REGULATIONS FOR THE DEGREE OF
BACHELOR OF ENGINEERING IN ENGINEERING SCIENCE
(BEng[EngSc])

These regulations apply to students admitted to the BEng in Engineering Science degree in the academic year 2012-13 and thereafter.

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

ES1   Admission to the Degree

To be eligible for admission to the Bachelor of Engineering in Engineering Science degree, a candidate shall

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

ES2   Period of Study

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

ES3   Curriculum Requirements

To complete the curriculum, a candidate shall

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

ES4   Candidates shall normally select not fewer than 24 and not more than 30 credits of courses in any one semester (except the summer semester), unless otherwise permitted or required by the Board of the Faculty, or except in the last semester of study when the number of credits required to satisfy the outstanding curriculum requirements is fewer than 24 credits. Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, and/or further credits during the summer semester, accumulating up to a maximum of 72 credits in one academic year. Candidates may, with the approval of the Board of the Faculty, exceed 72 credits in an academic year provided that the total number of credits taken shall not exceed 288 credits. Students making up for failed credits can be permitted by the Faculty to take up to 432 credits.

ES5   Candidates with unsatisfactory academic progress may be required by the Board of the Faculty to take a reduced study load.

ES6   **Selection of Courses**

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

ES7   **Assessment and Grades**

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

ES8   Written examinations or tests shall normally be held at the end of each semester unless otherwise specified in the syllabuses.

ES9   Candidates are required to make up for failed courses in the following manner:

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

ES10   Candidates shall not be permitted to repeat a course for which they have received a grade D or above for the purpose of upgrading.

ES11   There shall be no appeal against the results of examinations and all other forms of assessment.

ES12   Unless otherwise permitted by the Board of the Faculty, a candidate will be recommended for discontinuation of their studies if

(a)   he/she fails to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take 36 credits in the two given semesters;
(b)   he/she fails to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester); or
(c)   he/she has exceeded the maximum period of registration specified in ES2.

ES13   Absence from Examination

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

ES14   Advanced Standing

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

(a)   a minimum of three 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 180 credits shall be accumulated through study in this University, or from transfer of credits for courses completed at other institutions in accordance with UG4(d) of the Regulations for the First Degree Curricula.

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

ES15   Degree Classification

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

a)   satisfied all the requirements in the UG5 of the Regulations for First Degree Curricula;
b)   passed not fewer than 240 credits, comprising
    i)   introductory courses, including General Engineering Courses;
    ii)   advanced courses;
    iii)   capstone experience;
    iv)   a Chinese language enhancement course[1];
    v)   two English language enhancement courses, including Core University English[2] and English in the Discipline;
    vi)   Common Core Curriculum courses;
    vii)   all required courses as prescribed in respective syllabuses; and
    viii)   elective courses.

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[1]   Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG9001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

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

ES16   The degree of Bachelor of Engineering in Engineering Science shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours, and Pass. The classification of honours shall be determined by the Board of Examiners for the degree of BEng with the following Cumulative GPA (CGPA) scores, with all courses taken (including failed courses) carrying equal weighting:

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

ES17   Honours classification may not be determined solely on the basis of a candidate's Cumulative GPA and the Board of Examiners for the BEng degree may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Cumulative GPA falls below the range stipulated in ES16 of the higher classification by not more than 0.05 of a Grade Point.

ES18   A list of candidates who have successfully completed all degree requirements shall be posted on Faculty notice boards.

SYLLABUS FOR THE DEGREE OF
BACHELOR OF ENGINEERING IN ENGINEERING SCIENCE
(BEng[EngSc])

The syllabus applies to students admitted in the academic year 2012-13 and thereafter under the four-year curriculum.

Curriculum Structure

Candidates are required to complete not fewer than 240 credits in accordance with the regulations and syllabuses for the Bachelor of Engineering degree in Engineering Science. The curriculum structure of the Bachelor of Engineering degree in Engineering Science is as follows:

Course Categories	No. of credits
UG5 Requirements	
• English language enhancement courses	12
• Chinese language enhancement courses	6
• Common Core Curriculum Courses	36
Sub-total	*54*
Major option in Engineering Science	
• General Engineering Courses	18 to 24
• Discipline Introductory Courses	18 to 30
• Discipline Advanced Courses	12 to 30
• Capstone Experience	6
• Disciplinary Elective Courses	6 to 36
Sub-total	*96*
Elective Courses (including Disciplinary Elective Courses, Second Major/Minor option; Free Electives)	*90*
Total	**240**

Major Options

- Environmental Engineering
- Energy Engineering
- Materials Engineering
- Biomedical Engineering
- Computing & Data Analytics

Curriculum

The Curriculum comprises 240 credits of courses as follows:

General Engineering Courses
Students are required to complete 18 to 24 credits of General Engineering Course.

Discipline Core Courses
Students are required to complete ALL discipline core courses in accordance with the syllabuses of major option concerned (30 to 60 credits), comprising introductory core courses and advanced core courses.

Disciplinary Elective Courses
Students are required to complete 6 to 36 credits of disciplinary elective courses in accordance with the syllabuses of major option concerned.

Elective Courses
Students are required to complete at least 90 credits of elective course(s) offered by departments within or outside of the Faculty of Engineering.

University Requirements
Students are required to complete:
   a) 12 credits in English language enhancement, including 6 credits in "CAES1000 Core University English" and 6 credits in English-in-the-Discipline course of respective major option;
   b) 6 credits in Chinese language enhancement course "CENG9001 Practical Chinese for Engineering Students" and
   c) 36 credits of courses in the Common Core Curriculum, selecting not more than one course from the same Area of Inquiry within one academic year and at least one and no more than two courses from each Area of Inquiry during the whole period of study.

Capstone Experience
Students are required to complete the 6-credit capstone experience course of respective major option to fulfill the capstone experience requirement for the degree of BEng in Engineering Science.

Internship
Students may enroll in the 6-credit internship of respective departments as disciplinary elective course subject to the approval of the Programme Director. The internship normally takes place after their third year of study.

Degree Classification

The degree of Bachelor of Engineering shall be awarded in five divisions in accordance with ES16 of the Regulations for the Degree of Bachelor of Engineering in Engineering Science and UG9 of the Regulations for the First Degree Curricula.

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

The curriculum of BEng in Engineering Science degree comprises 240 credits of courses with the following structure:

A. Common Requirements for all major options in BEng in Engineering Science

   UG 5 Requirements (54 credits)

Course Code	Course	No. of credits
CAES1000	Core University English	6
CAES95##	English in the Discipline course*	6
CENG9001	Practical Chinese for Engineering Students	6
CC##XXXX	University Common Core Course (6 courses)**	36
Total for UG5 Requirements		54

*English in the Discipline course of respective major options of BEng in Engineering Science curriculum is as follows:

Course Code	Course Title	Major option of BEng(EngSc)	Year/Semester
CAES9530	Technical English for Mechanical and Building Services Engineering	BEng(EngSc) in Materials Engineering	Semester 2, Year 3
CAES9531	Technical English for Medical Engineering	BEng(EngSc) in Biomedical Engineering	Semester 1, Year 3
CAES9540	Technical English for Civil Engineering	BEng(EngSc) in Environmental Engineering	Semester 1, Year 4
CAES9541	Technical English for Electrical and Electronic Engineering	BEng(EngSc) in Energy Engineering	Semester 2, Year 4
CAES9542	Technical English for Computer Science	BEng(EngSc) in Computing & Data Analytics	Semester 1, Year 4

** Students can select not more than one course from each Area of Inquiry within one academic year and at least one but no more than two courses from each Area of Inquiry during the whole period of study.

B. Specific Requirements for Individual Major Option of BEng in Engineering Science degree

1. Environmental Engineering

Faculty General Engineering Courses (24 credits)

Course Code	Course Title	No. of credits
MATH1851	Calculus and Ordinary Differential Equations	6
MATH1853	Linear Algebra, Probability & Statistics	6
ENGG1111/ ENGG1112	Computer programming and applications/ Computer programming and applications I	6
PHYS1050	Physics for engineering students	6
Total for Faculty General Engineering Courses		**24**

Discipline Core Engineering Courses (30 credits)

Introductory Courses (18 credits)

Course Code	Course Title	No. of credits
CIVL1105	Environmental engineering	6
CIVL2103	Fluid mechanics	6
ENGG1201	Engineering for sustainable development	6
Total for Introductory Discipline Core Engineering Courses		**18**

Advanced Courses (12 credits)

Course Code	Course Title	No. of credits
CIVL2104	Hydraulics and hydrology	6
MECH2407	Multi-Variables Calculus & Partial Differential Equations	6
Total for Advanced Discipline Core Engineering Courses		**12**

Capstone Experience (6 credits)

Course Code	Course Title	No. of credits
CIVL4101	Capstone design project	6
Total for Capstone Experience		6

Disciplinary Elective Courses (36 credits)

Course Code	Course Title	No. of credits
CIME2101	Water & air quality: concepts & measurements	6
CIVL3106	Engineering hydraulics	6
CIVL3107	Environmental impact assessment of civil engineering projects	6
CIVL3111	Municipal and industrial wastewater treatment	6
CIVL3115	Solid and hazardous waste management	6
CIVL3121	Water Resources engineering	6
CIVL3122	Wind engineering	6
MECH3420	Air pollution control	6
MECH4426	Acoustics and noise control	6
Complete six disciplinary elective courses for a total of 36 credits		36

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside the Faculty of Engineering.

Note: Students can take Research Postgraduate courses as disciplinary elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Environmental Engineering)

Year	Language	Common Core	General Engineering/ Core/Capstone Experience	Disciplinary Electives	Elective Courses	Total
1	6	24	30	0	0	60
2	0	12	18	12	18	60
3	12	0	12	24	12	60
4	0	0	0	0	60	60
Total	**18**	**36**	**60**	**36**	**90**	**240**

2. Energy Engineering

Faculty General Engineering Courses (24 credits)

Course Code	Course Title	No. of credits
MATH1851	Calculus and Ordinary Differential Equations	6
MATH1853	Linear Algebra, Probability & Statistics	6
ENGG1111	Computer programming and applications	6
PHYS1050	Physics for engineering students	6
Total for Faculty General Engineering Courses		24

Discipline Core Engineering Courses (54 credits)

Introductory Courses (24 credits)

Course Code	Course Title	No. of credits
ENGG1203	Introduction to electrical and electronic engineering	6
ELEC2147	Electrical energy technology	6
ELEC2346	Electric and electronic circuits	6
ELEC2441	Computer organization and microprocessor	6
Total for Introductory Discipline Core Engineering Courses		24

Advanced Courses (30 credits)

Course Code	Course Title	No. of credits
ELEC3141	Power transmission and distribution	6
ELEC3142	Electrical energy conversion	6
ELEC3143	Power electronics	6
MECH2407	Multi-Variables Calculus & Partial Differential Equations	6
MECH3402	Engineering thermodynamics	6
Total for Advanced Discipline Core Engineering Courses		30

Capstone Experience (6 credits)

Course Code	Course Title	No. of credits
ELEC3848	Integrated design project	6
Total for Capstone Experience		6

Disciplinary Elective Courses (12 credits)

Course Code	Course Title	No. of credits
ELEC2242	Introduction to electromagnetic waves and fields	6
ELEC3241	Signal and linear systems	6
ELEC3844	Engineering management and society	6
ELEC4141	Electric railway systems	6
ELEC4142	Power system protection and switchgear	6
ELEC4144	Electric vehicle technology	6
ELEC4145	Building services – electrical services	6
ELEC4146	Building services – electrical installations	6
ELEC4147	Power system analysis and control	6
BBSE2401	Utility services	6
BBSE3408	Air conditioning and refrigeration engineering	6
MECH3418	Dynamics and control	6
MECH4409	Energy conversion systems	6
MECH4411	Heat transfer	6
MECH4423	Building energy management and control systems	6
Complete two disciplinary elective courses for a total of 12 credits		12

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside the Faculty of Engineering.

Note: Students can take Research Postgraduate courses as disciplinary elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Energy Engineering)

Year	Language	Common Core	General Engineering/ Core/Capstone Experience	Disciplinary Electives	Elective Courses	Total
1	6	24	30	0	0	60
2	0	12	24	0	24	60
3	12	0	30	12	6	60
4	0	0	0	0	60	60
Total	**18**	**36**	**84**	**12**	**90**	**240**

3. **Materials Engineering**

Faculty General Engineering Courses (24 credits)

Course Code	Course Title	No. of credits
MATH1851	Calculus and Ordinary Differential Equations	6
MATH1853	Linear Algebra, Probability & Statistics	6
ENGG1111/ ENGG1112	Computer programming and applications/ Computer programming and applications I	6
PHYS1050	Physics for engineering students	6
Total for Faculty General Engineering Courses		24

Discipline Core Engineering Courses (60 credits)

Introductory Courses (30 credits)

Course Code	Course Title	No. of credits
ENGG1205	Introduction to mechanical engineering	6
MECH2404	Drawing and elements of design and manufacture	6
MECH2413	Engineering Mechanics	6
MECH2419	Properties of Materials	6
ELEC2242	Introduction to Electromagnetic Waves and Field	6
Total for Introductory Discipline Core Engineering Courses		30

Advanced Courses (30 credits)

Course Code	Course Title	No. of credits
ELEC3347	Electronic Materials and Devices	6
ELEC4248	Optical Networking Devices and Technologies	6
MECH4414	Materials for Engineering Applications	6
MECH4466	Nanotechnology: Fundamentals and applications	6
MEDE3600	Biomaterials I	6
Total for Advanced Discipline Core Engineering Courses		30

Capstone Experience (6 credits)

Course Code	Course Title	No. of credits
MECH3421	Design	6
Total for Capstone Experience and Internship Courses		6

Disciplinary elective Courses (6 credits)

Course Code	Course Title	No. of credits
IMSE3106	Manufacturing technology	6
IMSE4129	Manufacturing system analysis and design	6
MECH3409	Mechanics of Solids	6
MECH3416	Fundamentals of Aeronautical Engineering	6
MECH4412	Product Design and Development	6
MECH4415	Applied Stress and Strength Analysis	6
MECH4467	Microsystems for energy, biomedical and consumer electronics applications	6
MEDE3502	Biomedical instrumentation and systems	6
Complete one disciplinary elective course for a total of 6 credits		6

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside the Faculty of Engineering.

Note: Students can take Research Postgraduate courses as disciplinary elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Materials Engineering)

Year	Language	Common Core	General Engineering/ Core/Capstone Experience	Disciplinary Electives	Elective Courses	Total
1	6	24	30	0	0	60
2	0	12	24	0	24	60
3	12	0	36	6	6	60
4	0	0	0	0	60	60
Total	**18**	**36**	**90**	**6**	**90**	**240**

4. Biomedical Engineering

Faculty General Engineering Courses (24 credits)

Course Code	Course Title	No. of credits
MATH1851	Calculus and Ordinary Differential Equations	6
MATH1853	Linear Algebra, Probability & Statistics	6
ENGG1111/ ENGG1112	Computer programming and applications/ Computer programming and applications I	6
PHYS1050	Physics for engineering students	6
Total for Faculty General Engineering Courses		24

Discipline Core Engineering Courses (42 credits)

Introductory Courses (30 credits)

Course Code	Course Title	No. of credits
ENGG1203	Introduction to electrical and electronic engineering	6
ENGG1205	Introduction to mechanical engineering	6
ENGG1206	Introduction to biomedical engineering	6
ENGG1207	Foundations of biochemistry for medical engineering	6
MEDE2301	Life sciences I (Biochemistry)	6
Total for Introductory Discipline Core Engineering Courses		30

Advanced Courses (12 credits)

Course Code	Course Title	No. of credits
MEDE2302	Life sciences II (Cell Biology & Physiology)	6
MEDE3301	Life sciences III (Physiology)	6
Total for Advanced Discipline Core Engineering Courses		12

Capstone Experience (6 credits)

Course Code	Course Title	No. of credits
MEDE3010	Integrated Project	6
Total for Capstone Experience		6

Disciplinary Elective Courses (24 credits)

Course Code	Course Title	No. of credits
MEDE3500	Electromagnetics in biomedicine	6
MEDE3501	Medical imaging	6
MEDE3502	Biomedical instrumentation and systems	6
MEDE3503	Biophotonics	6
MEDE3600	Biomaterials I	6
MEDE3602	Thermofluids for medical engineering	6
MEDE3605	Molecular and cellular biomechanics	6
MEDE3606	Transport phenomena in biological systems	6
MEDE3607	Cell and tissue engineering	6
ELEC4242	Robotics	6
Complete four disciplinary elective courses for a total of 24 credits		24

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside the Faculty of Engineering.
Note: Students can take Research Postgraduate courses as disciplinary elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Biomedical Engineering)

Year	Language	Common Core	General Engineering/ Core/Capstone Experience	Disciplinary Electives	Elective Courses	Total
1	6	18	36	0	0	60
2	0	18	24	0	18	60
3	12	0	12	24	12	60
4	0	0	0	0	60	60
Total	**18**	**36**	**72**	**24**	**90**	**240**

5. Computing & Data Analytics

Faculty General Engineering Courses (18 credits)

Course Code	Course Title	No. of credits
COMP2121	Discrete mathematics	6
ENGG1111	Computer programming and applications	6
MATH1013	University mathematics II*	6
Total for Faculty General Engineering Courses		18

Discipline Core Engineering Courses (54 credits)

Introductory Courses (24 credits)

Course Code	Course Title	No. of credits
COMP2119	Introduction to data structures and algorithms	6
COMP2123	Programming Technologies and Tools	6
STAT2601	Probability and statistics I	6
STAT2602	Probability and statistics II	6
Total for Introductory Discipline Core Engineering Courses		24

Advanced Courses (30 credits)

Course Code	Course Title	No. of credits
COMP3250	Design and analysis of algorithms	6
COMP3278	Introduction to database management systems	6
COMP3323	Advanced database systems	6
COMP3407	Scientific computing	6
STAT3600	Linear statistical analysis	6
Total for Advanced Discipline Core Engineering Courses		30

Capstone Experience (6 credits)

Course Code	Course Title	No. of credits
COMP4804	Computing and data analytics project	6
Total for Capstone Experience		6

Disciplinary Elective Courses (18 credits)

Course Code	Course Title	No. of credits
STAT3609	The statistics of investment risk	6
STAT3611	Computer-aided data analysis	6
STAT3612	Data mining	6
STAT3613	Marketing engineering	6
STAT3615	Practical mathematics for investment	6
STAT3618	Derivatives and risk management	6
STAT4601	Time series analysis	6
STAT4607	Credit risk analysis	6
STAT4608	Market risk analysis	6
Complete three disciplinary elective courses for a total of 18 credits		18

*Students can be waived for taking "MATH1013 University mathematics II" should they completed "MATH1851 Calculus and Ordinary Differential Equations" and "MATH1853 Linear Algebra, Probability & Statistics".

Pre-requisite for "MATH1013 University mathematics II":
- Level 2 or above in HKDSE Mathematics plus Extended Module 1; or
- Level 2 or above in HKDSE Mathematics plus Extended Module 2; or
- Completed "MATH1011 University mathematics I"

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside the Faculty of Engineering.

Note: Students can take Research Postgraduate courses as disciplinary elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Computing and data analytics)

Year	Language	Common Core	General Engineering/ Core/Capstone Experience	Disciplinary Electives	Elective Courses	Total
1	6	24	30	0	0	60
2	0	12	12	0	36	60
3	6	0	30	18	6	60
4	6	0	6	0	48	60
Total	**18**	**36**	**78**	**18**	**90**	**240**

Programme Structure of BEng in Engineering Science - Reference

Major Option/ Course Type	General Engineering	Introductory Course	Advanced Course	Capstone Experience	Disciplinary Electives	Total
Environmental Engineering	24	18	12	6	36	96
Energy Engineering	24	24	30	6	12	96
Materials Engineering	24	30	30	6	6	96
Biomedical Engineering	24	30	12	6	24	96
Computing & Data Analytics	18	24	30	6	18	96

COURSE DESCRIPTIONS

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

Faculty General Engineering Courses

ENGG1111	Computer programming (6 credits) or
ENGG1112	Computer programming I (6 credits)
MATH1851	Calculus and Ordinary Differential Equations (6 credits)
MATH1853	Linear Algebra, Probability & Statistics (6 credits)
PHYS1050	Physics for engineering students (6 credits)
ENGG1201	Engineering for sustainable development (6 credits)
ENGG1202	Foundation of computer science (6 credits)
ENGG1203	Introduction to electrical and electronic engineering (6 credits)
ENGG1205	Introduction to mechanical engineering (6 credits)
ENGG1206	Introduction to biomedical engineering (6 credits)
ENGG1207	Foundations of biochemistry for medical engineering (6 credits)

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

ENGG1111   Computer programming and applications (6 credits)

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

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

Assessment: 50% continuous assessment, 50% examination

ENGG1112   Computer programming and applications I (6 credits)

This course covers both the basic and advanced features of the C/C++ programming languages, including syntax, identifiers, data types, control statements, functions, arrays, file access, objects and classes, class string, structures and pointers. It introduces programming techniques such as recursion, linked lists and dynamic data structures. The concept and skills of program design, implementation and debugging, with emphasis on problem-solving, will also be covered.
Target students are those who wish to complete the programming course in a slower pace covering 2 semesters.

Assessment: 50% continuous assessment, 50% examination

MATH1851   Calculus and ordinary differential equations (6 credits)

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

Assessment: 20% continuous assessment, 80% examination

MATH1853   Linear algebra, probability and statistics (6 credits)

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

Assessment: 20% continuous assessment, 80% examination

PHYS1050   Physics for Engineering Students (6 credits)

Units and Dimensional Analysis, Motion of a Particle in One and Two Dimensions, Newton's Laws of Motion, Friction, Curvilinear and Circular Motion on a Plane, Force, Impulse and Momentum, Force Polygon and Static Equilibrium, Work and Energy, System of Particles, Moment of Inertia and Rotation of a Rigid Body, Simple Harmonic Motion and Pendulum;

Electrostatic Fields and Potential, Gauss's Law, DC circuits, Magnetic field due to Moving Charges, Force on a Moving Charge in Magnetic Field, Biot-Savart law, Ampere's law, Electromagnetic Induction, Faraday's Law, Eddy Currents, AC circuits, Phases in Capacitive and Inductive Circuits, Power, DC and AC Generators, Transformer.

Assessment: 50% continuous assessment, 50% examination

ENGG1201   Engineering for sustainable development (6 credits)

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

Assessment: 50% continuous assessment, 50% examination

ENGG1202   Introduction to computer science (6 credits)

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

Assessment: 100% continuous assessment

ENGG1203   Introduction to electrical and electronic engineering (6 credits)

This course provides an overview of the general field of electrical and electronic engineering and its role in the modern world. The function of different electronic engineering disciplines in modern electronic system designs will be introduced, including signal processing, system-level design, digital logic design, circuits design, as well as electronic devices design. The role of electrical systems and their impact on the environment will also be discussed. Finally, the socio-economical impact of electrical and electronic technologies will be introduced.

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

ENGG1205   Introduction to mechanical engineering (6 credits)

The course aims to provide students with a comprehensive knowledge in the nature of mechanical engineering by studying important applications including modeling of mechanical systems, working principles of robots, mechanics and propulsion of aircrafts, strong materials. Students will be required to complete hands-on projects.

Assessment: 30% continuous assessment, 70% examination

ENGG1206   Introduction to biomedical engineering (6 credits)

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

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

ENGG1207   Foundations of biochemistry for medical engineering (6 credits)

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

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

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

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

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

Assessment: 70% continuous assessment, 30% examination

University Language Enhancement Courses

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

CAES1000   Core University English
CAES95##   English in the Discipline course for respective BEng curriculum and BEng(EngSc) major option
CENG9001   Practical Chinese for engineering students

COURSE DESCRIPTIONS

CAES1000   Core University English (6 credits)

The Core University English (CUE) aims to enhance first-year students' academic English language proficiency in the university context. CUE focuses on developing students' academic English language skills for the Common Core Curriculum. These include the language skills needed to understand and produce spoken and written academic texts, express academic ideas and concepts clearly and in a well-structured manner and search for and use academic sources of information in their writing and speaking. Students will also complete four online-learning modules through the Moodle platform on academic

grammar, academic vocabulary, citation and referencing skills and understanding and avoiding plagiarism. This course will help students to participate more effectively in their first-year university studies in English, thereby enriching their first-year experience.

Assessment: 60% continuous assessment, 40% examination

CAES9530   Technical English for Mechanical and Building Services Engineering (6 credits)

This 6-credit English-in-the-Discipline course will introduce ME and BSE students to professional and technical communication in the context of technical project report writing and oral presentation. The course will provide an intensive English environment and engage students in activities which help them prepare for the completion of the assessments required by the design project. Assessment is wholly by coursework.

Assessment: 100% continuous assessment

CAES9531   Technical English for Medical Engineering (6 credits)

This English in the Discipline course aims to develop Medical Engineering students' ability to write and speak in their discipline. The course will focus on developing students' ability to write a technical report and give a technical presentation on a medical device they have developed. The English course will run alongside the project course, which requires students to develop a portable electrocardiogram (ECG) recording device from scratch, use the device to gain data, and use the obtained data to explain aspects of human physiology. The students then need to write a report and give a presentation which explains a mixture of medical and engineering information. This English course will focus on the English language skills needed to complete these assignments. Students will be assessed using the report and the presentation they produce for the project course as well as a final written test and an out of class learning component.

Assessment: 100% continuous assessment

CAES9540   Technical English for Civil Engineering (6 credits)

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

Assessment: 100% continuous assessment

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

Running alongside Final Year Project, this one semester, 6-credit course will build and consolidate final year CS students' ability to compose technical reports, and make technical oral presentations. The focus

of this course is on helping students to report on the progress of their Final Year Project in an effective, professional manner in both written and oral communication. Topics include accessing, abstracting, analyzing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; and technical presentations. Assessment is wholly by coursework.

Assessment: 100% continuous assessment

CAES9542   Technical English for Computer Science (6 credits)

Running alongside CSIS0801 Final Year Project, this one-semester, 6-credit course will build and consolidate final year CS students' ability to compose technical reports, and make technical oral presentations. The focus of this course is on helping students to report on the progress of their Final Year Project in an effective, professional manner in both written and oral communication. Topics include accessing, abstracting, analyzing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; and technical presentations. Assessment is wholly by coursework.

Assessment: 100% continuous assessment

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

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

Assessment: 50% continuous assessment, 50% examination

Discipline Core/Disciplinary Elective Courses

BBSE2401   Utility services (6 credits)

Characteristics and design of different utility service installations, cold, hot and flushing water supply systems, steam supply, sanitary and storm water drainage systems, vertical transportation system, communication systems, security and alarm.

Assessment: 15% practical work; 20% continuous assessment; 65% Examination.

BBSE3408   Air conditioning and refrigeration engineering (6 credits)

Air conditioning systems, psychrometry, thermal comfort, load and energy calculations, air-side systems, fan design and other major components, air duct design, space air diffusion, water-side systems, piping system design, pump design and operation, indoor air quality, mechanical and natural ventilation,

ventilation efficiency, refrigerants and refrigeration systems, refrigeration cycles and principles, design of refrigeration systems, refrigeration system components and performance.

Assessment: 15% practical work; 20% continuous assessment; 65% Examination.

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

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

Prerequisite: CIVL1105 Environmental engineering
Assessment: 10% practical work, 10% continuous assessment, 80% examination

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CIVL1105   Environmental engineering (6 credits)

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

Assessment: 20% practical work, 80% examination

CIVL2103   Fluid mechanics (6 credits)

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

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

Assessment: 30% continuous assessment, 70% examination

CIVL2104   Hydraulics and hydrology (6 credits)

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

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

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CIVL3106   Engineering hydraulics (6 credits)

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

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

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

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

Prerequisite: CIVL2104 Hydraulics and hydrology
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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

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

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

CIVL3111   Municipal and industrial wastewater treatment (6 credits)

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

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

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

CIVL3115   Solid and hazardous waste management (6 credits)

Human activities generate solid waste materials that are often discarded because they are considered useless. However, the disposal of these unwanted waste materials has created a heavy burden to our environment and sometimes even threatened the human health due to its hazardous properties. Waste management has become one of the most significant problems of our time because the current ways of life in Hong Kong and in many areas of the world produce enormous amounts of waste, and most people want to preserve their lifestyle, while also protecting the environment and public health. Furthermore, if managed properly, many of these waste materials can be reused or recovered for becoming a resource for industrial production or energy generation. This course is an introduction to the key managing concepts and processing technologies of solid waste. It aims to train future engineers capable of conducting solid waste project planning for industries, businesses, communities and governmental sectors. The discussion of context will stem from solid waste materials generated from municipal sources, and then include selected examples from industrial sources and/or of hazardous properties with local relevance. After the training provided by this course, students are expected to be capable of using different planning tools to manage the reduction of solid waste generation, the reuse and recovery of waste materials, or the safe and economical disposal strategies.

Assessment: 30% continuous assessment, 70% examination

CIVL3121   Water resources engineering (6 credits)

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

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

Prerequisite: CIVL1105 Environmental engineering and CIVL2103 fluid mechanics
Assessment: 20% practical work, 80% examination

CIVL3122   Wind engineering (6 credits)

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

The course provides students with the basic scientific knowledge of the engineering description of wind and the engineering phenomena of wind flow around bluff bodies, buildings, bridges and civil engineering structures. The basics of flow-structure interaction and wind-induced vibration of structures are also presented. The course then continues to describe the format and features of a wind loading code

and how the code should be interpreted with the knowledge of wind engineering. The course also introduces the effects of wind on pedestrian comfort and pollutant dispersion.

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

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CIVL4101   Capstone Design Project (6 credits)

All modern engineering projects require substantial design and communication skills from engineers. With the demand for quality infrastructural projects, many professional engineers are required to participate in interdisciplinary teams throughout various project stages. Therefore this course aims to train future civil engineers to handle civil engineering projects through synergetic teamwork within a multi-disciplinary working environment. The course will start by introducing the importance of engineering design and communication skills, and then will equip students with the general knowledge of project design across different disciplines by a series of guest lectures. Student will be divided into small project groups. Each group will be allocated a real-life project and supervised by one of the departmental teaching staff (staff tutor) and an industrial tutor. The students will work closely with their staff tutor and industrial tutor throughout the project period, together with the specific technical advisors, to carry out feasibility study, preliminary design and detail design of their project. The project will be assessed by a series of oral presentations and written reports from the project team.

Assessment: 100% continuous assessment

COMP2119   Introduction to data structures and algorithms (6 credits)

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

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

COMP2121   Discrete mathematics (6 credits)

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

Assessment: 50% continuous assessment, 50% examination

COMP2123   Programming technologies and tools (6 credits)

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

Prerequisite: CSIS1117 or COMP1117 or ENGG1002 or ENGG1111 or ENGG1112
Assessment: 50% continuous assessment, 50% examination

COMP3250   Design and analysis of algorithms (6 credits)

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

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

COMP3278   Introduction to database management systems (6 credits)

This course studies the principles, design, administration, and implementation of database management systems. Topics include: entity-relationship model, relational model, relational algebra, database design and normalization, database query languages, indexing schemes, integrity and concurrency control. This course may not be taken with BUSI0052.

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

COMP3323   Advanced database systems (6 credits)

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

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

COMP3407   Scientific computing (6 credits)

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

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

COMP4804   Computing and Data Analytics Project (6-credits)

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

Assessment: 100% continuous assessment

ELEC2147   Electrical energy technology (6 credits)

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

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

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

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

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ELEC2242   Introduction to electromagnetic waves and fields (6 credits)

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

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

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

ELEC2346   Electric and electronic circuits (6 credits)

The aim of this course is to provide students with a basic understanding of simple electric and electronic circuits.

Mutually exclusive with: ENGG1008, ELEC1306
Assessment: 20% practical work, 20% continuous assessment, 60% examination

ELEC2441   Computer organization and microprocessors (6 credits)

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

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

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

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ELEC3141   Power transmission and distribution (6 credits)

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

Specifically, the course covers the following topics:
- Power transmission systems
- Transmission line model
- Power distribution systems
- Distribution overhead lines and underground cables
- Various issues in distribution systems

Co-requisite: ELEC2147 Electrical energy technology
Mutually exclusive with: ELEC2101
Assessment: 10% practical work, 90% examination

ELEC3142   Electric energy conversion (6 credits)

This course aims at providing sound understanding of various electrical energy conversion devices and systems. The emphasis is on four kinds of electrical energy conversion – electromechanical motion, electric heating, electric lighting and electrochemistry.
Specifically, the course covers the following topics: electric machines including DC machines, synchronous machines, induction machines and special machines; electric heating including resistive heating, induction heating and dielectric heating; electric lighting including incandescent lighting, discharge lighting and LED lighting; electrochemical sources including batteries and ultracapacitors.

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

ELEC3143   Power electronics (6 credits)

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

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

Mutually exclusive with: ELEC2103

Assessment: 20% continuous assessment, 80% examination

ELEC3241   Signals and linear systems (6 credits)

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

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

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

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

Mutually exclusive with: ELEC2201

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

ELEC3347   Electronic materials and devices (6 credits)

The aim of this course is to provide students with an understanding of (i) the properties of materials and their applications from the microscopic point of view and (ii) the principles underlying the operation of semiconductor devices.

Pre-requisite: ELEC3346 Electronic devices and circuits
Mutually exclusive with: ELEC2305
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC3844   Engineering management and society (6 credits)

The aims of ELEC3844 Engineering Management and Society are to develop basic understanding of organization and management skills, professional ethics and legal foundation for the engineering discipline. Topics on engineering organization, project management and managerial skills, decision making processes, contingency and crisis management, leadership, corporate culture and philanthropy will be discussed. In order to provide a clear and right insight for engineering students to interact and contribute to the society, topics related to professional conduct, social responsibility, sustainability and safety issues, technology and environment, professional ethics are included. For the legal foundation, topics such as contract, intellectual property, tort, professional negligence and related law issues are discussed.

Mutually exclusive with: ELEC2814
Assessment: 50% continuous assessment, 50% examination

ELEC3848   Integrated design project (6 credits)

This course aims at providing students in small teams an opportunity to apply and integrate their knowledge in electrical and electronic engineering courses, as well as project management, to implement a practical system. At the beginning of the course, students are guided to acquire skills in using hardware and software development tools through a sequence of laboratory exercises. Students then begin working on the project. Regular lecture and tutorial sessions are conducted to help students throughout the process. Besides implementing the system to the required project specification, students are encouraged to extend the project with their own inputs.

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

ELEC4141   Electric railway systems (6 credits)

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

At the end of this course, students who fulfill the requirements of this course will be able to:
- describe and understand the construction and functions of electrical installations and the prerequisites that apply in the operation of installations;
- explain different electrical installations that are parts of the operation of electric railway traffic with respect to both function and the essential connections with the parts of the installation;
- understand the basic concepts of power supply systems for railways;
- understand the rolling-stocks, traction systems and supporting systems of electric railway systems;
- understand the automatic train operation, control, and protection systems;
- have a general grasp on the basic concepts of magnetic levitation systems;
- demonstrate knowledge, understanding of high-speed rail networks and railway engineering management, health and safety.

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

ELEC4142   Power system protection and switchgear (6 credits)

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

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

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

Pre-requisite: ELEC3141 Power transmission and distribution
Mutually exclusive with: ELEC3112
Assessment: 10% practical work, 90% examination

ELEC4144   Electric vehicle technology (6 credits)

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

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

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

ELEC4145 Building services- electrical services (6 credits)

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

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

- describe and understand the construction and functions of building services installation for building to operate;
- explain different building services installation forming part of a building and its connection between each others;
- understand the lighting installation;
- understand the vertical transportation system;
- understand the plumbing and drainage systems;
- understand the fire services system;
- understand the heating, ventilation and air-conditioning system;
- understand the building automation system.

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

ELEC4146 Building services- electrical installations (6 credits)

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

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

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

- design schematically a safe electrical installation for a typical high-rise building;
- analyse data and carry out relevant calculations in respect of aforementioned aims;
- demonstrate knowledge, problem solving skill, and relevant management for health and safety.

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

ELEC4147   Power system analysis and control (6 credits)

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

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

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

Pre-requisite: ELEC3141 Power transmission and distribution
Mutually exclusive with: ELEC3107
Assessment: 10% continuous assessment, 90% examination

ELEC4242   Robotics (6 credits)

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

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

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

Pre-requisite: ELEC3245 Control and instrumentation
Mutually exclusive with: ELEC3222
Assessment: 20% continuous assessment, 80% examination

ELEC4248   Optical networking devices and technologies (6 credits)

The course aims at providing detailed understanding about the optical networks. Students will learn optical components for building optical networks such as optical waveguides, fibers, variety of light sources, passive and active components, wavelength division multiplixer, transmitters and receivers. Students will gain the knowledge in the operation principles and the applications of optical components. With the knowledge, the requirement and knowhow to build the network from optical components are discussed. Some commercial devices and demons units are also discussed for gaining the practical knowledge.

Pre-requisite: ELEC3247 Engineering electromagnetism
Mutually exclusive with: ELEC3223
Assessment: 20% continuous assessment, 80% examination

IMSE3106   Manufacturing technology (6 credits)

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

Assessment: 25% continuous assessment, 75% examination

IMSE4129   Manufacturing system analysis and design (6 credits)

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

Prerequisite: IMSE3108 Operational research techniques I
Assessment: 30% continuous assessment, 70% examination

MATH1013   University mathematics II (6 credits)

This course aims at students with Core Mathematics plus Module 1 or Core Mathematics plus Module 2 background and provides them with basic knowledge of calculus and some linear algebra that can be applied in various disciplines.

Assessment: 50% continuous assessment; 50% examination

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

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

Assessment: 100% continuous assessment.

MECH2407   Multi-Variables Calculus & Partial Differential Equations (6 credits)

This course aims to further develop the foundation of mathematics used in engineering discipline. Students will be explored to Fourier series representations, multivariable functions, vector analysis and elementary partial differential equations. Through the development of solution methods, students will enrich their experience in critical analysis and problem solving.

Assessment: 20% continuous assessment, 80% examination

MECH2413   Engineering Mechanics (6 credits)

Stress and strain; bending of beams; deflection of beams; thin-walled pressure vessels; kinematics of particles with different forms of acceleration; mechanisms; simple and epicyclic gear trains; momentum and energy conservation, application of kinetic principles to particles and vehicles with mass variation, velocity-dependent resistance and the action of central forces; undamped and damped free vibration.

Assessment: 10% practical work; 10% continuous assessment; 80% examination.

MECH2419   Properties of materials (6 credits)

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

Assessment: 10% practical work; 10% continuous assessment; 80% examination.

MECH3402   Engineering thermodynamics (6 credits)

Steam and gas power plants; refrigeration; jet propulsion; gas mixture; psychrometry and air-conditioning; introduction to heat transfer and combustion.

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

MECH3409   Mechanics of solids

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

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

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MECH3416   Fundamentals of aeronautical engineering

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

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

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MECH3418   Dynamics and control

Advanced rotational motion; balancing of rotating and reciprocating masses; forced vibration of single degree of freedom systems; vibration measurement, isolation and control; torsional vibration of multi-rotor systems; free transverse vibration of shafts; modelling of physical systems; time response analysis of dynamical systems; feedback control systems; control system design and applications; stability; root locus method.

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

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MECH3420   Air pollution control

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

Assessment: 20% continuous assessment; 80% examination

MECH3421   Design

Students undertake a group design project under supervision from September to April of the following year. Project topics are stipulated by industrial sponsors.

Assessment: 100% practical work

MECH4409　Energy conversion systems

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

Assessment: 30% continuous assessment, 70% examination

MECH4411　Heat transfer

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

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

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MECH4412　Product design and development

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

Assessment: 40% continuous assessment; 60% examination

MECH4414　Materials for engineering applications

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

Assessment: 15% continuous assessment; 85% examination

MECH4415　Applied stress and strength analysis

Theory of elasticity, plastic analysis, finite element methods for two- and three-dimensional continua; rectangular plate bending; fracture mechanics.

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

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MECH4423　Building energy management and control systems

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

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

MECH4426   Acoustics and noise control

Human hearing; sound measurement and environmental noise legislation; wave equation, sound radiation by piston and aeroacoustic source mechanisms; sound propagation and reflection in ducts; duct modes; sound absorption mechanisms; sound reverberation in rooms and transmission through walls; physics of active noise control; introduction to vibration isolation.

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

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MECH4466   Nanotechnology: fundamentals and applications

Characteristic length scales, nanomaterials, nanostructures, physical properties of nanostructures, deposition techniques of nanofabrication, micro/nanolithography, high resolution analysis and characterization, scanning probe methods, nanoindentation, mechanical behaviours of bulk nanostructured materials, processing techniques for bulk nanostructured materials, ultrahigh strength of nanostructures, bio-nanotechnology, energy storage, energy conversion, nanophotonics, plasmonics, optical metamaterial

Assessment: 10% continuous assessment; 90% examination

MECH4467   Microsystem for energy, biomedical and consumer electronics applications

MEMS and microsystem products, microsensors, microactuators, microfluidic devices, multidisciplinary nature of microsystem design and manufacture, fluid mechanics in microscaled flows, materials for MEMS and microfluidic devices, Fluid mechanics in microscaled flows, fabrication techniques of MEMS and microfluidic devices, flow characterization techniques, flow control with microfluidics, microfluidics for life sciences and chemistry.

Assessment: 10% continuous assessment; 90% examination

MEDE2301   Life sciences I (Biochemistry) (6 credits)

This course presents an overview and an understanding of the basic mechanisms underlying life processes. Topics include chemistry of life – pH, water, etc; fundamental bioenergetics; biomolecules and their functions; intermediary metabolism; enzymes and coenzymes; nucleic acids and genetic information.

Assessment: 30% continuous assessment, 70% examination

MEDE2302   Life sciences II (Cell Biology & Physiology) (6 credits)

This course aims to provide a basic understand of the structure and function of cells and tissues within our body, including the structures and functions of the cell; the general organisation of epithelium and glands; the different types and functions of the connective tissues; the general organisation of the nervous tissues, muscle and skin tissues, bone marrow and lymphatic tissues. The second part of the course will provide the students with integrated knowledge of human physiology and pathophysiology that is relevant to medical engineering in such areas as organization of the body, homeostasis and excitable tissues; the

cardiovascular system; the renal system, and some common disorders of the cardiovascular and renal systems.

Assessment: 20% continuous assessment, 80% examination

MEDE3010   Integrated project (6 credits)

This project is broadly centered around the topic of biomedical circuits. Its overall aim is to provide biomedical or electronic engineering students with a hands-on opportunity to develop an electrocardiogram (ECG) amplifier circuit from scratch and thereby learn more about the technical details of bio-potential measurement devices. Upon completing this course, the student should be able to explain to others the practical importance and technical details of amplifier circuits used for ECG potential measurements; to develop an ECG amplifier on a breadboard as well as a standalone package using basic electronic parts such as op-amp chips, resistors, and capacitors. Understand how proper design of circuits can play an important role in measuring bio-potentials and assist in medical diagnoses accordingly.

Assessment: 100% practical work

MEDE3301   Life sciences III (Physiology) (6 credits)

To provide the students with integrated knowledge of human physiology and pathophysiology that is relevant to medical engineering in such areas as (1) blood, blood clotting and immune response, (2) breathing and gas transport, (3) generation and transmission of nerve impulses, muscle contraction, bone, (4) the brain and its functions, autonomic system and reflexes, and (5) some disorders of the above.

Assessment: 30% continuous assessment, 70% examination

MEDE3500   Electromagnetics in biomedicine (6 credits)

The aim of this course is two-folded. First, fundamental physics and mathematics in electricity and magnetism are discussed. Vector analysis is included. Topics on electricity include electric field, Gauss's law, divergence theorem, electric potential, capacitor, dielectrics, Poisson's and Laplace's equations, and work and electrostatic energy. Topics on magnetism include magnetic field, Ampere's circuital law, Stokes theorem, magnetic flux, magnetic materials, and Faraday's law. Finally, Maxwell equations and transmission lines are explained. Second, emphasis is placed on the biological aspects of electromagnetism. Sections on biomedical applications of electromagnetism cover the biomedical instrument – linear accelerator (cyclotron, proton treatment facility). Sections on bioelectromagnetism and bioelectromagnetics cover electromagnetic fields generated by biological systems and the biological interaction with electromagnetic fields.

Assessment: 20% continuous assessment, 80% examination

MEDE3501   Medical imaging (6 credits)

Medical imaging is an indispensible technology in modern healthcare and biomedical research. It provides in vivo anatomical, physiological and functional information of the human body in normal,

developing and pathological states. The rapid development in this field not only leads to better disease diagnosis and more accurate treatment efficacy assessment, but also paves the way for better understanding of living biological systems.

This course will focus mainly on the principles of conventional (X-ray and Ultrasound) and modern (Computerized Tomography – CT; Magnetic Resonance Imaging – MRI; Nuclear Imaging and Optical Imaging) imaging techniques applied to biological systems and in medical diagnoses and the interpretations of these images.

At the end of the course, students should gain a clear understanding in the physics, working principles and mathematics involved in the various imaging modalities covered. They should also be able to appreciate the interdisciplinary nature of the subject and learn the latest development or advancement in the field of medical imaging.

Pre-requisites: MEDE2201 or MEDE2203 or MEDE2500 or ELEC3241
Assessment: 25% continuous assessment, 75% examination

MEDE3502   Biomedical instrumentation and systems (6 credits)

This course introduces the essential principles of biomedical instrumentation and systems used for both diagnostic and therapeutic purposes from the level of human body, organs, cells, down to the molecular level. Their applications encompass a wide range of areas, ranging from healthcare, clinical applications to basic life science research. Examples include ECG, EEG; blood pressure sensors; DNA microarray; flow cytometry, cardiac pacemakers, defibrillators and laser surgery.

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

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MEDE3503   Biophotonics (6 credits)

This is an introductory course in biophotonics covering: (1) The essential concepts of (i) basic ray optics, (ii) wave optics, e.g. interference and diffraction, and (iii) photon optics, e.g. laser principles. (2) Interaction of light with biological cells/tissues and its significances and implications in optical bioimaging and other optical diagnostic and therapeutic applications. (3) State-of-the-art biophotonic instrumentations and technologies: optical bioimaging and microscopy (optical coherence tomography (OCT), fluorescence microscopy, multiphoton and other nonlinear optical microscopy), lab-on-chip biosenors, laser therapy, optical-fiber-based micro-endoscopy.

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

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MEDE3600   Biomaterials I (6 credits)

Bonds and crystal structure; defects in crystalline solids; diffusion; solidification; phase diagram; strength of materials; plastic deformation; recrystallization; grain growth; fracture of materials; fatigue life and fatigue crack growth; creep; corrosion; structure and properties of polymers; analytical and testing techniques; definitions in biomaterials science and engineering; history of biomaterials; structure and properties of biological materials; materials in biomedical applications.

Assessment: 15% practical work, 85% examination

MEDE3600   Biomaterials I (6 credits)

Bonds and crystal structure; defects in crystalline solids; diffusion; solidification; phase diagram; strength of materials; plastic deformation; recrystallization; grain growth; fracture of materials; fatigue life and fatigue crack growth; creep; corrosion; structure and properties of polymers; analytical and testing techniques; definitions in biomaterials science and engineering; history of biomaterials; structure and properties of biological materials; materials in biomedical applications.

Assessment: 15% practical work, 85% examination

MEDE3602   Thermofluids for medical engineering (6 credits)

Concepts and definitions in engineering thermodynamics; thermodynamic properties; first law of thermodynamics; basic concepts in fluid mechanics for medical engineering; dimensional analysis and similarity; introduction to mass transport; introduction to diffusion.

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

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MEDE3605   Molecular and cellular biomechanics (6 credits)

The focus of this course is on the physics of molecular biology and the mechanics of the cell. Topics include: (1) Biopolymer (actin filaments, microtubules, DNA etc.) conformations and dynamics (random walk model of polymers, worm-like chain model, persistence length, entropic driven elasticity); (2) Basic statistical mechanics and thermodynamics of solutions (entropy of mixing, Osmotic pressure); (3) Mechanics of the cell (membrane elasticity, cell shape, cell adhesion); and (4) Introduction to intermolecular interactions (electrostatic force, van der Waals force).

Assessment: 40% continuous assessment, 60% examination

MEDE3606   Transport phenomena in biological systems (6 credits)

Basic equations of fluid mechanics; fluid flow in the circulation and tissues; transport in porous media; mass transport in biological systems; kinetics; heat conduction; heat convection; heat exchangers.

Pre-requisites: MEDE2005 or MEDE3602
Assessment: 20% continuous assessment, 80% examination

MEDE3607   Cell and tissue engineering (6 credits)

This course firstly introduces the nature on cell and tissue organization, tissue dynamic processes including development, homeostatis and wound healing. Second, it reviews in detail the basic components of engineered tissues including cells, scaffolds and signals. For cells, important cellular-fate processes such as attachment, migration, proliferation, differentiation and apoptosis, and the cell culture technology will be reviewed before focusing on stem cells and their relevance in tissue engineering. For scaffolds, the analogous role of scaffolds and extracellular matrix of native tissues will be compared and the technological advancement in scaffold design and fabrication will be highlighted. On signals, different

types of cell-regulating signals including soluble biofactors, insoluble matrix factors and cell-cell interactions and biophysical signals such as topological and mechanical signals will be introduced before an integrative summary on the application of these signals in designing stem cell niche can be made. Apart from employing these signals extrinsically, direct genetic manipulation of cells can also achieve the purpose of modifying cellular functions. The basic understanding and technological achievement of gene transfer and delivery and its applications in tissue engineering will be covered.

Assessment: 20% practical work, 80% examination

STAT2601   Probability and statistics I (6 credits)

The discipline of statistics is concerned with situations in which uncertainty and variability play an essential role and forms an important descriptive and analytical tool in many practical problems. Against a background of motivating problems this course develops relevant probability models for the description of such uncertainty and variability.

Assessment: 25% continuous assessment, 75% examination

STAT2602   Probability and statistics II (6 credits)

This course builds on STAT2601, introducing further the concepts and methods of statistics. Emphasis is on the two major areas of statistical analysis: estimation and hypothesis testing. Through the disciplines of statistical modelling, inference and decision making, students will be equipped with both quantitative skills and qualitative perceptions essential for making rigorous statistical analysis of real-life data.

Assessment: 25% continuous assessment, 75% examination

STAT3600   Linear statistical analysis (6 credits)

The analysis of variability is mainly concerned with locating the sources of the variability. Many statistical techniques investigate these sources through the use of 'linear' models. This course presents the theory and practice of these models.

Assessment: 25% continuous assessment, 75% examination

STAT3609   The statistics of investment risk (6 credits)

Most investments involve some risk. The decision to invest or not is usually made against a background of uncertainty. Whilst prediction of the future is difficult, there are statistical modelling techniques which provide a rational framework for investment decisions, particularly those relating to stock markets and the markets for interest rates, commodities and currencies. Building upon research, both in Hong Kong and abroad, this course presents the prevailing statistical theories for prices and price-change in these vital markets.

Assessment: 30% continuous assessment, 70% examination

STAT3611   Computer-aided data analysis (6 credits)

This is a computer-aided course of statistical modelling designed for students who have taken STAT3600 Linear Statistical Analysis and like to see theory illustrated by practical computation. Real data sets will be presented for modelling and analysis using statistical software SAS for gaining hands-on experience. The course aims to develop skills of model selection and hypotheses formulation so that questions of interest can be properly formulated and answered. An important element deals with model review and improvement, when one's first attempt does not adequately fit the data.

Assessment: 50% continuous assessment, 50% examination

STAT3612   Data mining (6 credits)

With an explosion in information technology in the past decade, vast amounts of data appear in a variety of fields such as finance, customer relations management and medicine. The challenge of understanding these data with the aim of creating new knowledge and finding new relationships among data attributes has led to the innovative usage of statistical methodologies and development of new ones. In this process, a new area called data mining is spawned. This course provides a comprehensive and practical coverage of essential data mining concepts and statistical models for data mining.

Assessment: 100% continuous assessment

STAT3613   Marketing engineering (6 credits)

This course is designed to provide an overview and practical application of trends, technology and methodology used in the marketing survey process including problem formulation, survey design, data collection and analysis, and report writing. Special emphasis will be put on statistical techniques particularly for analysing marketing data including market segmentation, market response models, consumer preference analysis and conjoint analysis. Students will analyse a variety of marketing case studies.

Assessment: 50% continuous assessment, 50% examination

STAT3615   Practical mathematics for investment (6 credits)

The main focus of this course is built on the concepts on financial mathematics. Practical applications of these concepts are also considered.

Assessment: 25% continuous assessment, 75% examination

STAT3618   Derivatives and risk management (6 credits)

Nowadays all risk managers must be well versed in the use and valuation of derivatives. The two basic types of derivatives are forwards (having a linear payoff) and options (having a non-linear payoff). All other derivatives can be decomposed to these underlying payoffs or alternatively they are variations on

these basic ideas. This course aims at demonstrating the practical use of financial derivative in risk management. Emphases are on pricing and hedging strategies, and the concept of no-arbitrage.

Assessment: 25% continuous assessment, 75% examination

STAT4601   Time-series analysis (6 credits)

A time series consists of a set of observations on a random variable taken over time. Time series arise naturally in climatology, economics, environment studies, finance and many other disciplines. The observations in a time series are usually correlated; the course establishes a framework to discuss this. This course distinguishes different type of time series, investigates various representations for the processes and studies the relative merits of different forecasting procedures. Students will analyse real time-series data on the computer.

Assessment: 40% continuous assessment, 60% examination

STAT4607   Credit risk analysis (6 credits)

For a commercial bank, credit risk has always been the most significant. It is the risk of default on debt, swap, or other counterparty instruments. Credit risk may also result from a change in the value of an asset resulting from a change in the counterparty's creditworthiness. This course will introduce students to quantitative models for measuring and managing credit risk. It also aims to provide students with an understanding of the credit risk methodology used in the financial industry and the regulatory framework in which the credit risk models operate.

Assessment: 40% continuous assessment, 60% examination

STAT4608   Market risk analysis (6 credits)

Financial risk management has experienced a revolution in the last decade thanks to the introduction of new methods for measuring risk, particularly Value-at-Risk (VaR). This course introduces modern risk management techniques covering the measurement of market risk using VaR models and financial time series models, and stress testing.

Assessment: 40% continuous assessment, 60% examination