COMPUTER ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2014-15 under the four-year curriculum.

Definition and Terminology

Each course offered by the Departments of Electrical and Electronic Engineering and Computer Science shall be classified as either introductory level course or advanced level course.

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

A Discipline Elective course refers to any technical course offered by the Departments of Electrical and Electronic Engineering or Computer Science for the fulfillment of the curriculum requirements of the degree of BEng in Computer Engineering that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

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

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

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

Elective Courses
Students are required to complete 18 credits of elective courses offered by either the Departments of Electrical and Electronic Engineering and Computer Science, or other departments within or outside of the Faculty of Engineering.

University Requirements
Students are required to complete:

a) 12 credits in English language enhancement, including 6 credits in "CAES1000 Core University English" and 6 credits in "CAES9541 Technical English for Electrical and Electronic Engineering";
b) 6 credits in Chinese language enhancement course "CENG9001 Practical Chinese for Engineering Students"; and
c) 36 credits of courses in the Common Core Curriculum, selecting 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.

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

Internship

Students are required to complete the 6-credit internship "ELEC3840 Internship", which normally takes place after their third year of study.

Degree Classification

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

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

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

UG 5 Requirements (54 credits)

Course Code	Course	No. of credits
CAES1000	Core University English	6
CAES9541	Technical English for Electrical and Electronic Engineering	6
CENG9001	Practical Chinese for Engineering Students	6
CC##XXXX	University Common Core Course (6 courses)*	36
Total for UG5 Requirements		54

* Students 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and Ordinary Differential Equations	6
MATH1853	Linear Algebra, Probability & Statistics	6
ENGG1111	Computer Programming and Applications	6
PHYS1050	Physics for engineering students	6
ENGG1202	Introduction to Computer Science	6
ENGG1203	Introduction to Electrical and Electronic Engineering	6
Total for General Engineering Courses		36

Discipline Core Courses (90 credits)

Introductory Courses (42 credits)

Course Code	Course	No. of credits
COMP2119	Introduction to Data Structures and Algorithms	6
COMP2121	Discrete Mathematics	6
COMP2123	Programming Technologies and Tools	6
ELEC2346	Electric circuit theory	6
ELEC2441	Computer organization and microprocessors	6
ELEC2840	Engineering training	6
MECH2407 or COMP3250	Multivariable calculus and partial differential equations or Design and analysis of algorithms	6
Total for Introductory Discipline Core Courses		42

Advanced Courses (42 credits)

Course Code	Course	No. of credits
COMP3230	Principles of Operating Systems	6
COMP3234	Computer and Communication Networks	6
COMP3297	Introduction to Software Engineering	6
ELEC3342	Digital system design	6
ELEC3844	Engineering management and society	6
ELEC3848	Integrated design project	6
ELEC3441 or ELEC3442	Computer architecture or Embedded systems	6
Total for Advanced Discipline Core Courses		42

Capstone Experience and Internship (18 credits)

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

+Capstone Experience
*Training

Discipline Elective Courses (30 credits)

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

Elective Courses (18 credits)

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

Summary of curriculum structure of BEng (Computer Engineering)

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

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and Ordinary Differential Equations
MATH1853	Linear Algebra, Probability & Statistics
ENGG1111	Computer Programming and Applications
PHYS1050	Physics for engineering students
ENGG1202	Introduction to Computer Science
ENGG1203	Introduction to Electrical and Electronic Engineering

University Requirements (UG5) (24 credits)

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

SECOND YEAR

Introductory Core Courses (42 credits)

COMP2119	Introduction to Data Structures and Algorithms
COMP2121	Discrete Mathematics
COMP2123	Programming Technologies and Tools
ELEC2346	Electric circuit theory
ELEC2441	Computer organization and microprocessors
ELEC2840	Engineering training
MECH2407 or	Multivariable calculus and partial differential equations or
COMP3250	Design and analysis of algorithms

University Requirements (UG5) (18 credits)

CC##XXXX	Three Common Core Courses

THIRD YEAR

Advanced Core Courses (42 credits)

COMP3230	Principles of Operating Systems
COMP3234	Computer and Communication Networks
COMP3297	Introduction to Software Engineering
ELEC3342	Digital system design
ELEC3844	Engineering management and society
ELEC3848	Integrated design project
ELEC3441 or	Computer architecture or
ELEC3442	Embedded systems

Internship (6 credits)

ELEC3840	Internship

University Requirements (UG5) (6 credits)

CENG9001	Practical Chinese for Engineering Students

Discipline Elective Courses (6 credits)

FOURTH YEAR

Discipline Elective Courses (24 credits)

Capstone Experience (12 credits)
ELEC4848 Senior design project

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

Elective Courses (18 credits)

ELECTRICAL ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2014-15 and thereafter under the four-year curriculum.

Definition and Terminology

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

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

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

Curriculum

The Curriculum comprises 240 credits of courses as follows:

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

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

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

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

University Requirements
Students are required to complete:

a) 12 credits in English language enhancement, including 6 credits in "CAES1000 Core University English" and 6 credits in "CAES9541 Technical English for Electrical and Electronic Engineering";

b) 6 credits in Chinese language enhancement course "CENG9001 Practical Chinese for Engineering Students"; and
c) 36 credits of courses in the Common Core Curriculum, selecting 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.

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

Internship
Students are required to complete the 6-credit internship "ELEC3840 Internship", which normally takes place after their third year of study.

Degree Classification

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

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

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

UG 5 Requirements (54 credits)

Course Code	Course	No. of credits
CAES1000	Core University English	6
CAES9541	Technical English for Electrical and Electronic Engineering	6
CENG9001	Practical Chinese for Engineering Students	6
CC##XXXX	University Common Core Course (6 courses)*	36
Total for UG5 Requirements		54

* Students 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and Ordinary Differential Equations	6
MATH1853	Linear Algebra, Probability & Statistics	6
ENGG1111	Computer Programming and Applications	6
PHYS1050	Physics for engineering students	6
ENGG1203	Introduction to Electrical and Electronic Engineering	6
ENGG120#	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering*	6
Total for General Engineering Courses		36

*Choose one General Engineering Course from the following list:

ENGG1201	Engineering for sustainable development
ENGG1202	Foundation of computer science
ENGG1204	Industrial management and logistics

ENGG1205 Introduction to mechanical engineering
ENGG1206 Introduction to biomedical engineering

Discipline Core Courses (72 credits)

Introductory Courses (36 credits)

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

Advanced Courses (36 credits)

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

Capstone Experience and Internship (18 credits)

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

+Capstone Experience
*Training

Discipline Elective Courses (48 credits)

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

Elective Courses (12 credits)

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

Summary of curriculum structure of BEng (Electrical Engineering)

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

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and Ordinary Differential Equations
MATH1853	Linear Algebra, Probability & Statistics
ENGG1111	Computer Programming and Applications
PHYS1050	Physics for engineering students
ENGG1203	Introduction to Electrical and Electronic Engineering
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering

University Requirements (UG5) (24 credits)

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

SECOND YEAR

Introductory Core Courses (36 credits)

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

Advanced Core Courses (6 credits)

ELEC3241	Signal and linear systems

University Requirements (UG5) (18 credits)

CC##XXXX	Three Common Core Courses

THIRD YEAR

Advanced Core Courses (30 credits)

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

Internship (6 credits)
ELEC3840 Internship

University Requirements (UG5) (6 credits)
CENG9001 Practical Chinese for Engineering Students

Discipline Elective Courses (18 credits)

FOURTH YEAR

Discipline Elective Courses (30 credits)

Capstone Experience (12 credits)
ELEC4848 Senior design project

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

Elective Courses (12 credits)

ELECTRONIC ENGINEERING

SYLLABUS

The syllabus applies to students admitted in the academic year 2014-15 and thereafter under the four-year curriculum.

Definition and Terminology

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

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

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

Curriculum

The Curriculum comprises 240 credits of courses as follows:

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

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

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

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

University Requirements
Students are required to complete:

a) 12 credits in English language enhancement, including 6 credits in "CAES1000 Core University English" and 6 credits in "CAES9541 Technical English for Electrical and Electronic Engineering";
b) 6 credits in Chinese language enhancement course "CENG9001 Practical Chinese for Engineering Students"; and
c) 36 credits of courses in the Common Core Curriculum, selecting 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.

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

Internship
Students are required to complete the 6-credit internship "ELEC3840 Internship", which normally takes place after their third year of study.

Degree Classification

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

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

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

UG 5 Requirements (54 credits)

Course Code	Course	No. of credits
CAES1000	Core University English	6
CAES9541	Technical English for Electrical and Electronic Engineering	6
CENG9001	Practical Chinese for Engineering Students	6
CC##XXXX	University Common Core Course (6 courses)*	36
Total for UG5 Requirements		54

* Students 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.

General Engineering Courses (36 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and Ordinary Differential Equations	6
MATH1853	Linear Algebra, Probability & Statistics	6
ENGG1111	Computer Programming and Applications	6
PHYS1050	Physics for engineering students	6
ENGG1203	Introduction to Electrical and Electronic Engineering	6
ENGG120#	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering*	6
Total for General Engineering Courses		36

*Choose one General Engineering Course from the following list:

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

Discipline Core Courses (78 credits)

Introductory Courses (42 credits)

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

Advanced Courses (36 credits)

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

Capstone Experience and Internship (18 credits)

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

+Capstone Experience
*Training

Discipline Elective Courses (42 credits)

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

Elective Courses (12 credits)

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

Summary of curriculum structure of BEng (Electronic Engineering)

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

The proposed syllabus by study year is as follows:

FIRST YEAR

General Engineering Courses (36 credits)

MATH1851	Calculus and Ordinary Differential Equations
MATH1853	Linear Algebra, Probability & Statistics
ENGG1111	Computer Programming and Applications
PHYS1050	Physics for engineering students
ENGG1203	Introduction to Electrical and Electronic Engineering
ENGG120X	Any one of the General Engineering Courses offered by other Departments of the Faculty of Engineering

University Requirements (UG5) (24 credits)

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

SECOND YEAR

Introductory Core Courses (42 credits)

ELEC2147	Electrical energy technology
ELEC2242	Introduction to electromagnetic waves and fields
ELEC2346	Electric circuit theory

ELEC2347	Fundamentals of optics
ELEC2441	Computer organization and microprocessors
ELEC2840	Engineering training
MECH2407	Multivariable calculus and partial differential equations

University Requirements (UG5) (18 credits)

CC##XXXX	Three Common Core Courses

THIRD YEAR

Advanced Core Courses (36 credits)

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

Internship (6 credits)

ELEC3840	Internship

University Requirements (UG5) (6 credits)

CENG9001	Practical Chinese for Engineering Students

Discipline Elective Courses (12 credits)

FOURTH YEAR

Discipline Elective Courses (30 credits)

Capstone Experience (12 credits)

ELEC4848	Senior design project

University Requirements (UG5) (6 credits)

CAES9541	Technical English for Electrical and Electronic Engineering

Elective Courses (12 credits)

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

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

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

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

Code	Course Name	Credits
(i) 12 credits of core courses		
ELEC2346	Electric circuit theory	6
ENGG1203	Introduction to electrical and electronic engineering*	6
(ii) 36 credits of disciplinary elective courses selected from the following:		
ELEC2147	Electrical energy technology	6
ELEC2242	Introduction to electromagnetic waves and fields	6
ELEC2347	Fundamentals of optics	6
ELEC2441	Computer organization and microprocessors	6
ELEC3141	Power transmission and distribution	6
ELEC3142	Electrical energy conversion	6
ELEC3143	Power electronics	6
ELEC3241	Signals and linear systems	6
ELEC3242	Communications engineering	6
ELEC3244	Digital signal processing	6
ELEC3245	Control and instrumentation	6
ELEC3247	Engineering electromagnetism	6
ELEC3342	Digital system design	6
ELEC3346	Electronic circuits	6
ELEC3347	Electronic materials and quantum physics	6
ELEC3348	Electronic devices	6
ELEC3349	Optical devices	6
ELEC3441	Computer architecture	6
ELEC3443	Computer networks	6
ELEC3641	Human computer interaction	6
ELEC3643	Systems and network programming	6
ELEC4343	Design of digital integrated circuits	6
ELEC4344	Advanced electronic circuits	6

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

COURSE DESCRIPTIONS

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

General Engineering Courses

ENGG1111	Computer programming (6 credits)
MATH1851	Calculus and Ordinary Differential Equations (6 credits)
MATH1853	Linear Algebra, Probability & Statistics (6 credits)
MECH2407	Multivariable calculus and partial differential equations (6 credits)
PHYS1050	Physics for engineering students (6 credits)
ENGG1201	Engineering for sustainable development (6 credits)
ENGG1202	Foundation of computer science (6 credits)
ENGG1203	Introduction to electrical and electronic engineering (6 credits)
ENGG1204	Industrial management and logistics (6 credits)
ENGG1205	Introduction to mechanical engineering (6 credits)
ENGG1206	Introduction to biomedical engineering (6 credits)

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

University Requirements on Language Enhancement Courses

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

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

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

Adjunct course: ELEC4848 Senior design project
ELEC3848 Integrated design project

Co-requisite: ELEC4848 Senior design project
ELEC3848 Integrated design project (for BEng(Sc) Energy Engineering students only)

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

Assessment: 100% continuous assessment

University Common Core Curriculum

36 credits of courses in the University Common Core Curriculum, in which 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:

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

ELEC2147. Electrical energy technology (6 credits)

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

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

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

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

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

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

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

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

ELEC2346. Electric circuit theory (6 credits)

This is an introductory course that provides students with a solid foundation of knowledge on electric circuits and concepts, to prepare them for subsequent circuit-related courses. At the end of the course,

the student will be able to identify, analyse, design and optimize basic circuits based on fundamental circuit laws and theorems, using passive and active circuit components as well as the op-amp.

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

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

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ELEC2347. Fundamentals of optics (6 credits)

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

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

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

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ELEC2441. Computer organization and microprocessors (6 credits)

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

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

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

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

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

Specifically, the course covers the following topics: basics of the Java development environment; Java applications and applets; Java syntaxes; control structures; methods in Java; iteration; recursion; objects; classes; interfaces; inheritance; polymorphism; overloading; overriding; wrapper classes; type conversions; strings; string manipulations in Java; Java exceptions; try blocks; throwing and catching exceptions in Java; byte and character streams; stream classes; file classes; file manipulation in Java;

arrays; dynamic memory allocation; dynamic data structures including the dynamically linked lists, stacks, queues, trees, graphs, hash tables; sorting; searching; examples of Java applications.

Pre-requisite: ENGG1111 Computer programming and applications
Mutually exclusive with: ELEC1502, COMP2396, ELEC1503
Assessment: 40% continuous assessment, 60% examination

ELEC2840. Engineering training (6 credits)

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

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

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

ELEC3141. Power transmission and distribution (6 credits)

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

Specifically, the course covers the following topics:

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

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

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ELEC3142. Electrical energy conversion (6 credits)

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

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

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

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ELEC3143. Power electronics (6 credits)

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

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

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

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ELEC3241. Signals and linear systems (6 credits)

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

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

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

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

Mutually exclusive with: ELEC2201
Assessment: 20% practical work, 10% continuous assessment, 70% examination

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ELEC3242. Communications engineering (6 credits)

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

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

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

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

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ELEC3244. Digital signal processing (6 credits)

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

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

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

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ELEC3245. Control and instrumentation (6 credits)

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

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

ELEC3247. Engineering electromagnetism (6 credits)

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

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

Pre-requisite: ELEC2242 Introduction to electromagnetic waves and fields
Mutually exclusive with: ELEC2207
Assessment: 50% continuous assessment, 50% examination

ELEC3342. Digital system design (6 credits)

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

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

Pre-requisite: ELEC2441 Computer organization and microprocessors

Mutually exclusive with: ELEC2302
Assessment: 50% continuous assessment; 50% examination

ELEC3346. Electronic circuits (6 credits)

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

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

Pre-requisite: ELEC2346 Electric circuit theory
Mutually exclusive with: ELEC2306
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC3347. Electronic materials and quantum physics (6 credits)

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

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

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

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ELEC3348. Electronic devices (6 credits)

This course aims to provide students with a basic understanding of the principles underlying the operation of common semiconductor devices: p-n junction diode, bipolar junction transistor (BJT) and metal-oxide-semiconductor field-effect transistor (MOSFET).

The course begins with introducing the basics semiconductor physics and p-n junction theories using band diagrams. It then proceeds to teach the device structures and physical operations of bipolar junction transistor (BJT) and metal-oxide-semiconductor field-effect transistor (MOSFET), introducing device models as appropriate.

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

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ELEC3349. Optical devices (6 credits)

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

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

ELEC3441. Computer architecture (6 credits)

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

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

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

ELEC3442. Embedded systems (6 credits)

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

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

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

ELEC3443. Computer networks (6 credits)

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

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

ELEC3541. Software engineering & operating systems (6 credits)

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

Specifically this course covers the following topics in Software Engineering and Operating Systems: software engineering process; principles that guide practice; requirements and modeling; software design concepts; software architectural and detail design methodologies; software testing strategies; software maintenance; software quality; software documentation.
Software development systems: assembler, linker and loader, compiler; basic operating system and process concepts; concurrent processes; processor management; primary and secondary memory management; file and database systems.

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

ELEC3641. Human computer interaction (6 credits)

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

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

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

ELEC3643. Systems and network programming (6 credits)

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

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

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

ELEC3840. Internship (6 credits)

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

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

ELEC3844. Engineering management and society (6 credits)

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

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

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

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

Mutually exclusive with: ELEC2815

Assessment: 30% continuous assessment, 70% examination

ELEC3846. Numerical methods and optimization (6 credits)

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

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

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

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

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

ELEC3847. Probability and statistics in engineering (6 credits)

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

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

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

ELEC3848. Integrated design project (6 credits)

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

the system to be built has electrical components for interfacing with the real world (e.g., a smart plug that can measure and regulate power consumption as well as display measured data to user through an external user interface), electronic components that integrated the external interfaces with the processing and networking cores, and computing components that handle the data manipulations. Thus, by design, each project team should consist of students from electrical engineering, electronic engineering and computer engineering.
At the beginning of the course, students are guided to acquire skills in using hardware and software development tools through introductory lectures and laboratory exercises. Students then begin working on the project. Technical consultation sessions are conducted as supplementary to help students throughout the process.
Assessment and grading will be made according to the quality of design product, demonstration and documentations. Besides implementing the system to the required project specification, students are encouraged to extend the project with their own inputs.

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

ELEC4141. Electric railway systems (6 credits)

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

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

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

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

ELEC4142. Power system protection and switchgear (6 credits)
The aim of this course is to provide fundamental knowledge of electric power in power system protection and switchgear. It elaborates on protective relays, protection transformer, transmission line protection, rotating machine protection, substation protection. Principles of over-voltages and electrical breakdown are discussed. Circuit breaker technologies, switchgears and their protection schemes, and auto-recloser and sectionalizer are included.

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

1. grasp and understand the basic principles and functions of protection relays and switchgears;

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

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

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ELEC4144. Electric vehicle technology (6 credits)

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

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

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

ELEC4145. Building services- electrical services (6 credits)

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

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

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

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

ELEC4146. Building services- electrical installations (6 credits)

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

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

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

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

ELEC4147. Power system analysis and control (6 credits)

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

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

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

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

ELEC4241. Communication systems (6 credits)

This course aims at providing detailed understanding of the basic principles of analogue and digital communication systems in the presence of noise with focus on basic issues relating to system design. It covers spectral analysis; random signal theory; information theory; noise in analogue systems; digital transmission through AWGN channels; digital carrier-modulation schemes; DM and PCM, error control coding.

Pre-requisite: ELEC3242 Communications engineering

Mutually exclusive with: ELEC3201
Assessment: 10% practical work, 90% examination

ELEC4242. Robotics (6 credits)

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

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

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

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

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

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

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

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

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

ELEC4244. Multimedia signals and applications (6 credits)

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

The course is designed to achieve the following:

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

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

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

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

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

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

ELEC4245. Digital image processing (6 credits)

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

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

point, line, edge and regions. The course concludes by considering some typical image processing applications.

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

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

ELEC4247. Information theory and coding (6 credits)

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

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

ELEC4248. Photonic systems technologies (6 credits)

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

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

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ELEC4249. Microwave engineering (6 credits)

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

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

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ELEC4250. Control systems (6 credits)

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

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

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

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ELEC4251. Microscopy (6 credits)

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

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

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ELEC4343. Design of digital integrated circuits (6 credits)

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

Specifically, the course covers the following topics: MOS processing : polysilicon gate, LOCOS isolation; MOSFET, as a switch in an inverter; NMOS logic : R-load, E-load, D-load, and their comparisons; Layout design of NMOS circuits; Design rules, extraction of device parameters, isolation concerns; Design of memory circuits : ROM, EPROM, EEPROM, DRAM, SRAM; CMOS processing : different types of well, threshold control; Problems in CMOS circuits : field inversion, latchup, SOI; CMOS circuits : analysis, layout design; Effects of scaling on the performance of MOS circuits; Bipolar junction transistor, BiCMOS circuits.

Pre-requisite: ELEC3346 Electronic circuits
Mutually exclusive with: ELEC2303, ELEC3303

Assessment: 50% continuous assessment, 50% examination

ELEC4344. Advanced electronic circuits (6 credits)

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

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

Pre-requisite: ELEC3346 Electronic circuits
Mutually exclusive with: ELEC2301 and ELEC3341
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC4442. Advanced networking technologies (6 credits)

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

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

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

ELEC4543. Fuzzy systems and neural networks (6 credits)

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

This course will cover two important topics in the field of Artificial Intelligence. By the end of this course, student should possess a firm grounding in the concepts and techniques of fuzzy logic and neural

network. The student should be able to apply the acquired knowledge to the development of intelligent systems or to the exploration of research problems.

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

ELEC4640. Distributed computing systems (6 credits)

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

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

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

ELEC4641. Computer network security (6 credits)

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

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

ELEC4642. VLSI design principles (6 credits)

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

The course content ranges from low level fabrics like MOSFET (metal-oxide-semiconductor field-effect transistor) basics, logic gate families, layout and fabrication practices, to higher level system knowledge like timing, memory, design optimization and tests; and eventually extends into basic analog circuit blocks like CMOS (complementary metal-oxide-semiconductor) transistor amplifiers and opamps etc.

The course also includes a Verilog design project that covers the typical VLSI design flow using the most popular electronic design automation (EDA) tools.

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

ELEC4649. Parallel computing (6 credits)

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

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

ELEC4745. Queueing theory (6 credits)

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

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

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

ELEC4848. Senior design project (12 credits)

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

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

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

Students are required to have meeting and discussion with his/her supervisors on a regular basis, usually every week or every fortnight. Mid-term Review will be held with both the supervisors and the 2nd

examiner in order review the student progress. The final assessment will be based Project Report, Presentation and Demonstration.

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

List of Courses by Subject Groups

Note:

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

Courses with similar contents are flagged as "mutually exclusive". For each set of mutually exclusive courses, students are not allowed to take more than one course. Subject to approval, some MSc courses may also be taken as Disciplinary Elective Courses in their respective subject groups. Each MSc course is equivalent to a 6-credit course by undertaking additional workload than an MSc student in the course concerned.

Group A: Electrical Energy

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2147	Electrical energy technology (core: EE)	6	-	-
3	ELEC3141	Power transmission and distribution (core: EE)	6	-	ELEC2147
3	ELEC3142	Electrical energy conversion (core: EE)	6	ELEC2147	-
3	ELEC3143	Power electronics (core: EE)	6	-	-
4	ELEC4141	Electric railway systems	6	ELEC2147	-
4	ELEC4142	Power system protection and switchgear	6	ELEC3141	-
4	ELEC4144	Electric vehicle technology	6	-	-
4	ELEC4145	Building services - electrical services	6	-	-
4	ELEC4146	Building services - electrical installations	6	-	-
4	ELEC4147	Power system analysis and control	6	ELEC3141	-

Group B: Electronics and Optics

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2346	Electric circuit theory (core: CE, EE, ElecE)	6	-	-
2	ELEC2347	Fundamentals of optics	6	-	-
3	ELEC3342	Digital system design (core: CE)	6	ELEC2441	-
3	ELEC3346	Electronic circuits (core: ElecE)	6	ELEC2346	-
3	ELEC3347	Electronic materials and	6		-

		quantum physics			
3	ELEC3348	Electronic devices (core: ElecE)	6	-	-
3	ELEC3349	Optical devices	6	ELEC2346 or ELEC2347	-
4	ELEC4248	Photonic systems technologies	6	ELEC2346 or ELEC3349	-
4	ELEC4251	Microscopy	6	-	-
4	ELEC4343	Design of digital integrated Circuits	6	ELEC3346	-
4	ELEC4344	Advanced electronic circuits	6	ELEC3346	-
4	ELEC4642	VLSI design principles	6	-	-

Group C: Signal Processing and Control Systems

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

Group D: Communications and Networking

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2242	Introduction to electromagnetic waves and fields (core: ElecE)	6	-	-
3	ELEC3242	Communications engineering (core: ElecE)	6	-	ELEC3241
3	ELEC3247	Engineering electromagnetism	6	ELEC2242	-
3	ELEC3443	Computer networks (mutually exclusive with COMP3234)	6	-	-
4	ELEC4241	Communication systems	6	ELEC3242	-
4	ELEC4243	Cellular radio and personal communication systems	6	ELEC3242	-
4	ELEC4247	Information theory and coding	6	-	-
4	ELEC4249	Microwave engineering	6	ELEC2242 or ELEC3247	-
4	ELEC4442	Advanced networking technologies	6	ELEC3443 or COMP3234	-

Group E: Computer Systems

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2441	Computer organization and microprocessors (core: CE, ElecE, EE) (mutually exclusive with COMP2120)	6	-	-
2	ELEC2543	Object-Oriented programming and data structures (mutually exclusive with COMP2396) (core: ElecE)	6	ENGG1111	-
3	ELEC3441	Computer architecture (core: CE) (mutually exclusive with COMP3231)	6	ELEC2441	-
3	ELEC3442	Embedded systems (core: CE)	6	ELEC3342	-
3	ELEC3541	Software engineering and operating systems (mutually exclusive with COMP3230 and COMP3297) (core: ElecE)	6	-	-
3	ELEC3641	Human computer interaction	6	ELEC2543 or COMP2396	-
3	ELEC3643	Systems and network programming (mutually exclusive with COMP3402)	6	ELEC2543 or (COMP2119 & COMP2396)	-
4	ELEC4543	Fuzzy systems and neural networks	6	-	-
4	ELEC4640	Distributed computing systems	6	(ELEC3541 or COMP3230) & (ELEC3443 or COMP3234)	-
4	ELEC4641	Computer network security (mutually exclusive with COMP3327)	6	ELEC3443 or COMP3234	-
4	ELEC4649	Parallel computing	6	ELEC3441	-

Group F: Complementary Studies

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

Group G: Projects

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

Group H: General Engineering

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

Group I: Mathematics

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	MATH1851	Calculus and ordinary differential equation	6		
1	MATH1853	Linear algebra, probability & statistics	6		
2	COMP2121	Discrete mathematics	6		
2	MECH2407	Multivariable calculus and partial differential equations	6		
3	MECH3407	Advanced partial differential equations & complex variables			
3	ELEC3846	Numerical methods and optimization (mutually exclusive with COMP3407)	6		
3	ELEC3847	Probability and statistics in engineering	6	MECH2407	
4	ELEC4745	Queueing theory	6	ELEC3847	

Group J: Software and IT Applications

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	COMP2119	Introduction to data structures and algorithms (core: CE)	6	COMP1117 or ENGG1111	COMP2123 (Pre- or Co-requisites)
2	COMP2123	Programming technologies and tools (core: CE)	6	COMP1117 or ENGG1111	-
2	COMP2396	Object-oriented programming and Java (mutually exclusive with ELEC2543)	6	COMP1117 or ENGG1111	-
3	COMP3230	Principles of operating systems (mutually exclusive with ELEC3541) (core: CE)	6	COMP2123 & (COMP2120 or ELEC2441)	-
3	COMP3234	Computer and communication	6	COMP2120 or	-

		networks (mutually exclusive with ELEC3443) (core: CE)		ELEC2441	
3	COMP3235	Compiling techniques	6	COMP2119; and COMP2123	-
3	COMP3250	Design and analysis of algorithms	6	COMP2119 or ELEC2543 (Pre- or Co-requisites)	-
3	COMP3258	Functional programming	6	COMP2121	
3	COMP3259	Principles of programming languages	6	COMP2119 & (COMP2120 or ELEC2441)	-
3	COMP3270	Artificial intelligence	6	COMP2119 or COMP2123	-
3	COMP3271	Computer graphics	6	COMP2119 or COMP2123	-
3	COMP3278	Introduction to database management systems	6	COMP2119 or ELEC2543	-
3	COMP3297	Introduction to software engineering (mutually exclusive with ELEC3541) (core: CE)	6	COMP2123	-
3	COMP3311	Legal aspects of computing	6	COMP2123	-
3	COMP3314	Machine learning	6	MATH1853; and COMP2119 or ELEC2543	-
3	COMP3315	Multimedia computing and applications (mutually exclusive with ELEC4244)	6	COMP2119	-
3	COMP3317	Computer vision	6	COMP2119 or ELEC2543	-
3	COMP3320	Electronic commerce technology	6	COMP3278	-
3	COMP3322	Modern technologies on World Wide Web (mutually exclusive with COMP3325)	6	COMP1117 or ENGG1111	-
3	COMP3323	Advanced database systems	6	COMP3278	-
					-
3	COMP3327	Computer and network security (mutually exclusive with ELEC4641)	6	COMP3230 & COMP3234	-
3	COMP3328	Wireless and mobile communication	6	COMP3234 & COMP2396	-
3	COMP3329	Computer game design and programming	6	COMP3271	-
3	COMP3330	Interactive mobile application design and programming	6	COMP1117 or ENGG1002 or ENGG1111 or ENGG1112 COMP2396	
3	COMP3351	Advanced algorithm analysis	6	COMP3250	-
3	COMP3402	System architecture and distributed computing (mutually exclusive with	6	COMP2396	-

		ELEC3643)			
3	COMP3403	Implementation, testing and maintenance of software systems	6	COMP2396 (Pre- or Co-requisite)	-
3	COMP3404	Software quality and project management	6	COMP3297	-
3	COMP3407	Scientific computing (mutually exclusive with ELEC3846)	6	(COMP1117 or ENGG1111) and COMP2121	-