COMPUTER ENGINEERING

SYLLABUS

This syllabus applies to students admitted in the academic year 2011-12 and 2012-13 under the three-year curriculum.

Definitions and Terminology:

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

All courses are grouped into the following 10 Subject Groups:

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

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

The Curriculum

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

(a) 24 credits from General Engineering courses, including:
  (i) ENGG1002 Computer programming and applications; AND
  (ii) ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB; AND
  (iii) ENGG1015 Introduction to electrical and electronic engineering; AND
  (iv) ENGG1007 Foundations of computer science
(b) 60 credits of Computer Engineering (CE) Discipline Core Courses
(c) 33 credits of Breadth/Depth Courses comprising
  (i) 12 credits of course(s) selected from Groups E, J; *and*
  (ii) the remaining are courses selected from Groups A, B, C, D, E, H, I, J but no more than 6 credits from Group H.
(d) Complementary Studies courses comprising (Total 12 credits):
  (i) ELEC2814 Engineering management and society (6 credits)
  (ii) ELEC2815 Economics, finance and marketing for engineers (6 credits)
(e) ELEC2818 Integrated design project (6 credits)
(f) ELEC3818 Senior design project (12 credits)
(g) ELEC1812 Engineering training (6 credits)
(h) ELEC1813 Internship (6 credits)

(i) UG5 requirements (21 credits):
   (i) CAES1507 Professional and technical written communication for engineers [1] (3 credits)
   (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
   (iii) CENG1001 Practical Chinese language course for engineering students[2] (3 credits)
   (iv) 12 credits of courses in the Common Core Curriculum, selecting no more than one course from each Area of Inquiry

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

Degree Classification

For students admitted in 2011-12, the best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

For students admitted in 2012-13, 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.

Order of Study

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

First Year

The first-year syllabus shall include the following courses:

General Engineering Courses (Total 24 credits)

Either
ENGG1003 Mathematics I (6 credits)
or
ENGG1004 Mathematics IA (3 credits) *and* ENGG1005 Mathematics IB (3 credits)
ENGG1002 Computer programming and applications (6 credits)
ENGG1007 Foundations of computer science (6 credits)
(can be replaced by CSIS1118 Foundations of computer science (6 credits))
(mutually exclusive with: ELEC1807, CSIS1118)
ENGG1015 Introduction to electrical and electronic engineering (6 credits)

Discipline Core Courses for CE (Total 24 credits)

[1] Students pursuing the double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

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

CSIS1119	Introduction to data structures and algorithms (6 credits)
CSIS1122	Computer programming II (6 credits)
ELEC1401	Computer organization and microprocessors (6 credits)
ELEC1306	Electric circuit theory (6 credits) (mutually exclusive with ENGG1008)

UG5 Requirements (Total 9 credits)

CAES1507	Professional and technical written communication for engineers (3 credits)[3]
CAES1515	Professional and technical oral communication for engineers (3 credits)
CENG1001	Practical Chinese language course for engineering students (3 credits)[4]

Training (Total 6 credits)

ELEC1812	Engineering training (6 credits)

Second Year

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

Discipline Core Courses for CE (Total 36 credits)

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

Complementary Studies (Total 6 credits)

ELEC2814	Engineering management and society (6 credits)

UG5 Requirements (Total 12 credits)

Two Common Core Courses (12 credits)

Project (Total 6 credits)

ELEC2818	Integrated design project (6 credits)

Training (Total 6 credits)

ELEC1813	Internship (6 credits)

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[3] Students pursuing the double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

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

Third Year

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

Breadth/Depth Courses (Total 33 credits)

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

Complementary Studies: (Total 6 credits)

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

Project (Total 12 credits)

ELEC3818 Senior design project (12 credits)

ELECTRONIC AND COMMUNICATIONS ENGINEERING

SYLLABUS

This syllabus applies to students admitted in the academic year 2011-12 and 2012-13 under the three-year curriculum.

Definitions and Terminology

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

All courses are grouped into the following 10 Subject Groups:

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

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

The Curriculum

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

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

(b) 60 credits of Electronic and Communications Engineering (EComE) Discipline Core Courses

(c) 33 credits of Breadth/Depth Courses comprising:
  (i) 12 credits of Breadth/Depth Courses from Groups A, B, C, D, E, J; AND
  (ii) 6 credits of Breadth/Depth Course from Group I; AND
  (iii) 15 credits of Depth Courses from Groups B, C, D, E with at least 12 credits selected from Groups B, D

(d) 12 credits of Complementary Studies courses comprising:
  (i) ELEC2814 Engineering management and society (6 credits)
  (ii) ELEC2815 Economics, finance and marketing for engineers (6 credits)

(e) 30 credits of Project and Training comprising:
  (i) ELEC2818 Integrated design project (6 credits)
  (ii) ELEC3818 Senior design project (12 credits)
  (iii) ELEC1812 Engineering training (6 credits)
  (iv) ELEC1813 Internship (6 credits)

(f) UG5 requirements (21 credits):
  (i) CAES1507 Professional and technical written communication for engineers[5] (3 credits)
  (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
  (iii) CENG1001 Practical Chinese language course for engineering students[6] (3 credits)
  (iv) 12 credits of courses in the Common Core Curriculum, selecting no more than one course from each Area of Inquiry

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

Degree Classification

For students admitted in 2011-12, the best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

For students admitted in 2012-13, 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.

[5] Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

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

Order of Study

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

First Year

The first-year syllabus shall include the following courses:

General Engineering Courses (Total 24 credits)

Either

ENGG1003 Mathematics I (6 credits)

or

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

ENGG1002 Computer programming and applications (6 credits)
ENGG1015 Introduction to electrical and electronic engineering (6 credits)
Additional 6 credits of General Engineering course from Group H

Discipline Core Courses for EComE (Total 24 credits)

ELEC1202	Introduction to electromagnetic waves and fields (6 credits)
ELEC1306	Electric circuit theory (6 credits) (mutually exclusive with ENGG1008)
ELEC1401	Computer organization and microprocessors (6 credits)
ELEC1503	Object oriented programming and data structures (6 credits)

UG5 Requirements (Total 9 credits)

CAES1507	Professional and technical written communication for engineers (3 credits)[7]
CAES1515	Professional and technical oral communication for engineers (3 credits)
CENG1001	Practical Chinese language course for engineering students (3 credits)[8]

Training (Total 6 credits)

ELEC1812 Engineering training (6 credits)

Second Year

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

Discipline Core Courses for EComE (Total 36 credits)

[7] Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

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

ELEC1802 Engineering mathematics II (6 credits)
ELEC2201 Signals and linear systems (6 credits)
ELEC2202 Communications engineering (6 credits)
ELEC2302 Digital system design (6 credits)
ELEC2306 Electronic circuits (6 credits)
ELEC2501 Software engineering and operating systems (6 credits)

Complementary Studies (Total 6 credits)

ELEC2814 Engineering management and society (6 credits)

UG5 Requirements (Total 12 credits)

Two Common Core Courses (12 credits)

Project (Total 6 credits)

ELEC2818 Integrated design project (6 credits)

Training (Total 6 credits)

ELEC1813 Internship (6 credits)

Third Year

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

Breadth/Depth Courses (Total 33 credits)

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

Complementary Studies (Total 6 credits)

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

Project (Total 12 credits)

ELEC3818 Senior design project (12 credits)

ELECTRICAL ENGINEERING

SYLLABUS

This syllabus applies to students admitted in the academic year 2011-12 and 2012-13 under the three-year curriculum.

Definitions and Terminology:

Each course offered by the Department of Electrical and Electronic Engineering shall be classified as either introductory level course or advanced level course, and be assigned a Level --- One, Two or

Three, in which Level One courses are introductory courses whereas advanced courses include Level Two and Three courses.

All courses are grouped into the following 10 Subject Groups:

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

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

The Curriculum

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

(a) 24 credits from General Engineering courses, including:
  (i) ENGG1002 Computer programming and applications; AND
  (ii) ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB; AND
  (iii) ENGG1015 Introduction to electrical and electronic engineering; AND
  (iv) An additional 6-credit General Engineering Course from Group H
(b) 48 credits of Electrical Engineering (EE) Discipline Core Courses
(c) 45 credits of Breadth/Depth Courses comprising:
  (i) 21 credits of Breadth/Depth Courses from Groups A, B, C, D, E, J; AND
  (ii) 6 credits of Breadth/Depth Course from Group I; AND
  (iii) 18 credits of Depth Courses from Group A
(d) 12 credits of Complementary Studies Courses comprising:
  (i) ELEC2814 Engineering management and society (6 credits)
  (ii) ELEC2815 Economics, finance and marketing for engineers (6 credits)
(e) ELEC2818 Integrated design project (6 credits)
(f) ELEC3818 Senior design project (12 credits)
(g) ELEC1812 Engineering training (6 credits)
(h) ELEC1813 Internship (6 credits)
(i) UG5 requirements (21 credits):
  (i) CAES1507 Professional and technical written communication for engineers[9] (3 credits)
  (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
  (iii) CENG1001 Practical Chinese language course for engineering students[10] (3

[9] Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

[10] Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese

credits)

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

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

Degree Classification

For students admitted in 2011-12, the best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

For students admitted in 2012-13, 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.

Order of Study

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

First Year

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

General Engineering Courses (Total 24 credits)

Either
ENGG1003 Mathematics I (6 credits)
or
ENGG1004 Mathematics IA (3 credits) *and* ENGG1005 Mathematics IB (3 credits)

ENGG1002 Computer programming and applications (6 credits)
ENGG1015 Introduction to electrical and electronic engineering (6 credits)
Additional 6 credits of General Engineering Course from Group H

Discipline Core Courses for EE (Total 24 credits)

ELEC1107 Electrical energy technology (6 credits)
ELEC1401 Computer organization and microprocessors (6 credits)
ELEC1802 Engineering mathematics II (6 credits)
ELEC1306 Electric circuit theory (6 credits)
(mutually exclusive with ENGG1008)

UG5 Requirements (Total 9 credits)

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especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

CAES1507 Professional and technical written communication for engineers (3 credits)
CAES1515 Professional and technical oral communication for engineers (3 credits)
CENG1001 Practical Chinese language course for engineering students (3 credits)

Training (6 credits)

ELEC1812 Engineering training (6 credits)

Second Year

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

Discipline Core Courses for EE (Total 24 credits)

ELEC2101 Power transmission and distribution (6 credits)
ELEC2102 Electrical energy conversion (6 credits)
ELEC2103 Power electronics (6 credits)
ELEC2201 Signals and linear systems (6 credits)

Breadth/Depth Courses (Total 12 credits)

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

Complementary Studies (Total 6 credits)

ELEC2814 Engineering management and society (6 credits)

UG5 Requirements (Total 12 credits)

Two Common Core Courses (12 credits)

Project (Total 6 credits)

ELEC2818 Integrated design project (6 credits)

Training (6 credits)

ELEC1813 Internship (6 credits)

Third Year

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

Breadth/Depth Courses (Total 33 credits)

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

Complementary Studies (Total 6 credits)

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

Project (Total 12 credits)

ELEC3818 Senior design project (12 credits)

INFORMATION ENGINEERING

SYLLABUS

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

Definitions and Terminology:

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

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

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

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

The Curriculum

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

(a) 24 credits from General Engineering courses, including:
  (i) ENGG1002 Computer programming and applications; AND
  (ii) ENGG1003 Mathematics I or both ENGG1004 Mathematics IA and ENGG1005 Mathematics IB; AND
  (iii) ENGG1015 Introduction to electrical and electronic engineering; AND
  (iv) An additional 6-credits of General Engineering course from Group H
(b) 54 credits of Information Engineering (InfoE) Discipline Core Courses
(c) 39 credits of Breadth/Depth Courses comprising:
  (i) 18 credits of Depth Courses from Groups A, B, C, D, E, J; AND
  (ii) 21 credits of Breadth/Depth Courses from Group A, B, C, D, E, I, J but no more than 6 credits from Group I.
(d) 12 credits of Complementary Studies courses comprising:
  (i) ELEC2814 Engineering management and society (6 credits)

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

(e) ELEC2818 Integrated design project (6 credits)
(f) ELEC3818 Senior design project (12 credits)
(g) ELEC1812 Engineering training (6 credits)
(h) ELEC1813 Internship (6 credits)
(i) UG5 requirements (21 credits):
    (i) CAES1507 Professional and technical written communication for engineers[11] (3 credits)
    (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
    (iii) CENG1001 Practical Chinese language course for engineering students[12] (3 credits)
    (iv) 12 credits of courses in the Common Core Curriculum, selecting no more than one course from each Area of Inquiry

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

Degree Classification

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

Order of Study

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

First Year

The first-year syllabus shall include the following courses:

General Engineering Courses (Total 24 credits)

Either
ENGG1003 Mathematics I (6 credits)
or
ENGG1004 Mathematics IA (3 credits) *and* ENGG1005 Mathematics IB (3 credits)

ENGG1002 Computer programming and applications (6 credits)
ENGG1015 Introduction to electrical and electronic engineering (6 credits)
Additional 6 credits of General Engineering course from Group H

[11] Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

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

Discipline Core Courses for InfoE (Total 24 credits)

ELEC1306	Electric and electronic circuitscircuit theory (6 credits) (mutually exclusive with ENGG1008)
ELEC1401	Computer organization and microprocessors (6 credits)
ELEC1503	Object oriented programming and data structures (6 credits)
ELEC1802	Engineering mathematics II (6 credits)

UG5 Requirements (Total 9 credits)

CAES1507	Professional and technical written communication for engineers (3 credits)[13]
CAES1515	Professional and technical oral communication for engineers (3 credits)
CENG1001	Practical Chinese language course for engineering students (3 credits)[14]

Training (Total 6 credits)

ELEC1812	Engineering training (6 credits)

Second Year

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

Discipline Core Courses for InfoE (Total 30 credits)

ELEC2201	Signals and linear systems (6 credits)
ELEC2202	Communications engineering (6 credits)
ELEC2403	Computer networks (6 credits)
ELEC2501	Software engineering and operating systems (6 credits)
ELEC2817	Probability and statistics in engineering (6 credits)

Breadth/Depth Courses (Total 6 credits)

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

UG5 Requirements (Total 12 credits)

Two Common Core Courses (12 credits)

Complementary Studies (Total 6 credits)

ELEC2814	Engineering management and society (6 credits)

Project (Total 6 credits)

ELEC2818	Integrated design project (6 credits)

[13] Students pursuing double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1507

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

Training (Total 6 credits)

ELEC1813 Internship (6 credits)

Third Year

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

Breadth/Depth Courses (Total 33 credits)

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

Complementary Studies (Total 6 credits)

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

(30

Project (Total 12 credits)

ELEC3818 Senior design project (12 credits)

List of Courses by Subject Groups

Note:

Courses with similar contents are flagged as "mutually exclusive". For each set of mutually exclusive courses, students are not allowed to take more than one course. Subject to approval, some MSc courses may also be taken as Depth Courses in their respective subject groups. Each MSc course is counted as 3 credits.

Group A: Electrical Energy

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ELEC1107	Electrical energy technology (core: EE)	6	-	-
2	ELEC2101	Power transmission and distribution (core: EE)	6	-	ELEC1107
2	ELEC2102	Electrical energy conversion (core: EE)	6	ELEC1107	-
2	ELEC2103	Power electronics (core: EE)	6	-	-
3	ELEC3104	Electric vehicle technology	6	-	-
3	ELEC3105	Building services - electrical services	6	-	-
3	ELEC3106	Building services - electrical installations	6	-	-
3	ELEC3107	Power system analysis and control	6	ELEC2101	-
3	ELEC3111	Electric railway systems	6	ELEC1107	-
3	ELEC3112	Power system protection and switchgear	6	ELEC2101	-

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Group B: Electronics and Optics

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ELEC1306	Electric circuit theory (core: CE, EE, EComE, InfoE) (mutually exclusive with ENGG1008)	6	-	-
1	ELEC1307	Fundamentals of optics	6	-	-
2	ELEC2302	Digital system design (core: CE)	6	ELEC1306 or ELEC1401	-
2	ELEC2305	Electronic materials and quantum physics	6	-	-
2	ELEC2306	Electronic circuits (core: EComE)	6	ELEC1306	-
2	ELEC2308	Electronic devices	6	-	-
2	ELEC2309	Optical devices	6	ELEC1306 or ELEC1307	-
3	ELEC3303	Design of digital integrated circuits (mutually exclusive with ELEC2303)	6	ELEC2306	-
3	ELEC3304	Advanced electronic circuits	6	ELEC2306	-
3	ELEC3223	Photonic systems technologies	6	ELEC1306 or ELEC2309	-
3	ELEC3612	VLSI design principles	6	-	-

Group C: Signal Processing and Control Systems

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

Group D: Communications and Networking

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ELEC1202	Introduction to electromagnetic waves and fields (core: EComE)	6	-	-
2	ELEC2202	Communications engineering (core: EComE, InfoE)	6	-	ELEC2201
2	ELEC2207	Engineering electromagnetism	6	ELEC1202	-
2	ELEC2403	Computer networks (mutually	6	-	-

		exclusive with ELEC2402, ELEC2701, CSIS0234) (core: InfoE)			
3	ELEC3201	Communication systems	6	ELEC2202	-
3	ELEC3203	Cellular radio and personal communication systems (mutually exclusive with CSIS0328, ELEC6071)	6	ELEC2202	-
3	ELEC3221	Microwave engineering	6	ELEC1202 or ELEC2207	-
3	ELEC3227	Information theory and coding (mutually exclusive with ELEC3204)	6	-	-
3	ELEC3402	Advanced networking technologies (mutually exclusive with ELEC3401)	6	ELEC2403 or ELEC2701 or CSIS0234	-

Group E: Computer Systems

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

3	ELEC3631	Computer network security (mutually exclusive with CSIS0327)	6	ELEC2402 or ELEC2403 or CSIS0234	-

Group F: Complementary Studies

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ELEC1812	Engineering training	6	-	-
1	ELEC1813	Internship	6	-	-
2	ELEC2814	Engineering management and society	6	-	-
2	ELEC2815	Economics, finance and marketing for engineers	6	-	-

Group G: Projects

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC2818	Integrated design project	6	-	-
3	ELEC3818	Senior design project	12	-	-

Group H: General Engineering

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	ENGG1002	Computer programming and applications	6	-	-
1	ENGG1003	Mathematics I	6	-	-
1	ENGG1004	Mathematics IA (mutually exclusive with ENGG1003)	3	-	-
1	ENGG1005	Mathematics IB (mutually exclusive with ENGG1003)	3	-	-
1	ENGG1006	Engineering for sustainable development	6	-	-
1	ENGG1007	Foundations of computer science (can be replaced by CSIS1118 Foundations of computer science) (mutually exclusive with: ELEC1807, CSIS1118)	6	-	-
1	ENGG1009	Industrial management and logistics	6	-	-
1	ENGG1011	Introduction to biomedical engineering	6	-	-
1	ENGG1015	Introduction to electrical and electronic engineering	6	-	-
1	ENGG1018	Introduction to mechanical engineering			

Group I: Mathematics

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
2	ELEC1802	Engineering mathematics II (core: CE, EComE, EE, InfoE)	6	ENGG1003 or (ENGG1004 & ENGG1005)	-
2	ELEC2816	Numerical methods and optimization (mutually exclusive with CSIS0407)	6	-	-
2	ELEC2817	Probability and statistics in engineering (core: InfoE)	6	ENGG1003 or (ENGG1004 & ENGG1005)	-
3	ELEC3705	Queueing theory	6	ELEC2811 ELEC2817	-

Group J: Software and IT Applications

Level	Code	Course Title	Credit	Prerequisite	Co-requisite
1	CSIS1119	Introduction to data structures and algorithms (core: CE)	6	CSIS1117 or ENGG1002	CSIS1122 (Computer Programming II) (Pre- or Co-requisites)
1	CSIS1123	Programming technologies and tools	6	CSIS1117 or ENGG1002	-
2	CSIS0230	Principles of operating systems (mutually exclusive with ELEC2501) (core: CE)	6	(CSIS1122 or CSIS1123) & (CSIS1120 or ELEC1401)	-
2	CSIS0234	Computer and communication networks (mutually exclusive with ELEC2402, ELEC2403) (core: CE)	6	CSIS1120 or ELEC1401	-
2	CSIS0259	Principles of programming languages	6	CSIS1119 & (CSIS1120 or ELEC1401)	-
2	CSIS0278	Introduction to database management systems	6	CSIS1119 or ELEC1502 or ELEC1503	-
2	CSIS0297	Introduction to software engineering (core: CE)	6	CSIS1122 or CSIS1123	-
2	CSIS0311	Legal aspects of computing	6	CSIS1122 or CSIS1123	-
2	CSIS0396	Object-oriented programming and Java (mutually exclusive with ELEC1502, ELEC1503)	6	CSIS1117 or ENGG1002	-
2	CSIS2258	Functional programming	6	CSIS1118 or CSIS1121	
3	CSIS0235	Com CSISpiling techniques	6	CSIS1119 & (CSIS1122 or CSIS1123)	-
3	CSIS0250	Design and analysis of algorithms	6	CSIS1119 or ELEC1502 or	

				ELEC1503 (Pre- or Co-requisites)	
3	CSIS0270	Artificial intelligence	6	CSIS1119 or CSIS1122 or CSIS1123	-
3	CSIS0271	Computer graphics	6	CSIS1119 or CSIS1122 or CSIS1123	-
3	CSIS0314	Machine learning	6	CSIS1119 or ELEC1502 or ELEC1503	-
3	CSIS0315	Multimedia computing and applications (mutually exclusive with ELEC3224)	6	CSIS1119	-
3	CSIS0317	Computer vision	6	CSIS1119 or ELEC1502 or ELEC1503	-
3	CSIS0320	Electronic commerce technology	6	CSIS0278	-
3	CSIS0322	Modern technologies on World Wide Web (mutually exclusive with CSIS0325)	6	CSIS1117 or ENGG1002	-
3	CSIS0323	Advanced database systems	6	CSIS0278	-
3	CSIS0327	Computer and network security (mutually exclusive with ELEC3631, ELEC3626)	6	CSIS0230 & CSIS0234	-
3	CSIS0328	Wireless and mobile communication	6	CSIS0234 & CSIS0396	-
3	CSIS0329	Computer game design and programming	6	CSIS0271	-
3	CSIS0351	Advanced algorithm analysis	6	CSIS0250	-
3	CSIS0402	System architecture and distributed computing (mutually exclusive with ELEC2603)	6	CSIS0396	-
3	CSIS0403	Implementation, testing and maintenance of software systems	6	CSIS0396 (Pre- or Co-requisite)	-
3	CSIS0404	Software quality and project management	6	CSIS0297	-
3	CSIS0407	Scientific computing (mutually exclusive with ELEC2816)	6	(CSIS1117 or ENGG1002) and (CSIS1118 or CSIS1121 or ENGG1007)	-
3	CSIS3330	Interactive mobile application design and programming	6	COMP1117 or COMP2396 or CSIS0396 or CSIS1117 or ENGG1002 or ENGG1111 or ENGG1112	-

Minor in Electrical and Electronic Engineering

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

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

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

Code	Course Name	Credits
(i) 12 credits of core courses		
ELEC1306	Electric circuit theory	6
ENGG1015	Introduction to electrical and electronic engineering*	6
(ii) 24 credits of discipline elective courses selected from the following:		
ELEC1107	Electrical energy technology	6
ELEC1202	Introduction to electromagnetic waves and fields	6
ELEC1401	Computer organization and microprocessors	6
ELEC1503	Object-oriented programming and data structures	6
ELEC2101	Power transmission and distribution	6
ELEC2102	Electrical energy conversion	6
ELEC2103	Power electronics	6
ELEC2201	Signals and linear systems	6
ELEC2202	Communications engineering	6
ELEC2204	Digital signal processing	6
ELEC2205	Control and instrumentation	6
ELEC2207	Engineering electromagnetism	6
ELEC2302	Digital system design	6
ELEC2305	Electronic materials and quantum physics	6
ELEC2306	Electronic circuits	6
ELEC2401	Computer architecture	6
ELEC2403	Computer networks	6
ELEC2501	Software engineering & operating systems	6
ELEC2601	Human computer interaction	6
ELEC2603	Systems and network programming	6
ELEC3303	Design of digital integrated circuits	6
ELEC3304	Advanced electronic circuits	6

*ENGG1015 cannot be used for satisfying the requirement of both this Minor programme and another degree programme. If ENGG1015 has already been taken for another degree programme, the student should take 6 credits of discipline elective course in list (ii) as a replacement.

Double-Degrees in BEng/BBA

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

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

Furthermore, such students are deemed to have satisfied 6 credits of Complementary Studies (ELEC2815 Economics, finance and marketing for engineers), 6 credits of Engineering Training (ELEC1812), 12 credits of Breadth Courses after they have successfully completed 24 credits of courses from the following list. The students are also deemed to have satisfied "CAES1507 Professional and technical written communication for engineers" after they have successfully completed the course "CAES1907 Business communication".

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

Minor in Business/Economics/Finance

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

Furthermore, such students are deemed to have satisfied 6 credits of Complementary Studies (ELEC2815 Economics, finance and marketing for engineers) and 6 credits of Engineering Training (ELEC1812) after they have successfully completed 12 credits of courses from the following list.

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

FINA2802	Investments and portfolio analysis	6

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

Level One

ELEC1107 Electrical energy technology (6 credits)

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.

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

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ELEC1202 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.

Assessment: 60% continuous assessment, 40% examination

ELEC1306 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
Assessment: 10% practical work, 30% continuous assessment, 60% examination

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ELEC1307. 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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ELEC1401 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: CSIS1120
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC1503 Object-oriented programming and data structures (6 credits)

This course aims to provide 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 (Level-2), Distributed Computing Systems (Level-3) or Embedded Systems (Level-3).

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: ENGG1002 Computer programming and applications
Mutually exclusive with: ELEC1502, CSIS0396
Assessment: 40% continuous assessment, 60% examination

ELEC1802 Engineering mathematics II (6 credits)

The aim of this course is to equip students with some extended concepts in mathematics needed for engineering. The concepts of complex analysis, Fourier series, and Fourier transform 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 knowledge and understanding of basic engineering mathematics;
2. Explore the concepts to some typical engineering applications;
3. Acquire learning strategies that will enhance their learning experience.

Pre-requisite: ENGG1003 or (ENGG1004 and ENGG1005)
Assessment: 30% continuous assessment, 70% examination

ELEC1812 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 (CE, EE, InfoE and EComE) were 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

Assessment: 100% continuous assessment

ELEC1813 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.

Assessment: 100% continuous assessment

Level Two

ELEC2101 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: ELEC1107 Electrical energy technology
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC2102 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: ELEC1107 Electrical energy technology
Assessment: 20% practical work, 20% continuous assessment, 60% examination

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ELEC2103 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.

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

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ELEC2201 Signals and linear systems (6 credits)

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

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

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

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

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

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ELEC2202 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: ELEC2201 Signals and linear systems
Assessment: 20% practical work, 20% continuous assessment, 60% examination

ELEC2204 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: ELEC2201 Signals and linear systems
Assessment: 20% practical work, 20% continuous assessment, 60% examination

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ELEC2205 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: ELEC2201 Signals and linear systems
Assessment: 15% practical work, 85% examination

ELEC2207 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: ELEC1202 Introduction to electromagnetic waves and fields
Assessment: 50% continuous assessment, 50% examination

ELEC2302 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 characteristics of various block components are discussed. The analysis and synthesis of digital system structure, especially those related to timing, pipeling, and debugging are discussed.

Typically, digital systems have lots of electronic modules interfaced with each other. Thus, designers have to use various tools to design and analyze an entire digital system. In the course, students are guided to acquire skills in using hardware and software development tools through lectures, laboratory sessions and projects.

Pre-requisite: ELEC1306 Electric circuit theory or ELEC1401 Computer organization and microprocessors
Assessment: 50% continuous assessment; 50% examination

ELEC2305 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.

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

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ELEC2306 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: ELEC1306 Electric circuit theory
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC2308. Electronic devices (6 circuits)

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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ELEC2309. 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: ELEC1306 Electric circuit theory or ELEC1307 Fundamentals of optics
Assessment: 20% continuous assessment, 80% examination

ELEC2401 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: ELEC1401 Computer organization and microprocessors
Mutually exclusive with: CSIS0231 Computer architecture
Assessment: 60% continuous assessment, 40% examination

ELEC2403 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, ELEC2701 & CSIS0234
Assessment: 20% continuous assessment, 80% examination

ELEC2501 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 CSIS0230 & CSIS0297
Assessment: 15% practical work, 85% examination

ELEC2601 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: ELEC1503 Object-oriented programming and data structures or CSIS0396 Object-oriented programming and Java
Assessment: 40% continuous assessment, 60% examination

ELEC2603 Systems and network programming (6 credits)

This course aims to provide students with solid background on systems programming, in particular, UNIX system programming, and working level network software development using Java or Unix system facilities. 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: ELEC1503 Object-oriented programming and data structures or (CSIS1119 Introduction to data structures and algorithms and CSIS0396 Object-oriented programming and Java)
Mutually exclusive with: ELEC3628 & CSIS0402
Assessment: 40% continuous assessment, 60% examination

ELEC2814 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.

Assessment: 30% continuous assessment, 70% examination

ELEC2815 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.

Assessment: 30% continuous assessment, 70% examination

ELEC2816 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: CSIS0407
Assessment: 20% continuous assessment, 80% examination

ELEC2817 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.

Pre-requisite: ENGG1003 or (ENGG1004 and ENGG1005)
Assessment: 30% continuous assessment, 70% examination

ELEC2818 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.

Assessment: 100% continuous assessment

Level Three

ELEC3104 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.

Assessment: 40% continuous assessment, 60% examination

ELEC3105 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.

Assessment: 20% continuous assessment, 80% examination

ELEC3106 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;

Assessment: 20% continuous assessment, 80% examination

ELEC3107 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: ELEC2101 Power transmission and distribution
Assessment: 20% continuous assessment, 80% examination

ELEC3111 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: ELEC1107 Electrical energy technology
Assessment: 25% continuous assessment, 75% examination

ELEC3112 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: ELEC2101 Power transmission and distribution
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC3201 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: ELEC2202 Communications engineering
Assessment: 10% practical work, 90% examination

ELEC3203 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: ELEC2202 Communications engineering
Mutually exclusive with: CSIS0328, ELEC6071
Assessment: 30% practical work, 70% examination

ELEC3206 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: ELEC2205 Control and instrumentation
Assessment: 20% practical work, 10% continuous assessment, 70% examination

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ELEC3221 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 circuits 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: ELEC1202 Introduction to electromagnetic waves and fields or ELEC2207 Engineering electromagnetism
Assessment: 30% practical work, 30% continuous assessment, 40% examination,

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ELEC3222 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: ELEC2201 Signals and linear systems
Assessment: 20% continuous assessment, 80% examination

ELEC3223 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: ELEC1306 Electric circuit theory or ELEC2309 Optical devices
Assessment: 30% continuous assessment, 10% practical work, 60% examination

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ELEC3224 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: ELEC2201 Signal and Linear Systems
Mutually exclusive with: CSIS0315
Assessment: 30% continuous assessment, 70% examination

ELEC3225 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 (ELEC2201) 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: ELEC2201 Signal and Linear Systems
Mutually exclusive with: ELEC3505
Assessment: 40% continuous assessment, 60% examination

ELEC3226 Embedded systems (6 credits)

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

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: ELEC2302 Digital system design and ELEC2401 Computer architecture
Assessment: 55% practical work, 45% continuous assessment

ELEC3227 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
Assessment: 30% continuous assessment, 70% examination

ELEC3303 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: ELEC2306 Electronic circuits
Mutually exclusive with: ELEC2303
Assessment: 50% continuous assessment, 50% examination

ELEC3304 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: ELEC2306 Electronic circuits
Mutually exclusive with: ELEC2301
Assessment: 10% practical work, 20% continuous assessment, 70% examination

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ELEC3402 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: ELEC2403 Computer networks or ELEC2701 Internet technologies and applications or CSIS0234 Computer and communication networks
Assessment: 40% continuous assessment, 60% examination

ELEC3503 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.

Assessment: 30% continuous assessment, 70% examination

ELEC3612 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.

Assessment: 50% continuous assessment, 50% examination

ELEC3629 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.

Pre-requisite: ELEC2401
Assessment: 40% continuous assessment, 60% examination

ELEC3630 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: (ELEC2501 Software engineering and operating systems or CSIS0230 Principles of operating systems) and (ELEC2402 Computer communications or ELEC2403 Computer networks or CSIS0234 Computer and communication networks)
Mutually exclusive with: ELEC3622
Assessment: 40% continuous assessment, 60% examination

ELEC3631 Computer network security (6 credits)

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

Pre-requisite: ELEC2402 Computer communications or ELEC2403 Computer networks or CSIS0234 Computer and communication networks
(mutually exclusive with CSIS0327 Computer and network security)
Assessment: 40% continuous assessment, 60% examination

ELEC3705 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: ELEC2811 or ELEC2817 Probability and Statistics in Engineering
Assessment: 30% continuous assessment, 70% examination

ELEC3818 Senior design project (12 credits)

This course aims at providing the very fundamental training in conducting an individual design project Technical 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.

Assessment: 100% continuous assessment
