computer-aided design and manufacture (CAD/CAM) (6 credit-units)

Basic data structure techniques; transformation techniques; mathematical bases for surface modeling; principles of solid modeling and applications; numerical control; computer-aided production management; computer-integrated manufacturing.

MECH3008. Design (6 credit-units)

Design methodology; engineering design; design for manufacturability; prototyping; project management.

MECH3009. Energy conversion systems (6 credit-units)

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

MECH3010. Engineering and technology management (6 credit-units)

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 application of decision trees; inventory control models; queuing theory ; transportation and resource allocation for business operations.

MECH3011. Heat transfer (6 credit-units)

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.

MECH3012. Product design and development (6 credit-units)

Creative product design and product development; methods and tools for design, analysis and testing; prototype making methods and practices; design for tooling design of electromechanical products.

MECH3013. Marine propulsion systems (6 credit-units)

Marine vehicles and marine prime movers; marine machinery systems; marine propulsors; propeller/engine design integration; waste heat recovery and advanced energy concepts; dynamics and vibrations of marine systems; speed and power control in marine systems.

MECH3014. Materials for engineering applications (6 credit-units)

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.

MECH3015. Applied stress and strength analysis (6 credit-units)

Theory of elasticity, bending of cantilever beams, torsion of non-circular members; finite element methods; analysis of rectangular plates; fracture mechanics; plastic analysis.

MECH3016. Waves in fluids (3 credit-units)

Small amplitude waves, shallow water waves, wave forces, ship waves, harbour oscillations, mass transport.

MECH3017. Mechatronic design methodology and robotics (6 credit-units)

Introduction to mechatronics and robotics; applications of sensors for intelligent control; embedded microprocessor; motion generation and transfer systems, design and control; case studies.

MECH3020. Vibration (6 credit-units)

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.

MECH3021. Viscous flow (6 credit-units)

Eulerian and Lagrangian descriptions; Navier-Stokes equations; low-Reynolds-number flows; laminar boundary layers; laminar stability theory; turbulent flows.

MECH3022. Project (12 credit-units)

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

MECH3023. Building energy management and control systems (6 credit-units)

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.

BBSE3005. Inter-disciplinary building services design (6 credit-units)

Inter-disciplinary building services design; design rationales; conceptual design of air conditioning, plumbing and drainage, fire services, electrical power supply, vertical transportation, and lighting systems; detailed design; requirements for teamwork and integration; tectonics considerations.

CIVE3002. Wind engineering (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVE3005. Solid and hazardous waste management (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

CIVE3006. Municipal and industrial wastewater treatment (6 credit-units)

For course descriptions, see the syllabuses of the Civil Engineering programme.

MEDICAL ENGINEERING

PROGRAMME STRUCTURE

Definitions and Terminology

The Level of a course shall be 1, 2 or 3. Each course shall be assigned a Level, which is indicated in the first left-most digit of the 4-digit numeral in the latter half of the course code.

A Compulsory course is a course which a student must study. A Core course is a Compulsory course which a student must pass in the manner as stipulated in the Regulations. Elective courses refer to any optional subjects in the programme.

A Complementary Studies course is either a Level 1, Level 2 or Level 3 course offered as a compulsory or optional course for the curriculum. It also includes broadening courses on a list approved by the Programme Director which would normally be considered as Level 1 courses.

Loading

The normal load for a student is 60 credit-units of courses (excluding summer vacation) with 30 credit-units in each semester. Students are allowed to increase the loading by not more than 6 credit-units in a semester or decrease the loading by the equivalent number of credit-units which they have previously taken as additional loading and passed.

Curriculum Requirement

The curriculum comprises of 180 credit-units of courses as follows:

(a) Nineteen Core courses (114 credit-units)
(b) 33 credit-units of elective courses for the Biomedical Information Processing Stream and the Biomechanics Stream
(c) Nine Complementary Studies courses (33 credit-units)

To complete the degree requirement, a student must take all the courses listed under (a) to (c) and obtain at least 180 credit-units. In addition, students must pass the English and Chinese language courses (12 credit-units), at least a pass in a broadening course (3 credit-units) in Humanities and Social Sciences Studies, and at least a pass in a broadening course (3 credit-units) in Culture and Value Studies or an area of study outside this degree curriculum as an elective course, as well as satisfy the IT Proficiency Test as stipulated in the University or B.Eng. Degree Regulations.

First Year

Courses

Students must take the examination/coursework in the following courses and pass the courses listed under (a), (b)(i), (b)(ii) and (b)(iii).

(a) 8 Core courses (48 credit-units)
(b) 4 Complementary Studies courses (15 credit-units) consisting of
  (i) "Problem solving and communication in medical engineering" (6 credit-units)
  (ii) "Engineer in society" (3 credit-units)
  (iii) Broadening course in Humanities and Social Sciences Studies (3 credit-units)
  (iv) Broadening course on the approved list (3 credit-units)

Core Courses		
Code	Title	Credit-units
BIOC1901	Basic biochemistry	6
ELEC1501	Computer programming and data structure	6
ELEC1611	Circuit theory and digital logic design	6
LIFE1002	Life sciences I	12
MECH1006	Mathematics I	6
MECH1009	Properties of materials I	3
MECH1012	Foundations of engineering mechanics	6
MECH1017	Mechanics for medical engineering	3
Total credit-units		48

Complementary Studies Courses		
Code	Title	Credit-units
ECEN1511	Problem solving and communication in medical engineering	6
MECH1010	Engineer in society	3
	2 Broadening courses	3+3
Total credit-units		15

Second Year

Courses

Students must take the examination/coursework in the following courses and pass the courses listed under (a), (b)(i), (b)(ii) and (b)(iii).

(a) 9 Core courses (48 credit-units)
(b) 4 Complementary Studies courses (12 credit-units) consisting of
  (i) "Professional and technical oral communication for engineers" (3 credit-units)
  (ii) "Practical Chinese language course for engineering students" (3 credit-units)
  (iii) Broadening course in Culture & Value Studies; or an area of study outside this degree curriculum as an elective course (3 credit-units)
  (iv) Broadening course on the approved list (3 credit-units)

Core Courses		
Code	Title	Credit-units
BIOC1903	Introduction to molecular genetics	6
ELEC1614 or ELEC1401	Electronic devices and circuits Computer organization and microprocessors	6
ELEC2201	Signals and linear systems	6
LIFE2004	Life sciences II & III	6
MECH2014	Thermofluids for medical engineering	3
MECH2007	Mathematics II	6
MEDE2003	Medical engineering I	6
MEDE2004	Biomaterials I	3
MEDE3001	Medical engineering II	6
Total credit-units		48

Complementary Studies Courses		
Code	Title	Credit-units
ECEN1510	Professional and technical oral communication for engineers	3
CENG1001	Practical Chinese language course for engineering students	3
	2 Broadening courses	3+3
Total credit-units		12

Third Year

Courses

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

(f) 2 Core courses (18 credit-units)
(g) 33 credit-units of elective courses for the Biomedical Information Processing Stream and the Biomechanics Stream
(h) Complementary Studies course: "Engineering economics and finance, organization and management" (6 credit-units)

Core Courses		
Code	Title	Credit-units
BIOC3908	Introduction to bioinformatics	6
MEDE3002	Medical engineering final year project	12
Total credit-units		18

Elective Courses for Biomedical Information Processing Stream		
Code	Title	Credit-units
CSIS0278	Introduction to database management systems	6
ELEC2204	Digital signal processing	6
ELEC2205	Control and instrumentation	6
ELEC3504	Image processing and computer vision	6
ELEC6053	Biomedical electronics and sensors systems	3
ELEC6067	Magnetic resonance imaging (MRI) technology and applications	3
DRAD6100	Imaging and clinical electrophysiological techniques	3
Total credit-units		33

Elective Courses for Biomechanics Stream		
Code	Title	Credit-units
MECH3017	Mechatronics design methodology and robotics	6
MECH2008	Mechanics of fluids	6
MECH3024	Mechanics of solids for medical engineers	6
MMPH6124	Basic medical bioengineering	3
MEDE3003	Biomaterials II	3
MEDE3004	Medical imaging	6
PBSL0322	Motor learning, anxiety and performance	9
PBSL0323	Advanced exercise physiology	9
Total credit-units		48

Complementary Studies courses		
Code	Title	Credit-units
ELEC3703	Engineering economics and finance, organization and management	6

The list of courses is not final and some courses may not be offered every year.

SYLLABUSES

First Year

BIOC1901. Basic biochemistry (6 credit-units)

This course presents an overview of biochemistry and provides an understanding of the basic mechanisms underlying life processes. This is an independent course which can be taken by students from various disciplines. It also prepares students for further studies in Biochemistry and Molecular Biology.

ELEC1501. Computer programming and data structures (6 credit-units)

Overview of computer software; operating systems (PC and Unix); compilers and loaders; high-level languages; structured programming; C language; elementary data structures; algorithms; object-oriented programming; C++; introduction to database.

ELEC1611. Circuit theory and digital logic design (6 credit-units)

Application of Boolean algebra in combinational logic circuits, combinational logic design, decoders, encoders, multiplexers, adders, subtractors; sequential circuits, latches, flip-flops, sequential circuit analysis, design with D and JK flip-flops, registers and counters, random-access memory, error detection and correction, programmable logic technologies, PLA, VLSI PLA, basic circuit concepts; circuit theorems; circuit response, sinusoidal steady-state analysis.

LIFE1002. Life sciences I (12 credit-units)

This course examines the concepts related to the structures and functions of the human body. The first semester study includes discussion of the organization of the body from the single cell to the coordinated whole. A major theme is the interaction of all body systems for the maintenance of a stable internal state, a condition called homeostasis. The foci are cellular function, basis of chemical interaction, tissue level organization, integumentary, digestive, respiratory, cardiovascular, haematologic and urinary systems, as well as metabolism. In the second semester, it continues to examine the concepts related to the structures and functions of the human body. The focus throughout the course is the normal physiological functions and anatomy of the body. The interrelationship between cells and organs will also be covered to make the physiological process more meaningful to students. The areas include musculoskeletal, nervous, endocrine and reproductive systems.

MECH1006. Mathematics I (6 credit-units)

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

MECH1009. Properties of materials I (3 credit-units)

Elements of atomic structure and bonding; crystal structure; defect theory; solidification; plastic deformation; recrystallization; phase diagrams; alloy properties; TTT diagrams; heat treatment.

MECH1012. Foundations of engineering mechanics (6 credit-units)

Force systems and equilibrium; moments of mass and area; introduction to stress and strain; kinematics of particles; Newton's 2nd law and dynamics of particles; dynamics of bodies; energy; impulse and momentum; hydrostatics; fluid in motion.

MECH1017. Mechanics for medical engineering (3 credit-units)

Stress and strain; bending of beams; deflection of beams; torsion of shafts; kinematics of linkage mechanisms; applications to engineering and biomechanics problems.

ECEN1511. Problem solving and communication in medical engineering (6 credit-units)

The main focus of this course is the Medical Engineering Project (MEP) which has been devised in collaboration with the Engineering and Medical Faculty. Medical Engineers will need to communicate with Medical professionals and Engineering professionals. They will also need to use their engineering knowledge and skills to solve medical engineering problems. The aim of MEP is to increase students' awareness of the variety of engineering issues and applications in the various medical fields, and to encourage them to talk to medical professionals.

MECH1010. Engineer in society (3 credit-units)

Perceptions of engineering; historical development of engineering design; risk awareness, safety issues; green and environmental issues.

Broadening course in Humanities and Social Sciences Studies (3 credit-units)

Broadening course on the approved list (3 credit-units)

Second Year

BIOC1903. Introduction to molecular genetics (6 credit-units)

This course provides students with basic and updated knowledge of the structure and functions of nucleic acids, a general picture of the molecular control of gene expression, and implications of molecular genetics in the development of recombinant DNA technology.

ELEC1614. Electronic devices and circuits (6 credit-units)

Electronic devices: quantum theory; solid-state theory; PN junction theory; bipolar junction transistor; field-effect devices including JFET, MOS capacitor, MESFET and MOSFET.
Electronic circuits: diode circuits; analyses of BJT and FET circuits; digital circuits; D/A and A/D conversion.

ELEC1401. Computer organization and microprocessors (6 credit-units)

Integer and floating point representations, control unit and data path, instruction set and addressing modes, subroutines, reentrancy, I/O programming, interrupt and exception handling, modern processors. Microprocessor system, interface hardware, memory system, displays and mass storage devices.

ELEC2201. Signals and linear systems (6 credit-units)

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; sampling and reconstruction; digital filters.

LIFE2004. Life sciences II & III (6 credit-units)

This course is a combination of parts of "Life sciences II" and "Life sciences III" and focuses on human physiology and pathophysiology. Discussion on temperature regulation, fluid, electrolyte and acid-base balance as well as sensory and motor functions. The concept of body functions in health and diseases is reinforced. The course contains both theory and laboratory components.

MECH2014. Thermofluids for medical engineering (3 credit-units)

Properties; first law of thermodynamics; second law of thermodynamics; basic concepts on fluids and flows; dimensional analysis, similarity and modeling; pipe flow analysis; modeling of complex biological systems; blood flow and pulmonary systems.

MECH2007. Mathematics II (6 credit-units)

Complex variables; Fourier series and Fourier transforms; partial differential equations; introduction to probability and statistics; elementary numerical analysis.

MEDE2003. Medical engineering I (6 credit-units)

Static and dynamic forces applied to the human body; lifting, throwing and running; gait analysis; the human energy system, muscles, tendons and ligaments; hydrostatic effects on the human circulatory system; structure of bone and tissue; molecular biosensors and human information systems.

MEDE2004. Biomaterials I (3 credit-units)

Concept of biomaterials; metallic implant materials; bioceramics; biopolymers and composite implant materials; tissue response to implants; medical devices and evaluation

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MEDE3001. Medical engineering II (6 credit-units)

Prosthetic design; thermodynamics applied to musculoskeletal and cardiovascular systems; mechanical and biomechanical failure criterion relating to human tolerance, injury and risk; venous valves and muscle pumps; tissue stresses and energy loss effects; computer-based monitoring of the human condition under stressful situations.

ECEN1510. Professional and technical oral communication for engineers (3 credit-units)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using oral English. Topics include accessing, abstracting, analysing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices; informal small group and formal oral presentations.

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

The course is designed to introduce practical Chinese writing skills; letter-writing: official, business & personal; office documents: notices, announcements, proposals, minutes and reports; technical writing skills; the language of legal documents: tenders and contracts; 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; Putonghua.

Broadening course in Culture & Value Studies; or an area of study outside this degree curriculum as an elective course (3 credit-units)

Broadening course on the approved list (3 credit-units)

Third Year

BIOC3908. Introduction to bioinformatics (6 credit-units)

Internet resources: DNA and protein sequence databases; information searching and retrieval: Entrez and SRS; simple sequence analysis; sequence alignment: pair-wise alignment, substitution matrices; sequence database searching: FASTA, BLAST, Smith-Waterman, algorithm and parameters; sequence alignment: multiple sequence alignment; Patterns, Motifs, and Profiles analysis; advance sequence analysis: secondary structures prediction, gene identification; protein structure analysis: display of macromolecules, protein homology modeling; phylogenetic analysis.

Prerequisite: BIOC1903 Introduction to molecular genetics

MEDE3002. Medical engineering final year project (12 credit-units)

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

CSIS0278. Introduction to database management systems (6 credit-units)

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, security, integrity, concurrency control, and contemporary topics in database management systems. This course may not be taken with BUSI0052.

Prerequisite: ELEC1501 Computer programming and data structures

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ELEC2204. Digital signal processing (6 credit-units)

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

Prerequisite: ELEC2201 Signals and linear systems

ELEC2205. Control and instrumentation (6 credit-units)

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. DNA-based chip technology; lab-on-a-chip.

Corequisite: ELEC2201 Signals and linear systems

ELEC3504. Image processing and computer vision (6 credit-units)

Digitization of images, transforms, enhancement, compression, segmentation, representation and description; irradiance and shading, depth estimation, coordinate systems and calibration, curves and surfaces, motion and optical flow; object representation, matching and recognition, simple applications.

Prerequisite: ELEC2201 Signals and linear systems

ELEC6053. Biomedical electronics and sensors systems (3 credit-units)

Biomedical technology, sensing, signal processing, control and computation. Molecular computing. Molecular and cell-based biosensor elements. Physiological and anatomic aspects of medical monitoring and imaging.

ELEC6067. Magnetic resonance imaging (MRI) technology and applications (3 credit-units)

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.

DRAD6100. Imaging and clinical electrophysiological techniques (3 credit-units)

Imaging techniques: computed tomography; contrast agents and contrast imaging; EEG and brain mapping, polysomnographic monitoring; interventional radiology; magnetic resonance imaging; nerve conduction, velocity, EMG; production of X-rays and radiography; radionuclide imaging; ultrasound.

MECH3017. Mechatronic design methodology and robotics (6 credit-units)

Introduction to mechatronics and robotics; applications of sensors for intelligent control; embedded microprocessor; motion generation and transfer systems, design and control; case studies.

MECH2008. Mechanics of fluids (6 credit-units)

Navier-Stokes equations; pipe and channel viscous flows; lubrication; boundary layer flows; two-dimensional potential flows; water waves; one-dimensional compressible flows; fluid machines.

MECH3024. Mechanics of solids for medical engineers (6 credit-units)

Introduction to theory of elastic bodies; theory of failure and plastic yielding; buckling; energy methods; introduction to finite element method; experimental methods for stress analysis; applications to engineering and biomechanics problems; problem-based learning.

MMPH6124. Basic medical bioengineering (3 credit-units)

The topics mirror the fundamental engineering science courses taught in the several engineering areas, but applied to problems in the biological world. The order of presentation consists of basic biomechanics of solids, fundamentals of fluid mechanics, bioheat and energy transfer, biomaterials, locomotion and muscle biomechanics.

MEDE3003. Biomaterials II (3 credit-units)

Soft tissues; soft tissue replacement; hard tissues; hard tissue replacement; introduction to tissue engineering.

MEDE3004. Medical imaging (6 credit-units)

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.

PBSL0322. Motor learning, anxiety and performance (9 credit-units)

This course will critically examine issues and theories related to anxiety, motor learning and performance in sport. Students will examine the anxiety / performance relationship, as well as applied issues, such as, emotion control, goal setting, skill acquisition and implicit learning.

PBSL0323. Advanced exercise physiology (9 credit-units)

This course provides an advanced understanding of the respiratory and cardiovascular adaptations to physical exercise; areas of applied work physiology such as diving, altitude, thermoregulation, water balance and ergogenics will also be explored.

ELEC3703. Engineering economics and finance, organization and management (6 credit-units)

Macroeconomics; financial instruments; accounting concepts and financial statements; cost and profit; economic evaluation. Management concepts, decision making processes, project management, leadership, management control, marketing.

SOFTWARE ENGINEERING

THE CURRICULUM

The curriculum shall comprise 186 credit-units of courses:

(a) Thirteen compulsory courses in the areas of software engineering and computing fundamentals (78 credit-units)

(b) Complementary studies courses comprising (36 credit-units):
  (i) English for computer science (3 credit-units)
  (ii) Professional and technical communication for computer science (3 credit-units)
  (iii) Practical Chinese language course for engineering students (3 credit-units)
  (iv) Engineering organization and management (3 credit-units)
  (v) Engineering and society (3 credit-units)
  (vi) Engineering economics and finance (3 credit-units)
  (vii) 18 credit-units of broadening courses, including at least one 3 credit-unit course in Humanities & Social Sciences Studies and at least one 3 credit-unit course in Culture and Value studies or an area of studies outside this degree curriculum as an elective.

(c) System integration project (6 credit-units)

(d) Software engineering project (12 credit-units)

(e) Eight CS/SE/related-area elective courses (48 credit-units)

(f) Workshop training (3 credit-units)

(g) Industrial training (3 credit-units)

To complete the curriculum, a candidate must pass all the courses listed under (a), (b)(i), (ii), (iii), (c), (d), (f) and (g), and a combination of other courses totalling at least 180 credit-units. In addition, a candidate must satisfy any other requirements as stipulated in the University or Faculty of Engineering regulations.

	Year 1 (60 credit-units)	Year 2 (60 + 3 credit-units)	Year 3 (60 + 3 credit-units)
I. Software Engineering	• Computer programming • Object-oriented programming • Software engineering process I: analysis and design (sub-total: 18 credit-units)	• System architecture and distributed computing • Software engineering process II: implementation, testing and maintenance (sub-total: 12 credit-units)	• Software quality and project management • Professionalism and ethics (sub-total: 12 credit-units)
II. Computing Fundamentals	• Foundations of computer science • Introduction to data structures and algorithms • Machine organization and assembly language programming • Engineering mathematics • (sub-total: 24 credit-units)	• Principles of operating systems • Principles of programming languages (sub-total: 12 credit-units)	

III. Complementary Studies	• English for computer science • Professional and technical communication for computer science • Practical Chinese language course for engineering students • Broadening courses (sub-total: 18 credit-units)	• Engineering organization and management • Engineering and society • Broadening course(s) (sub-total: 12 credit-units)	• Engineering economics and finance • Broadening course (sub-total: 6 credit-units)
Project		• System integration project (sub-total: 6 credit-units)	• Software engineering project (sub-total: 12 credit-units)
CS/SE/related-area Electives		• 3 courses (sub-total: 18 credit-units)	• 5 courses (sub-total: 30 credit-units)
Training		• Workshop Training [the summer following Year 1] (sub-total: 3 credit-units)	• Industrial Training [the summer following Year 2] (sub-total: 3 credit-units)

CSIS1xxx courses are level 1 courses assigned with a weight of 1, and CSIS0xxx courses are level 2 courses assigned with a weight of 2.

SYLLABUSES

FIRST YEAR

Area I: Software Engineering

CSIS1117. Computer programming (6 credit-units)

The goal of this course is for students to learn the general principles of programming, including how to design, implement, document, test, and debug programs.

CSIS1422. Object-oriented programming (6 credit-units)

Abstract data types and classes; object-oriented programming; software reusability; error reporting; introduction to Java; program development tools; version control; scripting languages. This course may not be taken with CSIS0396.

Prerequisite: CSIS1117

CSIS1401. Software engineering process I: analysis and design (6 credit-units)

This course introduces the software engineering process, and elaborates on software analysis and design. Topics in software process include: conventional software development phases; and modern software process models. Topics in analysis include: feasibility analysis and the system proposal; requirements discovery; information modelling and analysis; process modelling; and object-oriented analysis. Topics in design include: process design, input and output design, user-interface design, and object-oriented design.

Prerequisite: CSIS1117

Area II: Computing Fundamentals

CSIS1118. Foundations of computer science (6 credit-units)

Logic, sets, and functions; mathematical reasoning; counting techniques; relations; graphs; trees; modeling computation.

CSIS1119. Introduction to data structures and algorithms (6 credit-units)

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

Prerequisite: CSIS1117

CSIS1120. Machine organization and assembly language programming (6 credit-units)

Fundamentals of computer organization and machine architecture; number, character and instruction representations; addressing modes; assembly language programming including stack manipulation and subroutine linkage; basic logic design and integrated devices; the central processing unit and its control; concepts of microprogramming, data flow and control flow; I/O devices and their controllers, interrupts and memory organization; computer arithmetic.

CSIS1421. Engineering mathematics (6 credit-units)

Linear algebra, probability and statistics, multi-variable calculus, and ordinary differential equations.

Area III: Complementary Studies

ECEN1503. English for computer science (3 credit-units)

The focus is on developing confidence in the use of English in written and oral forms. Topics include: questioning skills, negotiating meaning, making effective grammatical and lexical choices, producing coherent writing and making confident oral presentations. Students engage in a substantial amount of project work.

ECEN1504. Professional and technical communication for computer science (3 credit-units)

The focus is on the understanding and use of spoken and written English for professional and technical communication. Topics include collecting, organizing and understanding information; presenting information in written and oral forms, technical report writing. Students work in groups to design and implement an investigative project related to their professional discipline.

CENG1001. Practical Chinese language course for engineering students (3 credit-units)

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; the language of legal documents: tenders and contracts; 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; Putonghua.

SECOND YEAR

Area I: Software Engineering

CSIS0402. System architecture and distributed computing (6 credit-units)

This course introduces the architecture of modern systems and the concepts and principles of distributed computing. Topics include: transaction processing, client-server computing, multi-tier architectures, middleware and messaging, component technology, and distributed object computing.

Pre/Co-requisite: CSIS0396 or CSIS1422

CSIS0403. Software engineering process II: implementation, testing and maintenance (6 credit-units)

This course examines the theory and practice of software implementation, testing and maintenance, and their place in modern software process. Topics in implementation include: detailed design issues and implementation strategies; coding style and standards; the review process; individual software process and metrics; code instrumentation; and reuse. Also examined are the implementation aspects of contemporary approaches such as generic programming, design patterns, and multi-paradigm development. 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/CSIS1422 and CSIS1401/CSIS0297

Area II: Computing Fundamentals

CSIS0230. Principles of operating systems (6 credit-units)

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, network structure, distributed systems, case studies.

Prerequisites: CSIS1117 and CSIS1120; or CSIS1117 and ELEC1622/ELEC1613

CSIS0259. Principles of programming languages (6 credit-units)

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: CSIS1118/CSIS1121, CSIS1119 and CSIS1120/ELEC1622/ELEC1613

Area III: Complementary Studies

ELEC2802. Engineering organization and management (3 credit-units)

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

ELEC2803. Engineering and society (3 credit-units)

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.

Project 1

CSIS0803. System integration project (6 credit-units)

This is a team project involving development and integration of software components. The objective is to put the concepts and theories covered in the preceding software engineering courses (CSIS1401, CSIS0402, CSIS0403) 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.

Summer Training 1

CSIS1411. Workshop training (3 credit-units)

THIRD YEAR

Area I: Software Engineering

CSIS0404. Software quality and project management (6 credit-units)

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.

Prerequisites: CSIS1401 or CSIS0297; and CSIS0403

CSIS0405. Professionalism and ethics (6 credit-units)

Topics include definitions of software engineering subject areas and professional activities; professional societies and ethics; professional competency and life-long training; uses, misuses and risks of software; information security and privacy; intellectual property and software law; software contract; social responsibilities; and software engineering standards.

Area III: Complementary Studies

ELEC2804. Engineering economics and finance (3 credit-units)

Macroeconomics; financial instruments; accounting concepts and financial statements; cost and profit; economic evaluation.

Project 2

CSIS0802. Software engineering project (12 credit-units)

This is a team project, to be taken by students in the final year, which requires substantial contribution from every individual team member. The project will go through the common process of requirements, analysis, design, implementation, testing, etc. Project standards will be enforced. This may not be taken with CSIS0801 Year Project.

Requirements for CS/SE/related-area electives:

Students are required to take a total of 8 elective courses in the computer science (CS), the software engineering (SE) and related areas, including at least 3 from SE area and at least 3 from CS area.

Software Engineering Area

CSIS0319. Object-oriented and formal development methods (6 credit-units)

To study the theory and practices in object-oriented methods and formal methods in software engineering. Topics include object-oriented analysis and design, formal specification and design, formal approaches to software testing, verification and reliability, integration of formal and informal methods.

Pre/Co-requisite: CSIS0297 or CSIS1401

CSIS0234. Computer and communication networks (6 credit-units)

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; examples of network protocols.

Prerequisite: CSIS0230

CSIS0278. Introduction to database management systems (6 credit-units)

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, security, integrity, concurrency control, and contemporary topics in database management systems. This course may not be taken with BUSI0052.

Prerequisites: CSIS1117 and CSIS1119; or ELEC1501

CSIS0406. Real-time and embedded systems (6 credit-units)

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

CSIS0407. Scientific computing (6 credit-units)

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 and CSIS1118

CSIS0201. Fundamentals of system performance modelling (6 credit-units)

Concepts of system modelling; review of basic probability; probability models, forecasting models, decision analysis, probabilistic inventory models; queuing systems, simulation modelling; Markovian decision process.

Prerequisite: CSIS1118

CSIS0408. Topics in software engineering (6 credit-units)

Advanced topics in software engineering that are of current interest.

Computer Science Area

- Level 2 and "Applications" courses (other than those in the Software Engineering area) offered by the CSIS Department.

Summer Training 2

CSIS1410. Industrial training (3 credit-units)

Computer Science/Software Engineering Related Areas

- **Level 3 courses from the Computer Engineering Programme**
- **Level 3 courses from the Information Engineering Programme**

In addition to the courses prescribed in the syllabuses, students in the Faculty of Engineering may apply to take the following additional courses outside their formal curriculum:

CENG1002. Putonghua course for students in the Faculty of Engineering (non-credit-unit bearing)

The course is divided into three parts: i) pronunciation; ii) the pinyin systems; and iii) texts: greetings, numbers, inquiry, time and appointments, asking for direction; shopping; making phone calls; at the bank; in the post office; and food and engineering terminology.

CENG1003. Advanced language studies in Chinese for engineering students (3 credit-units)

The course aims to help students to: (1) enhance their proficiency of the Chinese language and to improve their communication skills; (2) investigate the cultural, social and commercial conditions in Hong Kong, China and neighboring regions as reflected in the language; (3) address their needs in job hunting and career planning; (4) strengthen their language self-learning capacity. Main topics include: language, logical thinking and communication skills; language ability, job-hunting and career planning; design and propagation of Chinese websites in the engineering profession.
Assessment: 100% coursework

Prerequisite: CENG1001