THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

Department of
Electronic and Information Engineering
電子及資訊工程學系

BEng (Hons) Degree Programme in Electronic and Information Engineering

Code: 42470; Full-time, Credit-based

Programme Booklet

(2022/23)

Department of Electronic and Information Engineering

Bachelor of Engineering (Honours) Degree Programme in

Electronic and Information Engineering

Full-time Credit-based

Code: 42470

Programme Booklet

2022/2023

BEng(Hons) in Electronic and Information Engineering (Full-Time)

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This Programme Booklet is subject to review and changes which the Department can decide to make from time to time. Students will be informed of the changes as and when appropriate.

1. GENERAL INFORMATION

1.1 Cohort of Intakes and readership

This programme booklet is the Programme Requirement Document (PRD) for the 2022/23 cohort. Just in case any updated information is necessary after the publication of this booklet, students are requested to refer to the URL https://www.polyu.edu.hk/eie/study/undergraduate-programmes/beng_eie_42470/ for the most updated information. Should there be any discrepancy between the contents of this booklet and University regulations, University regulations always prevail.

1.2 Programme Information

Title of Programme	**Bachelor of Engineering (Honours) in Electronic and Information Engineering**
Host Department	Department of Electronic and Information Engineering (EIE)
Programme Structure	Credit-based
Final Award	Bachelor of Engineering (Honours) in Electronic and Information Engineering 電子及資訊工程學 (榮譽) 工學士
Mode of Attendance	Full-time
Professional Recognition	The programme has been granted full accreditation from the Hong Kong Institution of Engineers (HKIE). Graduates of the programme will satisfy the academic requirements for Corporate membership of the HKIE.

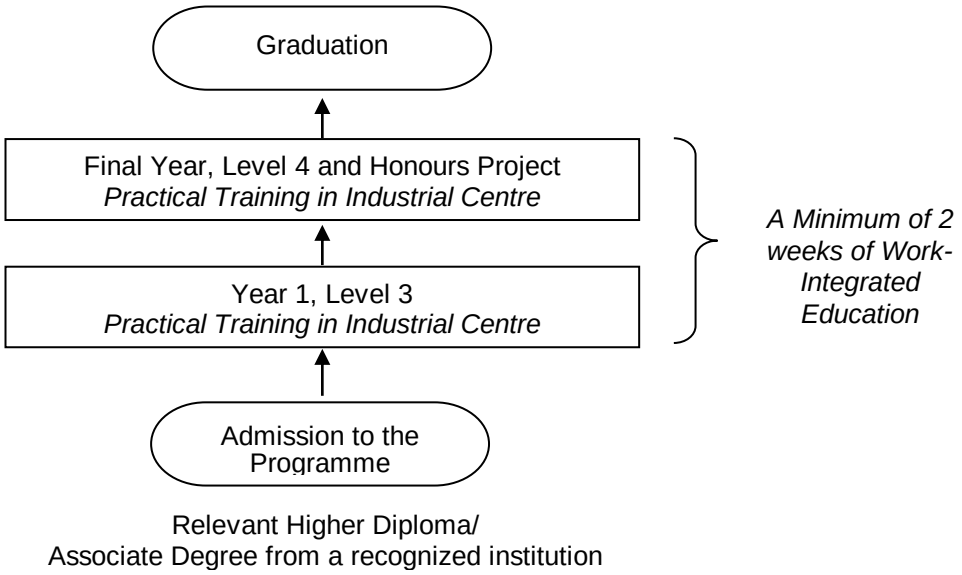
Normal Duration	Senior Year Intake Full-time Mode: 2 years Dual Degree Programme: 2 years	
Total Credits for Graduation (Academic Credits + Training Credits + WIE Training Credit)	Academic Credits: • Senior Year Intake: • Dual Degree Programme: Training Credits: 8 (for all intakes) Work-Integrated Education Training Credit: 1 (for all intakes)	 67 credits 70 credits

1.3 Modes of Attendance

A mode of study is characterized by the credits and subjects required and the progression pattern in Year 1 to Year 2.

Senior Year Intake Full-time Mode

Under this mode, senior year students will normally pursue their study by going through Year 1 and Year 2 in full time and then graduate at the end of Year 2 after having satisfied all programme requirements.



2. RATIONALE, AIMS AND INTENDED LEARNING OUTCOMES OF THE PROGRAMME

2.1 Background and Rationale

Electronic and information engineering are among the key technologies that play important roles in daily living. Various sectors, such as business, commerce, communication, education, entertainment, healthcare and transportation, require electronic and information engineering for smooth operation. Hence, it is envisioned that there is a great need of professionals who exercise knowledge and leadership in the areas of electronic and information engineering, as well as generic skills of problem solving, innovation, analysis and adaptability to contribute to the technological and economic development in the region and in the world.

2.2 Aims

This Programme aims at producing graduates with:

1. a wide range of professional knowledge and skills relevant to electronic and information engineering,
2. creativity and innovation,
3. adaptability to changing technology and society, and
4. all-rounded attributes.

2.3 Relationship of Programme Aims to University Missions

The University has the following missions:

1. To pursue impactful research that benefits the world.
2. To nurture critical thinkers, effective communicators, innovative problem solvers and socially responsible global citizens.
3. To foster a University community in which all members can excel in their aspirations with a strong sense of belonging and pride.

The following table illustrates the relationship between Programme Aims and University Missions:

Programme Aims	University Missions		
	1	2	3
1	X	X	X
2	X	X	
3	X	X	
4		X	X

2.4 Institutional Learning Outcomes

It is PolyU's educational mission to nurture competent professionals who are also critical thinkers, effective communicators, innovative problem solvers, lifelong learners, ethical leaders and socially responsible global citizens. The institutional learning outcomes for these attributes are provided as follows:

1. **Competent professional:** Graduates should be able to integrate and to apply in-depth discipline knowledge and specialised skills that are fundamental to functioning effectively as an entry-level professional (*professional competence*); understand the global trends and opportunities related to their professions (*global outlook*); and demonstrate

entrepreneurial spirit and skills in their work, including the discovery and use of opportunities, and experimentation with novel ideas (*entrepreneurship*).

2. **Critical thinker:** Graduates should be able to examine and critique the validity of information, arguments, and different viewpoints, and reach sound judgments on the basis of credible evidence and logical reasoning.
3. **Effective communicator:** Graduates should be able to comprehend and communicate effectively in English, and Chinese where appropriate, orally and in writing, in professional and day-to-day contexts.
4. **Innovative problem solver:** Graduates should be able to identify and define problems in both professional and day-to-day contexts, and produce innovative solutions to solve problems.
5. **Lifelong learner:** Graduates should be able to recognise the need for continual learning and self-improvement, and be able to plan, manage and evaluate their own learning in pursuit of self-determined goals.
6. **Ethical leader:** Graduates should have an understanding of leadership and be prepared to serve as a leader and a team player (*leadership and teamwork*); demonstrate self-leadership and psychosocial competence in pursuing personal and professional development (*intrapersonal competence*); be capable of building and maintaining relationship and resolving conflicts in group work situations (*interpersonal competence*); and demonstrate ethical reasoning in professional and day-to-day contexts (*ethical reasoning*).
7. **Socially responsible global citizen:** Graduates should have the capacity for understanding different cultures and social development needs in the local, national and global contexts (*interest in culture and social development*); and accept their responsibilities as professionals and citizens to society, their own nation and the world (s*ocial, national, and global responsibility*).

2.5 Intended Learning Outcomes of the Programme

On successful completion of the BEng(Hons) in Electronic and Information Engineering programme, students will be able to:

Category A Professional/Academic Knowledge and Skills

1. Understand the fundamentals of science and engineering, and have the ability to apply them.
2. Design and conduct experiments, as well as to evaluate the outcomes.

3. Design systems, components and processes to meet given specifications and constraints.
4. Identify, formulate and solve problems relevant to EIE.
5. Use modern engineering/IT tools appropriate to EIE practice.
6. Know the contemporary issues, and understand the impact of engineering solutions in a global and societal context.

Category B Attributes for All-roundedness

7. Work with others collaboratively in a multi-disciplinary team and have a knowledge of leadership.
8. Recognize social, professional and ethical responsibility.
9. Communicate effectively.
10. Recognize the need for and engage in life-long learning.

2.6 Relationship of Programme Outcomes to Programme Aims

The following table illustrates the relationship between Programme Outcomes and Programme Aims:

Programme Outcomes	Programme Aims			
	1	2	3	4
1	X		X	
2	X	X	X	
3	X	X	X	
4	X	X	X	
5	X		X	
6	X		X	X
7				X
8	X		X	X
9				X
10			X	X

2.7 Relationship of Intended Learning Outcomes of the Programme to Institutional Learning Outcomes

The following table illustrates the relationship between Intended Learning Outcomes of the Programme and Institutional Learning Outcomes:

Programme Outcomes	Institutional Learning Outcomes						
	1	2	3	4	5	6	7
1	X						
2	X	X					
3	X	X		X			
4	X			X			
5	X						
6	X	X				X	X
7						X	X
8						X	X
9			X				
10					X		

3. ENTRANCE REQUIREMENTS

For students who enter this programme by following the Hong Kong Diploma of Secondary Education (HKDSE) system or other local qualifications, they must satisfy both the University general minimum entrance requirements AND the programme-specific requirements as set out below.

3.1 University General Minimum Entrance Requirements

3.1.1 For those applying on the basis of other local qualifications:

- An appropriate Diploma (as specified in section 3.2 below) passed with credit or a Higher Certificate (as specified in section 3.2 below) from a recognised institution; OR
- An appropriate Associate Degree/Higher Diploma from a recognised institution (suitable candidates will be considered for advanced standing entry to the senior year curriculum).

3.2 Programme-specific Minimum Entrance Requirements

3.2.2 For those applying on the basis of other qualifications:

- An Associate Degree, Higher Diploma, Higher Certificate or Diploma (with Credit) in Engineering, Electronic Engineering, Information Engineering, Communication Engineering, Electrical Engineering, Computer Engineering or other similar disciplines.

3.2.3 For those applying on the basis of "advanced standing" status:

- Holders of Associate Degree/Higher Diploma in Electronic (and Information) Engineering, Electrical Engineering or other similar disciplines may be given credit transfer.

3.3 Admission of Advanced Standing Students Based On Advanced Academic Qualifications

(i) With approval by the Faculty, students may be admitted to the Programme beyond the initial stage provided they have demonstrably reached the general level of educational development which would have been reached had they taken the earlier stage(s) of the Programme, and provided that there is a high probability that they will complete the Programme successfully. These students will still be labelled as first year students even though they are following the curriculum of a later stage.

(ii) Students admitted on the basis of IB/A-Level qualifications will be given credit transfer, up to a maximum of 25% of the credit requirement for a 4-year degree programme in which 6 credits are for the Cluster Area Requirement (CAR), 3 credits for Freshmen Seminar, and 3 credits for University English. For IB/GCE candidates who are able to attain the specified grade and total score requirements, a maximum of 6 credits could be further given from the English and Chinese LCR subjects. Any further credit transfer on the remaining CAR or discipline-specific subjects will be decided by the programme host department.

(iii) The number of credits that a student is required to complete for the award concerned will be determined at the time of admission, and no later than the end of the subject add/drop period.

(iv) Information on the number of credits required for normal entry and for the individual students based on their admission qualifications will both be reflected on the transcripts of study.

(v) If students who are admitted to the programme with entry credit transfer wish to gain higher grades by studying the subject(s) again, they may approach their programme offering Department for declining the provision of taking fewer credits no later than the end of the add/drop period.

(vi) Students who, upon admission, wish to transfer any credits from their previous studies, and take fewer credits than those confirmed at the time of admission, will have to follow the procedures for "application for credit transfer" and to pay the related fees. The credits to be transferred are subject to the rule on validity period for subject credits.

3.4 Admission of students for Dual Degree Programme

- Students from Southern University of Science and Technology (SUSTech) should successfully complete 2 years of undergraduate education at SUSTech with a major in undergraduate programme and be selected by SUSTech as candidates for application to the Dual programme, be of comparable admission standard as PolyU Joint Entrance Examination (JEE) admittees, and meet PolyU's English language proficiency requirements.

4. PROGRAMME, SUBJECTS, AND CREDITS

4.1 Programme Specified Subjects

Most subjects to be studied at Year 1 and Year 2 are of standard credit value carrying 3 credits each, except for some subjects, such as Integrated Project, Honours Project, Professional Communication, etc. which carry credits other than 3. A student is expected to spend about 35 to 45 hours of study (inclusive of class contact and other study effort) to earn a credit. Table 4.1 lists the subjects, their credit values, and the category they belong to (Compulsory or Elective). All discipline-specific subjects shown as compulsory are non-deferrable and must be taken in accordance to the progression pattern. The subjects offered will be updated from time to time according to the need of society and the profession. The specified progression patterns stated in Section 5 of this programme document are subject to change due to general changes in the University's rules and regulations and reviews by the Department.

Students admitted to the programme through Senior Year entry route are required to complete a minimum of 67 or more academic credits to satisfy the degree requirements. The exact minimum number of academic credits required will depend on the academic background of the students. The subjects contributing to the 67 academic credits are listed in Table 4.1. However, they may choose to take additional subjects beyond the basic requirements. Please refer to Section 27 for detailed information on the requirements for graduation.

Table 4.1 Subjects Category and Credits

Year 1 and Year 2 Curricula

Subject Code	Subject Title	CR	Category of Subjects
General University Requirements (GUR)			
-	Cluster-Area Requirement I (CAR-English Language)	3	COM
-	Cluster-Area Requirement II (CAR M)	3	COM
-	Service-Learning	3	COM
-	Language and Communication Requirement I, II and III (LCR I, LCR II and LCR III)*	0-9	COM
-	Essential Components of General Education (Online Tutorials in Academic Integrity (OTAI), Artificial Intelligence and Data Analytics (AIDA), Innovation and Entrepreneurship (IE) and National Education (NE))	0	COM
Discipline-Specific Requirement (DSR)			
AF3625	Engineering Economics	3	COM
AMA2104	Probability and Engineering Statistics	3	COM
CLC3241P	Professional Communication in Chinese	2	COM
EIE3100	Analogue Circuit Fundamentals	3	COM
EIE3105	Integrated Project	6	COM
EIE3109	Mobile Systems and Application Development	3	ELE
EIE3112	Database System	3	ELE
EIE3123	Dynamic Electronic Systems	3	COM
EIE3305	Integrated Analogue and Digital Circuits	3	ELE
EIE3311	Computer System Fundamentals	3	COM
EIE3312	Linear Systems	3	COM
EIE3320	Object-Oriented Design and Programming	3	ELE
EIE3331	Communication Fundamentals	3	COM
EIE3333	Data and Computer Communications	3	COM
EIE4100	Computer Vision and Pattern Recognition	3	ELE
EIE4102	IP Networks	3	ELE
EIE4104	Mobile Networking	3	ELE
EIE4105	Multimodal Human Computer Interaction Technology	3	ELE
EIE4106	Network Management and Security	3	ELE
EIE4108	Distributed Systems and Cloud Computing	3	ELE
EIE4110	Introduction to VLSI and Computer-Aided Circuit Design	3	ELE
EIE4113	Wireless and Mobile Systems	3	ELE
EIE4114	Digital Forensics for Crime Investigation	3	ELE
EIE4116	Surveillance Studies and Technologies	3	ELE
EIE4118	Intrusion Detection and Penetration Test	3	ELE
EIE4119	Mobile Device System Architecture	3	ELE
EIE4122	Deep Learning and Deep Neural Networks	3	ELE
EIE4402	Power Electronics	3	ELE
EIE4413	Digital Signal Processing	3	ELE

Subject Code	Subject Title	CR	Category of Subjects
EIE4428	Multimedia Communications	3	ELE
EIE4432	Web Systems and Technologies	3	ELE
EIE4433	Honours Project	6	COM
EIE4435	Image and Audio Processing	3	ELE
EIE4449	Optical Communication Systems and Networks	3	ELE
ELC3531	Professional Communication in English	2	COM
ENG3003	Engineering Management	3	COM
ENG3004	Society and The Engineer	3	COM
ENG4001	Project Management	3	ELE
EIE2901/IC2114	Industrial Centre Training I for EIE	5	TRN
EIE3901/IC382	Multidisciplinary Manufacturing Project	3	TRN

Note:

AF	School of Accounting and Finance
AMA	Department of Applied Mathematics
AP	Department of Applied Physics
CLC	Chinese Language Centre
COM	Compulsory
EIE	Department of Electronic and Information Engineering
ELC	English Language Centre
ELE	Elective
ENG	Faculty of Engineering
IC	Industrial Centre
TRN	Training
*	Students are also required to fulfil the Language and Communication Requirements (LCR) as set out in Section 4.2 below in order to be eligible for graduation.

Subject to the approval by the Programme Leader, students may take at most one Level 5 subject per semester as a final-year technical elective during their final year of study. The total number of Level 5 subjects taken shall not exceed 2. The following is the list of Level 5 subjects currently available.

Subject Code	Subject Title	CR	Category of Subjects
EIE509	Satellite Communications - Technology and Applications	3	ELE
EIE511	VLSI System Design	3	ELE
EIE515	Advanced Optical Communication Systems	3	ELE
EIE522	Pattern Recognition: Theory & Applications	3	ELE
EIE529	Digital Image Processing	3	ELE
EIE546	Video Technology	3	ELE
EIE553	Security in Data Communication	3	ELE
EIE557	Computational Intelligence and its Applications	3	ELE
EIE558	Speech Processing and Recognition	3	ELE
EIE563	Digital Audio Processing	3	ELE
EIE566	Wireless Communications	3	ELE
EIE567	Wireless Power Transfer Technologies	3	ELE
EIE568	IoT - Tools and Applications	3	ELE
EIE569	Sensor Networks	3	ELE
EIE573	Mobile Edge Computing	3	ELE
EIE575	Vehicular Communications and Inter-Networking Technologies	3	ELE
EIE577	Optoelectronic Devices	3	ELE
EIE579	Advanced Telecommunication Systems	3	ELE
EIE580	RF and Microwave Integrated Circuits for Communication System Applications	3	ELE
EIE587	Channel Coding	3	ELE
EIE589	Wireless Data Network	3	ELE

4.2 Language and Communication Requirements (LCR)

Students are required to fulfil the four major components of the overall English and Chinese language requirements below in order to be eligible for graduation:

(i) Language and Communication Requirements (LCR) in English (6 credits) and Chinese (3 credits), as stated in Sections 4.2.1 and 4.2.2 below;
(ii) Writing Requirement, as stated in Section 4.2.3 below;
(iii) Reading Requirement, as stated in Section 4.2.4 below; and
(iv) Discipline-Specific Language Requirement, as stated in Section 4.2.5 below.

Students not meeting the equivalent standard of the Undergraduate Degree LCR will be required to take degree LCR subjects on top of the normal curriculum requirement. The Department will refer to the guidelines provided by the Language Centres (ELC and CLC) to determine whether a new student has met the equivalent standard.

4.2.1 English

All undergraduate students must successfully complete two 3-credit English language subjects as stipulated by the University (Table A), according to their English language proficiency level. These subjects are designed to suit students' different levels of English language proficiency at entry, as determined by their HKDSE score or the English Language Centre (ELC) entry assessment (when no HKDSE score is available, e.g. in the case of non-local students).

Students entering the University with specified attainment grades in certain public examinations can be given credit transfer or exemption for one or both LCR English subjects.

Table A: English LCR subjects (each 3 credits)

English language competence level/ Subject	***Practical English for University Studies***	***English for University Studies***	**Any LCR Proficient level elective subject in English (Table B)**
HKDSE Level 4 and above or equivalent	--	Subject 1	Subject 2
HKDSE Level 3 or equivalent	Subject 1	Subject 2	--

Table B: Proficient level elective subjects for DSE Level 4 students and above (or equivalent) (each 3 credits)

LCR Proficient level elective subjects	Advanced English Reading and Writing Skills
	Persuasive Communication
	English in Literature and Film
	Advanced English for University Studies

(The above framework will also apply to students on Senior Year curriculum.)

4.2.2 Chinese

All undergraduate students are required to successfully complete <u>one</u> 3-credit Chinese language subject successfully as stipulated by the University, according to their Chinese language proficiency level. (Table C).

Table C: Chinese LCR subjects

Categories of students	**Required subject**
For Chinese speaking students	A Chinese LCR subject
For non-Chinese speakers or students whose Chinese standards are at junior secondary level or below	One subject from **Table D** below

Table D: Chinese LCR subjects for non-Chinese speakers or students whose Chinese standards are at junior secondary level or below

Subject (3 credits)	**Pre-requisite/exclusion**
Chinese I (for non-Chinese speaking students)	For non-Chinese speaking students at beginners' level
Chinese II (for non-Chinese speaking students)	• For non-Chinese speaking students; and • Students who have completed Chinese I or equivalent
Chinese III (for non-Chinese speaking students)	• For non-Chinese speaking students at higher competence levels; and • Students who have completed Chinese II or equivalent
Chinese IV (for Non-Chinese speaking students)	• For non-Chinese students at intermediate competence levels; and • Students who have completed Chinese III or equivalent
Chinese Literature – Linguistics and Cultural Perspectives (for non-Chinese speaking students)	For non-Chinese speaking students at higher competence levels

Students who have obtained verified qualifications or certain results in some public examinations [e.g. HKDSE, HKALE, JEE, GSAT(Taiwan)] may be granted credit transfer/exemption for the Chinese LCR subject.

4.2.3 Writing Requirement in CAR Subjects

In additional to the LCR in English and Chinese explained above, all students must also, among the Cluster Areas Requirement (CAR) subjects they take, pass one subject that requires a substantial piece of writing in English and one subject that requires a substantial piece of writing in Chinese. Students who are non-Chinese speakers or those whose Chinese standards are at junior secondary level or below will be exempted from the Chinese Writing requirement.

4.2.4 Reading Requirement in CAR Subjects

All students must, among the CAR subjects they take, must pass one subject that requires the reading of an extensive text in English and one subject that requires the reading of an extensive text in Chinese. Students who are non-Chinese speakers or those whose Chinese standards are at junior secondary level or below will be exempted from the Chinese Reading requirement.

A list of approved CAR subjects for meeting the Writing Requirement (with a "W" designation) and for meeting the Reading Requirement (with an "R" designation) is shown at: https://www.polyu.edu.hk/ous/GURSubjects/CAR.php

4.2.5 Discipline-Specific Language Requirement

In addition to the LCR mentioned in Sections 4.2.1 to 4.2.4 above, students also have to complete the subject "Professional Communication" (2 credits in English and 2 credits in Chinese) as the discipline-specific language requirements.

Students who are non-Chinese speakers or those whose Chinese standards are at junior secondary level or below will be exempted from the Discipline-Specific Chinese Language requirement, i.e. CLC3241P Professional Communication in Chinese. These students must take 1 subject of any level **recommended by CLC/EIE** to make up for the minimum total credit requirement.

5. SPECIFIED PROGRESSION PATTERN

5.1 Senior Year Intake:
- For Senior Year students with relevant Higher Diploma/Associate Degree from a recognized institution [Note 3]

Year 1	
Semester 1 (15 credits)	**Semester 2 (18 credits)**
EIE3100 Analogue Circuit Fundamentals (3 credits)	AMA2104 Probability and Engineering Statistics (3 credits)
EIE3311 Computer System Fundamentals (3 credits)	EIE3123 Dynamic Electronic Systems (3 credits)
EIE3312 Linear Systems (3 credits)	EIE3331 Communication Fundamentals (3 credits)
EIE3333 Data and Computer Communications (3 credits)	ENG3004 Society and the Engineer (3 credits)
	Technical Elective 1 (3 credits) [Note 2]
EIE3105 Integrated Project (6 credits)	
Essential Components of General Education (0 credit)	
EIE2901/IC2114 Industrial Centre Training I for EIE (5 training credits)	
Year 2	
Semester 1 (18 credits)	**Semester 2 (16 credits)**
AF3625 Engineering Economics (3 credits)	CLC3241P Professional Communication in Chinese (2 credits)
ENG3003 Engineering Management (3 credits)	ELC3531 Professional Communication in English for Engineering Students (2 credits)
Technical Elective 2 (3 credits) [Note 2]	Technical Elective 4 (3 credits) [Note 2]
Technical Elective 3 (3 credits) [Note 2]	CAR-English Language (3 credits) [Note 1]
Service-Learning (3 credits)	CAR M (3 credits) [Note 1,4]
EIE4433 Honours Project (6 credits)	
EIE3901/IC382 Multidisciplinary Manufacturing Project (3 training credits)	

Total Number of Credits: 67 [Note 5]

Note 1: The study pattern for the subjects is indicative only. Students may take these subjects according to their own schedule. However, CAR – English Language should be completed in the first year of study. Students are recommended to consult their Academic Advisor for guidance and planning if necessary.

Note 2: At least 2 technical electives must be at level 4 or above.

Note 3: This is an example only, which shows a possible study pattern for graduates with relevant Higher Diploma/Associate Degree from a recognized institution. The exact study pattern for senior year intakes varies from student to student depending on the approved subjects transferred.

Note 4: Students also need to fulfil the Chinese reading and writing requirements (CR/CW), if such requirements have not been fulfilled in previous studies.

Note 5: The credits required and progression pattern presented above are for students who have been given credit transfer of the 9 credits Undergraduate Degree LCR subjects based upon their previous studies. Students not meeting the equivalent standard of the Undergraduate Degree LCR will be required to take the required subjects. Details on the Undergraduate Degree LCR subjects are given in section 4.2 of this booklet.

5.2 Dual Degree – PolyU BEng (Hons) in EIE and SUSTech BEng in Microelectronics Science and Engineering
- For dual degree students who have completed the first 2 years of study at the Southern University of Science and Technology

Year 1	
Semester 1 (15 credits)	**Semester 2 (21 credits)**
EIE3100 Analogue Circuit Fundamentals (3 credits)	AMA2104 Probability and Engineering Statistics (3 credits)
EIE3311 Computer System Fundamentals (3 credits)	EIE3331 Communication Fundamentals (3 credits)
EIE3333 Data and Computer Communications (3 credits)	EIE3123 Dynamic Electronic Systems (3 credits)
LCR II (English) (3 credits)	ENG3004 Society and the Engineer (3 credits)
CAR - A (3 credits) Note 1	Technical Elective 1 (3 credits) Note 2
EIE3105 Integrated Project (6 credits)	
Essential Components of General Education (0 credit)	
EIE2901/IC2114 Industrial Centre Training I for EIE (5 training credits)	
Year 2	
Semester 1 (18 credits)	**Semester 2 (16 credits)**
ENG3003 Engineering Management (3 credits)	AF3625 Engineering Economics (3 credits)
Technical Elective 2 (3 credits) Note 2	CLC3241P Professional Communication in Chinese (2 credits)
Technical Elective 3 (3 credits) Note 2	ELC3531 Professional Communication in English for Engineering Students (2 credits)
LCR III (Chinese) (3 credits)	Technical Elective 4 (3 credits) Note 2
Service-Learning (3 credits)	Technical Elective 5 (3 credits) Note 2
EIE4433 Honours Project (6 credits)	
EIE3901/IC382 Multidisciplinary Manufacturing Project (3 training credits)	

Total Number of Credits: 70 academic credits + 8 training credits

Note 1: The study pattern for the subjects is indicative only. Students may take these subjects according to their own schedule. They are recommended to consult their Academic Advisor for guidance and planning if necessary.

Note 2: At least 3 technical electives must be at level 4 or above.

6. CURRICULUM MAP

Alignment of Subjects with Programme Intended Learning Outcomes:

	Programme Outcomes									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A. GENERAL UNIVERSITY REQUIREMENTS (GUR)										
Cluster-Area Requirements (CAR) (2 Subjects)										
CAR A/English Language (Human Nature, Relations and Development with English)								**T,P**	**T,P**	**T,P**
CAR M (Chinese History and Culture)								**T,P**	**T,P**	**T,P**
Other Requirements										
SL - Service-Learning								**T,P**		
B. DISCIPLINE-SPECIFIC REQUIREMENTS (DSR)										
Compulsory - Mathematics and Basic Sciences Subjects										
AMA2104 Probability and Engineering Statistics	**T,P**			**T,P**	**T,P**				**T,P**	**T**
Compulsory - Engineering Subjects										
EIE3100 Analogue Circuit Fundamentals	**T,P**			**T,P, M**						
EIE3105 Integrated Project	**T,P**	**T,P**	**T,P, M**	**T,P**	**T,P**		**T,M**		**T,P, M**	
EIE3123 Dynamic Electronic Systems	**T,P, M**		**T,P, M**	**T,P**	**T,P**		**P**			
EIE3311 Computer System Fundamentals	**T**	**P**	**T**							
EIE3312 Linear Systems	**T,P**	**T,P**	**T,P**	**T**	**P**					**T**
EIE3331 Communication Fundamentals	**T**	**T,P**	**T,P**	**T**	**T,P**				**T**	
EIE3333 Data and Computer Communications	**T**	**T,P**		**T**	**T,P**				**T**	
Compulsory - Language and Complementary Studies										
CLC3241P Professional Communication in Chinese									**T,P, M**	
ELC3531 Professional Communication in English for Engineering Students									**T,P, M**	
AF3625 Engineering Economics						**T,P, M**	**T,P**		**T,P**	**T,P**
ENG3003 Engineering Management						**T**	**T,P, M**	**T**	**T,P, M**	
ENG3004 Society and The Engineer						**T,P, M**	**T,P, M**	**T,P, M**	**T,P**	
Compulsory - Capstone Project										
EIE4433 Honours Project+	**T,P, M**	**T,P, M**	**T,P, M**	**T,P, M**	**T,P, M**	**T,P, M**	**T,P**		**T,P, M**	**T,P, M**
Compulsory - Industrial Centre Training										
EIE2901/IC2114 Industrial Centre Training I for EIE	**T,P**				**T,P**			**T,P, M**		**T,P, M**
EIE3901/IC382 Multidisciplinary Manufacturing Project			**T,P, M**		**T,P**		**T,P, M**			
Elective - Engineering Subjects (Select Any 4 (For Senior Year Intake) / 5 (For Normal Year 1 Intake))										
EIE3109 Mobile Systems and Application Development			**T,P**		**T,P**					

	Programme Outcomes									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
EIE3112 Database System	**T**				**T**				**T,P**	
EIE3305 Integrated Analogue and Digital Circuits	**T,P**			**T,P, M**	**T,P**		**T,P**			
EIE3320 Object-Oriented Design and Programming	**T**		**T,P, M**	**T,P**	**P**		**P**			
EIE4100 Computer Vision and Pattern Recognition	**T**	**T**	**T**	**T**	**T,P, M**		**T**			**T**
EIE4102 IP Networks	**T**				**T,P, M**	**T**				**T**
EIE4104 Mobile Networking	**T**			**T,P, M**	**T,P**	**T**				**T**
EIE4105 Multimodal Human Computer Interaction Technology	**T,P**				**T,P, M**					
EIE4106 Network Management and Security	**T**	**T,P**	**T**	**T,P, M**	**T,P**			**T,P, M**	**T**	**T**
EIE4108 Distributed Systems and Cloud Computing	**T,P**		**T,P**	**T**	**T,P, M**				**T,P**	
EIE4110 Introduction to VLSI and Computer-Aided Circuit Design	**T,P**	**T,P, M**		**T,P**			**T,P**			
EIE4113 Wireless and Mobile Systems	**T,P, M**	**T,P, M**			**T,P**	**T,P**				
EIE4114 Digital Forensics for Crime Investigation	**T,P, M**				**T,P**				**T,P**	
EIE4116 Surveillance Studies and Technologies	**T,P, M**				**T,P**			**T,P, M**		
EIE4118 Intrusion Detection and Penetration Test	**T,P, M**	**T,P**			**T,P**	**T,P**		**T,P**	**T,P**	
EIE4119 Mobile Device System Architecture				**T**	**T,P**					**T,P, M**
EIE4122 Deep Learning and Deep Neural Networks	**T,P**				**T,P**					
EIE4402 Power Electronics	**T,P, M**	**T,P, M**		**T,P**			**T,P**			
EIE4413 Digital Signal Processing	**T,M**	**P**	**T,P, M**	**T**	**P**					**T**
EIE4428 Multimedia Communications	**T,P, M**		**T,P**	**T,P, M**						
EIE4432 Web Systems and Technologies	**T**		**T,P**					**T,P, M**		**T,P, M**
EIE4435 Image and Audio Processing	**T,M**	**P**		**P**			**P**			
EIE4449 Optical Communication Systems and Networks	**T**	**T,P**	**T**	**T,M**			**T**		**T**	
ENG4001 Project Management			**T,P**		**T,P**				**T,P**	**T,P, M**

Note:

Programme Outcomes:

1. Understand the fundamentals of science and engineering, and have the ability to apply them.
2. Design and conduct experiments, as well as to evaluate the outcomes.
3. Design systems, components and processes to meet given specifications and constraints.
4. Identify, formulate and solve problems relevant to EIE.
5. Have the ability to use modern engineering/IT tools appropriate to EIE practice.
6. Have a knowledge of contemporary issues, and understand the impact of engineering solutions in a global and societal context.
7. Be able to work with others collaboratively in a multi-disciplinary team and have a knowledge of leadership.
8. Recognize social, professional and ethical responsibility.
9. Communicate effectively.
10. Recognize the need for and to engage in life-long learning

T: Teach
P: Practise
M: Measured
+: Support of outcomes depends on particular project/subject design and requirements

7. HONOURS PROJECT

The Honours Project is considered to be of great importance. This is reflected in the number of credits it carries, being 6 credits which are equivalent to two standard-sized subjects. Furthermore, the result of the Honours Project will be very important when the Board of Examiners considers the award classification of a student. Normally, the Board of Examiners will expect a very good grade for the Honours Project when a student is to be awarded a high Honours classification.

One of the important features of the Honours Project is "learning by doing". It is intended to be a platform for the students to develop their intellectual and innovative abilities and to give them the opportunities to integrate and apply the knowledge and analytical skills gained in previous stages of study. It should also provide students with opportunities to develop their problem-solving skills and communication skills. The process from conceptualization to final implementation and testing, through problem identification and the selection of appropriate solutions will be practised by the students.

7.1 Project Management

Normally each student will be assigned one project under the supervision of an academic staff member so that he/she will work independently to achieve the project objectives. In other cases, several students may work on different aspects of a large-scale project.

The assignment of projects is expected to be completed by the month of June preceding the beginning of the final year of study. Guidelines for Honours Project are given to students at the beginning of the final year.

7.2 Project Assessment

Assessment of the Honours Project focuses in three main areas: project reports, oral presentations and work done over the whole project period. Assessment will be done by the project supervisor and an assessor. The Project Management Team, which is composed of the Programme Leader and staff members from teaching sections, will oversee the overall standard of assessment of the projects. The Project Management Team will also oversee the daily operation, such as fixing the dates of project report submission, oral presentation, demonstration, etc.

8. INDUSTRIAL CENTRE TRAINING

Industrial Centre (IC) Training is a practical training element in this curriculum to provide a chance for the students to develop hands-on experience in various engineering domains in order to prepare for a career in the engineering profession.

Students must pass all IC Training subjects in order to be considered for the BEng(Hons) in Electronic and Information Engineering award. IC Training is graded in the normal manner from A+ to F and will be counted in the evaluation of the Grade Point Average (GPA). However, they will not be counted towards Weighted GPA or Award GPA. The assessment method of Industrial Centre Training is based on 100% continuous assessment. The assessment components are workshop reports, competency in practical works, and appreciation tests. To complete the IC Training successfully, students must demonstrate good professional attributes including responsible attitude in training, excellent attendance with active learning, exercising best practice and care in equipment and tools while observing all safety codes. Details of assessment scheme are available from Industrial Centre.

9. WORK-INTEGRATED EDUCATION (WIE)

9.1 WIE is a mandatory component of the programme. There can be several routes or options for the students to pursue Work-Integrated Education (WIE). These options include the One-year Internship Scheme (OIS), industrial projects and other workplace training opportunities provided by the University or found by students themselves, etc.

9.2 Credits Requirement

In order to graduate from this programme, students must attain a minimum of <u>one</u> WIE training credit within the period of study. Following the Faculty of Engineering's guideline, students will be awarded one WIE training credit for acquiring two weeks' full-time training. WIE training credits will not be counted towards the Grade Point Average (GPA) or the Weighted GPA (WGPA). After assessing the training performance, a Pass or a Fail grade will be awarded to the student on his/her WIE component.

9.3 Intended Learning Outcomes of WIE

Since WIE can take different forms and be applied to different kinds of job, the learning outcomes to be achieved vary depending on the job nature and its duration

engaged by the student. However, based on the experience gained, WIE can bring a lot of advantages to students' learning both in the profession-specific areas and in their all-round development. The intended learning outcomes of WIE are elaborated in the following paragraph.

On successful completion of the WIE component, the students will be able to:

(i) Apply knowledge and skills learned from the Programme on the job in a broad context of networking and multimedia profession.
(ii) Recognize the operation and requirement of real-life business, leading to the development of entrepreneurship, global outlook, professional ethics, social and cultural understanding.
(iii) Recognize the expectation of employers, hence leading to better employability.
(iv) Develop their all-round attributes such as interpersonal skills and leadership.
(v) Develop their critical and creative thinking, and problem-solving skills while taking into account various real-life constraints, helping them to pursue life-long learning and continuing professional development.

9.4 WIE Options

WIE component under the Programme can be in many forms, including One-year Internship Scheme (OIS), industrial project and other job opportunities.

9.4.1 One-year Internship Scheme (OIS)

The OIS lasts for 1 year. Under the OIS, the students will pursue Year 1 study in full time, and then engage in industrial training in Year. After the industrial training year, the students will pursue their final-year study in full time again. Normally the students will graduate at the end of Year 3 after having satisfied all programme requirements.

Students who would like to join the OIS are required to submit an application to the Department prior to the commencement of the industrial training. They can choose to take subject(s) in a semester during the industrial training year but they will be required to pay a flat tuition fee.

9.4.2 Industrial Project

Industrial projects are Honours Projects working with the industry. Students working on an industrial project will pursue the project in a company for a certain period. The students will work with a real-life project in the real working environment.

9.4.3 Other Job Opportunities

It is possible that students find jobs for themselves to work during the summer vacation. This kind of job opportunity will be judged by the Department whether it is helpful to the students in achieving the intended learning outcomes of WIE. The students and the Academic Advisor/WIE Coordinators will work collaboratively with regard to the job selection and the subsequent training contents. The Department will constantly monitor the progress. At the end of the training, an assessment will be made on the achievement of learning outcomes.

9.5 Guidelines for Operation and Supervision of WIE

The Department adopts a set of strategies to support students' learning in the workplace. The followings are the details of the operation at different stages.

9.5.1 Preparation

The Department will actively align with the industry to get WIE placement opportunities for students. It is important for students to be fully aware of the benefits brought by WIE. Students will be asked to attend employment seminars as early as possible. Through this type of arrangement, students in all years will be well prepared for job hunting and employment in advance. Students will also be able to realize the benefits for engaging in WIE and the importance of taking an active role in completing the training with the best effort.

9.5.2 Operation

There will be WIE Coordinators overseeing all matters related to WIE activities under the Programme. The WIE Coordinators are the academic staff members of the Department responsible for the organization and

operation of WIE activities. To guide the students and monitor their progress in taking the WIE, each student will be assigned an academic advisor from the Department. The student and his/her Academic Advisor will jointly plan the WIE details, such as job selection, training plan, logging of activities, reporting, and assessment.

In the case that the student finds job placement(s) on his/her own, the Academic Advisor will work with the student to design the learning outcomes if the placement is suitable to be recognized as a WIE activity. The Academic Advisor will make frequent contacts with the student and, if appropriate, the employer to monitor the progress of the student.

Each student will be guided by his/her Academic Advisor when conducting the WIE training. The student's work will be monitored continuously and an assessment will be given when the WIE placement is completed.

9.5.3 Assessment of the WIE Component(s)

The objective of assessment is to determine what the student has achieved through WIE. The actual type of work and duration will vary from case to case. Hence, an assessment framework is set out in the following as a general guideline.

(i) Continuous Assessment

The Academic Advisor may visit the student during the training period so that the Academic Advisor and the employer will be able to discuss the student's performance together. This will give better feedback on the student's performance before the training is completed.

(ii) Report

After the training is completed, the student is required to submit a report to the Academic Advisor. The details to be contained in the report should be commensurate with the training duration. It contains a brief reflective writing on the training received, the objectives that have been achieved, and the experience gained. The student may also conduct a self-evaluation on his/her own performance. The report must be endorsed by the student's employer before its submission.

(iii) Employer Evaluation

At the end of the training period, the employer will provide an evaluation of the student's performance, assessing the student's work and all-round development.

(iv) Overall Assessment

An overall assessment of the student's performance will be made by the Academic Advisor by considering all the assessment components as stated in Section 9.5.3(i)-(iii). A pass grade will be given to the student upon satisfactory completion of the WIE component; otherwise, a failure grade will be given.

10. DEPARTMENTAL UNDERGRADUATE PROGRAMME COMMITTEE

10.1 The composition of the Departmental Undergraduate Programme Committee (DUPC) is decided by the Head of Department. Normally, the DUPC consists of Programme Leaders of all degree and higher diploma programmes hosted by the Department, Head of Department, representative from the Departmental Learning and Teaching Committee, teaching staff representatives, representatives from major serving departments and student representatives. The Committee is responsible for programme review and development.

10.2 The DUPC will collect and consider, on a regular basis, the views of students and other key stakeholders on the relevance and currency of the syllabi, the standards of the examinations, the development of the programme, the adequacy of resources and the local and worldwide trends related to learning and teaching, for the continuous improvement of the programme.

11. NORMAL DURATION FOR COMPLETION OF A PROGRAMME

11.1 Students should complete the programme within the normal duration of the programme as specified in this programme booklet. Those who exceed the normal duration of the programme will be de-registered from the programme unless prior approval has been obtained from relevant authorities. The study period of a student shall exclude deferment granted for justifiable reasons, and the semester(s) when the student has been approved to undertake internship. Any semester in which the

students are allowed to take zero subject will be counted towards their total period of registration.

11.2 Students who have been registered for the normal duration of the programme may request extension of their studies for up to one year with the approval of the relevant Heads of Department. Applications for extension of study period beyond one year and up to two years will require the approval from Faculty Board Chairman.

11.3 Students who have exceeded the normal duration of the programme for more than two years and have been de-registered can submit an appeal to the Academic Appeals Committee to request further extension. If the appeal fails, the student shall be de-registered.

12. STUDENT STATUS

12.1 Students' eligibility for the range of services provided by the University will be governed by the students' status, which is determined with reference to the mode of attendance of the programmes enrolled and/or the study load as described in Sections 12.2 to 12.5 below.

Full-time students:

12.2 Students enrolling on this programme with a study load of 9 credits or more in a semester are classified as *full-time* students. Students who wish to change their study load to less than 9 credits in a semester will have to seek prior approval from their Department.

12.3 Full-time local students enrolled on UGC-funded programmes are eligible to apply for financial assistance from the Government in the form of grant and loan. Government grant and loan may not be granted beyond the normal period of registration for the programme.

Self-paced students:

12.4 Students who wish to study at their own pace instead of following the specified progression pattern will have to seek prior approval from their Department. These students are referred to as self-paced students.

Subject-based students:

12.5 Students who wish to take individual subjects, but do not wish to register as a candidate for an award, are classified as subject-based students.

13. SUBJECT REGISTRATION AND WITHDRAWAL

13.1 In addition to programme registration, students need to register for subjects at specified periods prior to the commencement of a semester. An add/drop period will also be scheduled for each semester. Students may apply for withdrawal of their registration on a subject after the add/drop period, if they have a genuine need to do so. The application should be made to the relevant programme offering Department and will require the approval of both the subject teacher and the host Department Programme Leader concerned (or an alternate academic staff authorised by the programme offering Department). Applications submitted after the commencement of the examination period will not be considered. Once the application of subject withdrawal is approved, the tuition fee paid for the subject will be forfeited and the withdrawal status of the subject will be shown in the examination result notification and transcript of studies, but will not be counted in the calculation of the GPA.

13.2 The pre-requisite requirements of a subject must have been fulfilled before a student registers for that subject. However, the subject offering Department has the discretion to waive the pre-requisite requirements of a subject, if deemed appropriate. If the pre-requisite subject concerned forms part of the requirements for award, the subject has to be passed in order to satisfy the graduation requirements for the programme concerned, despite the waiving of the pre-requisite.

13.3 Subject to the maximum study load of 21 credits per semester and the availability of study places, students are allowed to take additional subjects on top of the prescribed credit requirement for award before they become eligible for graduation. Students will be allowed to take additional subjects for the following semester for broadening purpose, after they fulfil the graduation requirements. However, they will still be subject to the maximum study load of 21 credits per semester and the availability of places in the subjects concerned. They will enrol as subject-based students only and be subject to the rules on “Admission of Subject-based Students”, except that graduates from UGC-funded programmes will not be restricted to taking only subjects from a self-financed programme.

14. STUDY LOAD

14.1 For students following the progression pattern specified for their programme, they have to take the number of credits and subjects, as specified in this programme booklet, for each semester. Students cannot drop those subjects assigned by the department unless prior approval has been given by the department.

14.2 The normal study load is 15 credits in a semester for full-time study. The maximum study load to be taken by a student in a semester is 21 credits, unless exceptional approval is given by the Head of the Department. For such cases, students are reminded that the study load approved should not be taken as grounds for academic appeal.

14.3 To help improve the academic performance of students on academic probation (the meaning of "academic probation" can be found in Section 22.2.), these students will be required to take a reduced study load in the following semester (Summer Term excluded). The maximum number of credits to be taken in a semester by students on academic probation is 12. If these students have strong reasons to study more credits, they will have to obtain the endorsement/approval of the respective authority:

(i) study 13 to 15 credits in a semester: endorsement by the Programme Leader and approval by the Departmental Learning and Teaching Committee (DLTC);

(ii) study 16 to 18 credits in a semester: endorsement by the Programme Leader, the DLTC and the Head of Department, and approval by the Faculty Dean;

(iii) study more than 18 credits in a semester: endorsement by the Programme Leader, the DLTC and the Head of Department, and approval by QAC(AD).

14.4 Students are not allowed to take zero subject in any semester, including the mandatory summer term as required by some programmes, unless they have obtained prior approval from the Department; otherwise they will be classified as having unofficially withdrawn from the programme. Students who have been approved for zero subject enrolment (i.e. taking zero subject in a semester) are allowed to retain their student status and continue using campus facilities and library facilities. Any semester in which the students are allowed to take zero subject will nevertheless be counted towards the total period of registration.

14.5 Students who have obtained approval to pace their studies and students on programmes without any specified progression pattern who wish to take more than

the normal load of 15 credits in a semester should seek advice from the Department concerned before the selection of subjects.

15. SUBJECT EXEMPTION

Students may be exempted from taking any specified subjects, including mandatory General University Requirements (GUR) subjects, if they have successfully completed similar subjects previously in another programme or have demonstrated the level of proficiency/ability to the satisfaction of the subject offering Department. Subject exemption is normally decided by the subject offering Department. However, for applications submitted by students who have completed an approved student exchange programme, the subject exemption is to be decided by the programme offering Department in consultation with the subject offering Departments. In case of disagreement between the programme offering Department and the subject offering Department, the two Faculty Deans/School Board Chairmen concerned will make a final decision jointly on the application. If students are exempted from taking a specified subject, the credits associated with the exempted subject will not be counted towards the award requirements (except for exemptions granted at admission stage). It will therefore be necessary for the students to consult the programme offering Department and take another subject in order to satisfy the credit requirement for the award.

16. CREDIT TRANSFER

16.1 Students may be given credits for recognised previous studies including mandatory General University Requirements (GUR) subjects; and the credits will be counted towards meeting the requirements for award. Transferred credits may not normally be counted towards more than one award. The granting of credit transfer is a matter of academic judgment. In assessing the transferability of subjects previously taken, the syllabus of that subject should be carefully scrutinized to ascertain that it is comparable to the PolyU's curriculum. Whether the previous studies are from institutions on credit-based or non-credit-based system should not be a matter of concern, and the subject size need not be a perfect match. To ascertain the academic standing of the institution offering the previous studies, the Department might need to request the institutions concerned to provide more information.

16.2 Credit transfer may be done with or without the grade being carried over; the former should normally be used when the credits were gained from PolyU. Credit transfer with the grade being carried over may be granted for subjects taken from outside the University, if deemed appropriate, and with due consideration to the academic

equivalence of the subjects concerned and the comparability of the grading systems adopted by the University and the other approved institutions. Subject credit transfer is normally decided by the subject offering Department. However, for applications submitted by students who have completed an approved student exchange programme, the decision will be made by the programme offering Department in consultation with the subject offering Departments. As the application for credit transfer may involve subjects offered by more than one Department, the programme offering Department should coordinate and check whether the maximum limit for credit transfer for a student has been exceeded, and whether the student has fulfilled the residential requirement of the University.

16.3 In case of disagreement between the programme offering Department and the subject offering Department, the two Faculty Deans/School Board Chairmen concerned will make a final decision jointly on the application. The validity period of credits previously earned is 8 years after the year of attainment.

16.4 Normally, not more than 50% of the credit requirement for award may be transferable from approved institutions outside the University. For transfer of credits from programmes offered by PolyU, normally not more than 67% of the credit requirement for award can be transferred. In cases where both types of credits are being transferred (i.e. from programmes offered by PolyU and from approved institutions outside the University), not more than 50% of the credit requirement for award may be transferred. For students admitted to an Articulation Degree or Senior Year curriculum which is already a reduced curriculum, they should not be given credit transfer for any required GUR subjects, and are required to complete at least 60 credits in order to be eligible for a Bachelor's award.

16.5 If the credits to be transferred are part of a PolyU programme which is accredited by a professional body, the Department concerned should ensure that the transferred credits will also meet the requirement of the relevant professional body.

16.6 If a student is waived from a particular stage of study on the basis of advanced qualifications held at the time of admission, the student concerned will be required to complete fewer credits for award. For these students, the 'deducted' credits at admission stage will be counted towards the maximum limit for credit transfer when students apply for further credit transfer after their admission. This also applies to students admitted to an Articulation Degree or Senior Year curriculum when they claim further credit transfer after admission.

16.7 Notwithstanding the upper limits stipulated in Section 16.4 above, (and unless professional bodies stipulate otherwise) students may be given more credit transfer than these upper limits (e.g. upon completion of an exchange programme as mentioned in Section 16.8 below), subject to their satisfying the residential requirement.

16.8 Credit transfer can be applicable to credits earned by students through studying at a non-local partner institution under an approved exchange programme. Students should, before they start the exchange programme, seek prior approval from the programme offering Department (who will consult the subject offering Departments as appropriate) on their study plan and credit transferability. As with all other credit transfer applications, the Departments concerned should scrutinize the syllabuses of the subjects which the students are going to take at the partner institution, and determine their credit transferability based on academic equivalence with the corresponding subjects on offer at the PolyU, and the comparability of the grading systems adopted by PolyU and the partner institution. The transferability of credits, and the suitability for allowing grades to be carried over, must be determined and communicated to students before they start the exchange programme.

16.9 All credit transfers approved will take effect only in the semester for which they are approved. A student who applies for transfer of credits during the re-enrolment or the add/drop period of a particular semester will only be eligible for graduation at the end of that semester, even if the granting of credit transfer will immediately enable the student to satisfy the credit requirement for the award.

16.10 Regarding credit transfer for GUR subjects, the Programme Host Department is the approval authority at the time of admission to determine the number of GUR credits which an Advanced Standing student will be required to complete for the award concerned. Programme Host Departments will make reference to the mapping lists of GUR subjects, which are compiled by the Committee on General University Requirements (CoGUR), on the eligibility of the subjects that can be qualified as GUR subjects. Applications for credit transfer of GUR subjects after admission will be considered, on a case-by-case basis, by the Subject Offering Department or Office of Undergraduate Studies (OUS)/ Service-Learning and Leadership Office (SLLO), in consultation with the relevant Sub-committee(s) under CoGUR, as appropriate.

16.11 For credit transfer of retaken subjects, the grade attained in the last attempt should be taken in the case of credit transfer with grade being carried over. Students

applying for credit transfer for a subject taken in other institutions are required to declare that the subject grade used for claiming credit transfer was attained in the last attempt of the subject in their previous studies. If a student fails in the last attempt of a retaken subject, no credit transfer should be granted, despite the fact that the student may have attained a pass grade for the subject in the earlier attempts.

16.12 Students will not be granted credit transfer for a subject which they have attempted and failed in their current study unless the subject was taken by the student as an exchange-out student in his current programme.

17. DEFERMENT OF STUDY

17.1 Students may apply for deferment of study if they have a genuine need to do so such as illness or posting to work outside Hong Kong. Approval from the Department offering the programme is required. The deferment period will not be counted towards the total period of registration.

17.2 Application for deferment of study from students who have not yet completed the first year of a full-time programme will only be considered only in exceptional circumstances.

17.3 Where the period of deferment of study begins during a stage for which fees have been paid, no refund of such fees will be made.

17.4 Students who have been approved for deferment are not entitled to enjoy any campus facilities during the deferment period.

18. PRINCIPLES OF ASSESSMENT

18.1 Assessment of learning and assessment for learning are both important for assuring the quality of student learning. Assessment of learning is to evaluate whether students have achieved the intended learning outcomes of the subjects that they have taken and have attained the overall learning outcomes of the academic programme at the end of their study at a standard appropriate to the award. Appropriate methods of assessment that align with the intended learning outcomes will be designed for this purpose. The assessment methods will also enable teachers to differentiate students' different levels of

performance within subjects. Assessment for learning is to engage students in productive learning activities through purposefully designed assessment tasks.

18.2 Assessment will also serve as feedback to students. The assessment criteria and standards will be made explicit to students before the start of the assessment to facilitate student learning, and feedback provided will link to the criteria and standards. Timely feedback will be provided to students so that they are aware of their progress and attainment for the purpose of improvement.

18.3 The ultimate authority in the University for the confirmation of academic decisions is the Senate, but for practical reasons, the Senate has delegated to the Faculty/School Boards the authority to confirm the decisions of Boards of Examiners provided these are made within the framework of the General Assessment Regulations. Recommendations from Board of Examiners which fall outside these Regulations shall be ratified by the Academic Planning and Regulations Committee (APRC) and reported to the Senate.

19. ASSESSMENT METHODS

19.1 Students' performance in a subject can be assessed by continuous assessment and/or examination, at the discretion of the individual subject offering Department. Where both continuous assessment and examination are used, the weighting of each in the overall subject grade will be clearly stated in the programme booklet. The subject offering Department can decide whether students are required to pass both the continuous assessment and examination components, or either component only, in order to obtain a subject pass, but this requirement (to pass both, or either components) will be specified in the programme booklet. Learning outcomes should be assessed by continuous assessment and/or examination appropriately, in line with the outcome-based approach.

19.2 Continuous assessment may include tests, assignments, projects, laboratory work, field exercises, presentations and other forms of classroom participation. Continuous Assessment Assignments which involve group work should nevertheless include some individual components therein. The contribution made by each student in continuous assessment involving a group effort shall be determined and assessed separately, and this can result in different grades being awarded to students in the same group.

19.3 Assessment methods and parameters of subjects shall be determined by the subject offering Department.

19.4 At the beginning of each semester, the subject teacher will inform students of the details of the methods of assessments to be used within the assessment framework as specified in the programme booklet.

20. SUBJECT RESULTS

20.1 Subject Teachers, in respect of the subject they teach, have sole responsibilities for marking and grading students' coursework and examinations scripts. Timely feedback of continuous assessment will be given to students as soon as possible (e.g. not later than a month), and in any case, before the final examination/assessment. In this regard, Subject Teachers will be accountable to the Head of the subject offering Department, to ensure that all forms of assessment, including the students' coursework and examination scripts, are correctly marked and graded where appropriate. Subject Teachers will avoid administrative errors at all times, and submit the grades for finalisation by Subject Assessment Review Panel (SARP) according to the schedule of the Department. To ensure consistency and uniformity for a common subject taught by different Subject Teachers, meetings can be arranged amongst them before the examination papers are set or before the marking is done.

20.2 Subject grades will be reviewed and finalised by SARP before being formally released to students and submitted to the Board of Examiners. Each Department forms one or several SARPs to take care of the subjects it offers. The Board of Examiners will not attempt to change any grades.

20.3 SARP(s) shall be formed by the Head of the Department offering the subjects. It shall include the Head of the Department offering the subject as the Chairman, the relevant subject examiners and where appropriate, and the Programme Leader.

21. BOARD OF EXAMINERS (BoE)

21.1 The authority for approving the overall results of students rests with the Board of Examiners (BoE). The BoE will meet at the end of each semester (except for

Summer Term unless there are students who are eligible to graduate after the completion of Summer Term subjects) and is responsible to the Senate for making:

(i) decisions on straight forward progression and deregistration cases;

(ii) decisions on the classification of awards to be granted to each student on completion of the programme; and

(iii) decisions on cases with extenuating circumstance.

21.2 These decisions are made by the BoE at the end of each semester in the light of the standard of student achievement appropriate to the award to which the programme is designed to lead, the aims of the programme, the students' performance on the programme in previous years, the General Assessment Regulations of the University, the specific programme regulations, and good practice established in the University and elsewhere.

21.3 The BoE will not attempt to change the grades for any student in any subject nor condone failures. The decisions of the BoE, except those on straight forward progression and deregistration cases, will be ratified by the Faculty Board. The Faculty Board may refer the decisions back to the BoE for further consideration and explanation.

21.4 Any decisions by the BoE outside the General Assessment Regulations of the University, supported by the Faculty Board, shall be referred to the APRC for ratification. All approved cases shall be reported to the Senate. Decisions by BoE outside the programme regulations but within the General Assessment Regulations of the University fall within the authority of the Faculty Board.

21.5 For straight forward progression and deregistration cases, students shall be formally notified of decisions affecting them after the BoE meeting. For graduating students and cases with extenuating circumstances, students shall only be notified of decisions affecting them after the Faculty Board meeting. For cases which require ratification of APRC, students shall be formally notified of the decisions after APRC's ratification. Any prior communication of results to these students shall be subject to formal ratification.

22. PROGRESSION / ACADEMIC PROBATION / DEREGISTRATION

22.1 The Board of Examiners shall, at the end of each semester (except for Summer Term unless there are students who are eligible to graduate after completion of

Summer Term subjects or the Summer Term study is mandatory for the programme), determine whether each student is

(i) eligible for progression towards an award; or

(ii) eligible for an award; or

(iii) required to be deregistered from the programme.

22.2 When a student has a Grade Point Average (GPA) (see Section 26.3 below) lower than 1.70, he/she will be put on academic probation in the following semester. If a student is able to pull his/her GPA up to 1.70 or above at the end of that following semester, the status of "academic probation" will be lifted. The status of "academic probation" will be reflected in the examination result notification but not in the transcript of studies.

22.3 A student will have 'progressing' status unless he/she falls within any one of the following categories, which shall be regarded as grounds for deregistration from the programme:

(i) the student has reached the final year of the normal period of registration for that programme, as specified in the programme booklet, unless approval has been given for extension; or

(ii) the student has reached the maximum number of retakes allowed for a failed compulsory subject; or

(iii) the student's GPA is lower than 1.70 for two consecutive semesters and his/her Semester GPA in the second semester is also lower than 1.70; or

(iv) the student's GPA is lower than 1.70 for three consecutive semesters.

When a student falls within any of the categories as stipulated above, except for category (i) with approval for extension, the Board of Examiners shall de-register the student from the programme without exception.

22.4 A student may be de-registered from the programme enrolled before the time frame specified in Sections 22.3(iii) or 22.3(iv) above if his/her academic performance is poor to the extent that the Board of Examiners deems that his/her chance of attaining a GPA of 1.70 at the end of the programme is slim or impossible.

22.5 The progression of students to the following academic year will not be affected by the GPA obtained in the Summer Term, unless Summer Term study is mandatory for all students of the programme and constitutes a requirement for graduation, and is so specified in this programme booklet.

22.6 If the student is not satisfied with the de-registration decision of the Board of Examiners, he/she can lodge an appeal. All such appeal cases will be referred directly to Academic Appeals Committee (AAC) for **final** decision. Views of Faculties/Schools/Departments will be sought and made available to AAC for reference.

23. APPEAL AGAINST ASSESSMENT RESULTS

A student may appeal against a decision on their assessment results or the decision on deregistration upon the public announcement of the overall results. The procedures for appeals against examination results are detailed in the Student Handbook (https://www.polyu.edu.hk/ar/students-in-taught-programmes/student-handbook/).

24. RETAKING OF SUBJECTS

24.1 Students may only retake a subject which they have failed (i.e. Grade F or S or U). Retaking of subjects is with the condition that the maximum study load of 21 credits per semester is not exceeded.

24.2 The number of retakes of a subject should be restricted to two, i.e. a maximum of three attempts for each subject is allowed.

24.3 In cases where a student takes another subject to replace a failed elective subject, the fail grade will be taken into account in the calculation of the GPA, despite the passing of the replacement subject. Likewise, students who fail a Cluster Area Requirement (CAR) subject may need to take another subject from the same Cluster Area in order to fulfill this part of the GUR, since the original CAR subject may not be offered; in such cases, the fail grade for the first CAR subject will be taken into account in the calculation of the GPA, despite the passing of the second CAR subject. In the circumstances when students do not have a choice to retake a failed subject, such as when the failed subject has been phased out, a 'tie-subject' arrangement can be made with the approval of the Faculty Board. Under the arrangement, another appropriate subject can be taken as equivalent to the subject which is not offered. Upon passing the equivalent subject, the fail grade of the original subject will be replaced by the latest grade of the retake subject and the failure grade of the original subject will not be taken into account in the calculation of the GPA.

24.4 Students need to submit a request to the Faculty Board for the second retake of a failed subject.

24.5 Students who have failed a compulsory subject after two retakes and have been deregistered can submit an appeal to the Academic Appeals Committee (AAC) for a third chance of retaking the subject.

24.6 In relation to 24.5 above, in case AAC does not approve further retakes of a failed compulsory subject or the taking of an equivalent subject with special approval from the Faculty, the student concerned would be de-registered and the decision of the AAC shall be final within the University.

25. EXCEPTIONAL CIRCUMSTANCES

Absence from an assessment component

25.1.1 If a student is unable to complete all the assessment components of a subject, due to illness or other circumstances which are beyond his/her control and considered by the subject offering Department as legitimate, the Department will determine whether the student will have to complete a late assessment and, if so, by what means. This late assessment shall take place at the earliest opportunity, and normally before the commencement of the following academic year (except that for Summer Term, which may take place within 3 weeks after the finalisation of Summer Term results). If the late assessment cannot be completed before the commencement of the following academic year, the Faculty Board Chairman shall decide on an appropriate time for completing the late assessment.

25.1.2 The student concerned is required to submit his/her application for late assessment in writing to the Head of Department offering the subject, within five working days from the date of the examination, together with any supporting documents. Approval of applications for late assessment and the means for such late assessments shall be given by the Head of Department offering the subject or the Subject Teacher concerned, in consultation with the Programme Leader.

Assessment to be completed

25.2 For cases where students fail marginally in one of the components within a subject, the BoE can defer making a decision until the students concerned have completed

the necessary remedial work to the satisfaction of the subject examiner(s). The remedial work must not take the form of re-examination.

Aegrotat award

25.3 If a student is unable to complete the requirements of the programme in question for the award due to very serious illness, or other very special circumstances which are beyond his/her control, and considered by the Board of Examiners as legitimate, the Faculty/School Board will determine whether the student will be granted an aegrotat award. Aegrotat award will be granted under very exceptional circumstances.

25.4 A student who has been offered an aegrotat award shall have the right to either accept such an award, or request to be assessed on another occasion to be stipulated by the Board of Examiners; the student's exercise of this option shall be irrevocable.

25.5 The acceptance of an aegrotat award by a student shall disqualify him/her from any subsequent assessment for the same award.

25.6 An aegrotat award shall normally not be classified, and the award parchment shall not state that it is an aegrotat award. However, the Board of Examiners may determine whether the award should be classified provided that they have adequate information on the students' academic performance.

Other particular circumstances

25.7 A student's particular circumstances may influence the procedures for assessment but not the standard of performance expected in assessment.

26. GRADING

26.1 Assessment grades shall be awarded on a criterion-referenced basis. A student's overall performance in a subject shall be graded as follows:

Subject grade	***Short description***	***Elaboration on subject grading description***
A+ A A-	Excellent	Demonstrates excellent achievement of intended subject learning outcomes by being able to skillfully use concepts and solve complex problems. Shows evidence of innovative and critical thinking in unfamiliar situations, and is able to express the synthesis or application of ideas in a logical and comprehensive manner.
B+ B B-	Good	Demonstrates good achievement of intended subject learning outcomes by being able to use appropriate concepts and solve problems. Shows the ability to analyse issues critically and make well-grounded judgements in familiar or standard situations, and is able to express the synthesis or application of ideas in a logical and comprehensive manner.
C+ C C-	Satisfactory	Demonstrates satisfactory achievement of intended subject learning outcomes by being able to solve relatively simple problems. Shows some capacity for analysis and making judgements in a variety of familiar and standard situations, and is able to express the synthesis or application of ideas in a manner that is generally logical but fragmented.
D+ D	Pass	Demonstrates marginal achievement of intended subject learning outcomes by being able to solve relatively simple problems. Can make basic comparisons, connections and judgments and express the ideas learnt in the subject, though there are frequent breakdowns in logic and clarity.
F	Fail	Demonstrates inadequate achievement of intended subject learning outcomes through a lack of knowledge and/or understanding of the subject matter. Evidence of analysis is often irrelevant or incomplete.

'F" is a subject failure grade, whilst all others ('D' to 'A+') are subject passing grades. No credit will be earned if a subject is failed.

Indicative descriptors for modifier grades

Main Grade (solid)	The student generally performed at this level, indicating mastery of the subject intended learning outcomes at this level.
+ (exemplary)	The student consistently performed at this level and exceeded the expectations of this level in some regards, but not enough to claim mastery at the next level.
- (marginal)	The student basically performed at this level, but the performance was inconsistent or fell slightly short in some regards.

Note: The above indicative descriptors for modifier grades are not applicable to the pass grades D and D+

26.2 A numeral grade point is assigned to each subject grade. The grade points assigned to subject grades attained by students from 2020/21 are as follows:

Grade	***Grade Point for grades attained from 2020/21***
A+	4.3
A	4.0
A-	3.7
B+	3.3
B	3.0
B-	2.7
C+	2.3
C	2.0
C-	1.7
D+	1.3
D	1.0
F	0.0

26.3 At the end of each semester, a Grade Point Average (GPA) will be computed based on the grade point of all the subjects as follows:

$$\text{GPA} = \frac{\sum_{n=1}^{N} \text{Subject Grade Point}_n \times \text{Subject Credit Value}_n}{\sum_{n=1}^{N} \text{Subject Credit Value}_n}$$

where N = number of subjects (inclusive of failed subjects) taken by the student up to and including the latest semester. For subjects which have been retaken, only the grade point obtained in the final attempt will be included in the GPA calculation.

In addition, the following subjects will be excluded from the GPA calculation:

(i) Exempted subjects

(ii) Ungraded subjects

(iii) Incomplete subjects

(iv) Subjects for which credit transfer has been approved, but without any grade assigned (Subjects taken in PolyU or elsewhere and with grades assigned, and for which credit transfer has been approved, will be included in the GPA calculation.)

(v) Subjects from which a student has been allowed to withdraw (i.e. those with the code 'W')

Subject which has been given an "S" code, i.e. absent from all assessment components, will be included in the GPA calculation and will be counted as "zero" grade point. GPA is thus the unweighted cumulative average calculated for a student, for all relevant subjects taken from the start of the programme to a particular point of time. GPA is an indicator of overall performance, and ranges from 0.00 to 4.30 from 2020/21.

26.4 Different types of GPA

26.4.1 GPA will be calculated for each Semester including the Summer Term. This Semester GPA will be used to determine students' eligibility to progress to the next Semester alongside with the 'cumulative GPA'. However, the Semester GPA calculated for the Summer Term will not be used for this purpose, unless the Summer Term study is mandatory for all students of the programme concerned and constitutes part of the graduation requirements.

26.4.2 The GPA calculated after the second Semester of the students' study is therefore a 'cumulative' GPA of all the subjects taken so far by students, and without applying any level weighting.

26.4.3 Along with the 'cumulative' GPA, a weighted GPA will also be calculated, to give an indication to the Board of Examiners on the award classification a student will likely get if he/she makes steady progress on his/her academic studies.

26.4.4 When a student has satisfied the requirements for award, an award GPA will be calculated to determine his/her award classification.

26.4.5 The relationship between the different types of GPA, and the methods for calculating each, is further explained in Appendix 1.

27. GRADUATION REQUIREMENTS FOR BENG(HONS) IN ELECTRONIC AND INFORMATION ENGINEERING PROGRAMME

All students qualifying for a 2-year Full-time Undergraduate Degree offered from 2021/22 onward for must meet:

(i) the University Graduation Requirements, as explained in Section 27.1 below; and
(ii) the specific graduation requirements of their chosen programme of study, as stated in Section 27.2 below.

27.1 University Graduation Requirements

27.1.1 Senior Year Intake:

(i) Satisfy the following requirements in general education (GUR):
  (a) 3 credits of Service-Learning.
  (b) 6 credits of Cluster Areas Requirement (CAR) from CAR (M) and a specially-designed CAR with English Language)
  (c) Fulfilment of the English and Chinese reading and writing requirements in CAR subjects.
  (d) Non-credit bearing Essential Components of General Education
  (e) Having met the equivalent standard of the Undergraduate Degree Language and Communication Requirements (LCR) as set out in Section 4.2 [Note 1].
(ii) Earn a cumulative GPA of 1.70 or above at graduation.
(iii) Obtain at least 1 WIE credit as set out in Section 9.2.
(iv) Satisfy the residential requirement for at least 1/3 of the credits to be completed for the award the student is currently enrolled, unless the professional bodies stipulate otherwise.

Further details about the University Graduation Requirements can be found in Appendix 2.

Note 1: Non-Chinese speakers and those students whose Chinese standards are at junior secondary level or below will by default be exempted from the DSR - Chinese and CAR - Chinese Reading and Writing requirements. However, this group of students would still be required to take one Chinese LCR subject **recommended by CLC/ EIE** to fulfil their Chinese LCR.

Note 2: Students admitted to the programmes as Senior Year Intakes are not required to take the Healthy Lifestyle Programme. Advanced Standing students are required to take Healthy Lifestyle (except for those who are HD/AD holders who follow the Senior Year/Articulation Degree programme GUR curriculum).

27.1.2 Dual Degree Programme:

(i) Satisfy the following requirements in general education (GUR):
  (a) 3 credits of Cluster Areas Requirement (CAR) from CAR (A)
  (b) Fulfilment of the English and Chinese reading and writing requirements in CAR subjects.
  (c) 3 credits of Service-Learning
  (d) 6 credits of Langauge and Communication Requirements (LCR) as set out in Section 4.2 [Note 1].
  (e) Non-credit bearing Essential Components of General Education (OTAI+AIDA+IE)
  (f) Non-credit bearing Healthy Lifestyle (introductory lecturer, e-learning module and wrap-up lecture)

(ii) Earn a cumulative GPA of 1.70 or above at graduation.

(iii) Obtain at least 1 WIE credit as set out in Section 9.2.

(iv) Satisfy the residential requirement for at least 1/3 of the credits to be completed for the award the student is currently enrolled, unless the professional bodies stipulate otherwise.

27.2 Specific Graduation Requirements for the **BEng(Hons) in Electronic and Information Engineering** Programme

27.2.1 Senior Year Intake:

(i) Complete successfully a minimum of **67** academic credits composed of the following:
  (a) 9 credits of General University Requirements (GUR) as set out in Section 27.1.2 (i).
  (b) 58 credits of Discipline-Specific Requirements (DSR), of which 43 credits from subjects categorized as COM (compulsory) and 15 credits from subjects categorized as ELE (elective) (at least 3 of these electives must be at level 4 or above) as stated in Table 4.1.

(ii) Obtain a total 8 credits in TRN (Training) as stated in Table 4.1.

(iii) Satisfy the residential requirement for at least 1/3 of the credits to be completed for the award the student is currently enrolled, unless the professional bodies stipulate otherwise.

27.2.2 Dual Degree Programme:

(i) Complete successfully a minimum of **70** academic credits composed of the following:

(a) 12 credits of General University Requirements (GUR) as set out in Section 27.1.2 (i).

(b) 58 credits of Discipline-Specific Requirements (DSR), of which 46 credits from subjects categorized as COM (compulsory) and 12 credits from subjects categorized as ELE (elective) (at least 2 of these electives must be at level 4 or above) as stated in Table 4.1.

(ii) Obtain a total 8 credits in TRN (Training) as stated in Table 4.1.

(iii) Satisfy the residential requirement for at least 1/3 of the credits to be completed for the award the student is currently enrolled, unless the professional bodies stipulate otherwise.

27.3 Remedial subjects are designed for new students who are in need of additional preparations in a particular subject area, and only identified students of a programme are required to take these subjects. These subjects should therefore be counted outside the regular credit requirement for award.

27.4 In addition, students may be required to take subjects that are designed to enhance their skills in particular subject areas to underpin their further advanced study in the discipline. These underpinning subjects could be of different subject areas (e.g. Mathematics, science subjects), and the number of credits each student is required to take in a particular underpinning subject area may vary according to the different academic backgrounds of the students. With effect from the 2015/16 intake cohort, the regular credit requirement for award will count the lowest number of credits taken by the students in the same subject area.

27.5 Senior Year intakes admitted to the 4-year Undergraduate Degree programmes on the strength of the Associate Degree/Higher Diploma qualifications are required to complete at least 60 credits in order to be eligible for a Bachelor's degree. Exemption may be given from subjects already taken in the previous Associate

Degree/Higher Diploma studies. In that case, students should take other electives (including free electives) instead to make up the total of 60 credits required. All students admitted to Senior Year curriculum, irrespective of the entry qualifications they held when applying for admission to the programmes, are required to complete at least 60 credits to be eligible for award.

27.6 Level-0 subjects and training subjects (including clinical/field training) will not be counted to fulfil free elective requirement for graduation purpose.

27.7 A student is required to graduate as soon as he/she satisfies the graduation requirements as stipulated in Sections 27.1, 27.2, 27.6 and 27.7 above. The student concerned is required to apply for graduation, in the semester in which he/she is able to fulfil all his/her graduation requirements, and after the add/drop period for that semester has ended.

28. GUIDELINES FOR AWARD CLASSIFICATION

28.1 The guidelines for award classification of BEng(Hons) in Electronic and Information Engineering award are stated in the following. In using these guidelines, the Board of Examiners shall exercise its judgement in coming to its conclusions as to the award for each student, and where appropriate, may use other relevant information.

28.2 This Programme uses Weighted GPA as a guide for helping to determine award classifications. A University-wide standard weighting is applied to all subjects of the same level, with a weighting of 2 for Level 1 and 2 subjects, a weighting of 3 for Level 3, 4 and 5 subjects.

Weighted GPA will be computed as follows:

$$\text{Weighted GPA} = \frac{\sum_{n=1}^{N} \text{Subject Grade Point}_n \times \text{Subject Credit Value}_n \times W_n}{\sum_{n=1}^{N} \text{Subject Credit Value}_n \times W_n}$$

where $W_n = 2$ for all Level 1 and Level 2 subjects, and

$W_n = 3$ for all Level 3, Level 4 and Level 5 subjects.

$N =$ number of subjects counted towards the award as listed in Table 4.1 according to the Specified Progression Pattern (Section 5) (inclusive of failed subjects) taken by the student up to and including the latest semester. (For subjects that have been retaken, only the grade obtained in the final

attempt will be included in the GPA calculation except those exclusions specified in Section 28.3.)

Same as GPA, Weighted GPA ranges from 0.00 to 4.30 from 2020/21.

28.3 Any subjects passed after the graduation requirement has been met or subjects taken on top of the prescribed credit requirements for award will not be taken into account in the grade point calculation for award classification (see sections 26.3 and 28.2 above). However, if a student attempts more elective subjects (or optional subjects) than those required for graduation in or before the semester in which he/she becomes eligible for award, the elective subjects (or optional subjects), except for subjects which are selected by students to fulfill the free electives requirement for graduation, with a higher grade/contribution shall be included in the grade point calculation (i.e. the excessive subjects attempted with a lower grade/contribution, including failed subjects, will be excluded).

28.4 The following are guidelines for the Board for Examiners' reference in determining award classifications:

Honours Degrees	***Guidelines***
1st	The student's performance/attainment is outstanding, and identifies him/her as exceptionally able in the field covered by the programme in question.
2nd (Division I)	The student has reached a standard of performance/attainment which is more than satisfactory but less than outstanding.
2nd (Division II)	The student has reached a standard of performance/attainment judged to be satisfactory, and clearly higher than the 'essential minimum' required for graduation.
3rd	The student has attained the 'essential minimum' required for graduation at a standard ranging from just adequate to just satisfactory.

28.5 Under exceptional circumstances, a student who has completed an Honours degree programme, but has not attained Honours standard, may be awarded a Pass-without-Honours degree. A Pass-without-Honours degree award will be recommended, when the student has demonstrated a level of final attainment which is below the 'essential minimum' required for graduation with Honours from the programme in question, but has nonetheless covered the prescribed work of the programme in an adequate fashion while failing to show sufficient evidence of the expected intellectual calibre of Honours degree graduates. For example, if a student in an Honours degree programme has a Grade Point Average (GPA) of 1.70 or more, but his/her Weighted GPA is less than 1.70, he/she may be considered for a

Pass-without-Honours classification. A Pass-without-Honours is an unclassified award, but the award parchment will not include this specification.

28.6 Students who have committed academic dishonesty or non-compliance with examination regulations will be subject to the penalty of lowering the award classification by one level. For undergraduate students who should be awarded a Third class Honours degree, they will be downgraded to a Pass-without-Honours. The minimum of downgraded overall result will be kept at a Pass. In rare circumstances where both the Student Discipline Committee and Board of Examiners of a Department consider that there are strong justifications showing the offence be less serious, the requirement for lowering the award classification can be waived.

28.7 The following are the award GPA ranges for determining award classifications:

Honours Classification	***Award GPA***
1st	3.60 – 4.30
2nd (Division I)	3.00 – 3.59
2nd (Division II)	2.40 – 2.99
3rd	1.70 – 2.39

28.8 Decisions by the Boards of Examiners on award classifications to be granted to each student on completion of the programme shall be ratified by the Faculty Board (of Examiners). For cases the decisions of which do not conform to the above indicative GPA range, they should be referred, by the Faculty Board (of Examiners), to the APRC for ratification.

29. RECORDING OF DISCIPLINARY ACTIONS IN STUDENTS' RECORDS

29.1 With effect from Semester One of 2015/16, disciplinary actions against students' misconducts will be recorded in students' records.

29.2 Students who are found guilty of academic dishonesty or non-compliance with examination regulations will be subject to the penalty of having the subject result concerned disqualified, and be given a failure grade with a remark denoting 'Disqualification of result due to academic dishonesty/non-compliance with

examination regulations'. The remark will be shown in the students' record and transcript of studies, until their leaving the University.

29.3 Students who have committed disciplinary offences (covering both academic and non-academic related matters) will be put on 'disciplinary probation'. The status of 'disciplinary probation' will be shown in the students' record as well as the transcript of studies and testimonial during the probation period. The disciplinary probation is normally one year unless otherwise decided by the Student Discipline Committee.

29.4 The University reserves the right to withhold the issuance of any certificate of study to a student/graduand who has unsettled matters with the University, or is subject to disciplinary action.

30. SYLLABI

(Please see pages 51 to 169.)

APPENDIX

(Please see pages 170 to 174.)

Subject Description Form

<table>
<tr><td>Subject Code</td><td>AMA2104 (for 42470 and 42375)</td></tr>
<tr><td>Subject Title</td><td>Probability and Engineering Statistics</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>2</td></tr>
<tr><td>Pre-requisite/ Co-requisite/ Exclusion</td><td>Nil</td></tr>
<tr><td>Objectives</td><td>The lectures aim to provide students with an integrated knowledge required for the understanding and application of statistical techniques. To develop students' ability for logical thinking and effective communication, tutorial and presentation sessions will be held.</td></tr>
<tr><td>Intended Subject Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
1. Apply mathematical reasoning to analyze essential features of different statistical problems in engineering;
2. Apply appropriate probabilistic techniques to model and solve problems in engineering;
3. Make use of stochastic and Markov processes to solve typical engineering problems;
4. Search for useful information and use statistical software in solving statistical problems in the context of engineering.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td>1. <u>Probability Theory</u>
Probability and random variables; Probability distributions; Sampling distributions; Sampling means; The Central Limit Theorem; Significance and test of hypothesis.

2. <u>Stochastic Process</u>
Bernoulli process; Poisson process; time averaging and ergodicity; Spectral analysis; Correlation and spectra; Wiener-Khintchine theorem; White noise; Narrow-band noise; thermal noise; Signal-to-noise ratio and probability of error; Effective noise temperature and noise figure.

3. <u>Markov Process</u>
Recursions and Markov chains; Applications to queuing theory; Birth-death process.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>A two hour mass lecture will be conducted each week to initiate students into the ideas, concepts and techniques of the topics in the syllabus, which is then reinforced by a one hour tutorial designed to consolidate and develop students' knowledge through discussion and practical problem solving.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="4">Intended Subject Learning Outcomes to be Assessed</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. Continuous Assessment</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Continuous Assessment comprises of assignments, in class quizzes, online quizzes and a mid-term test. A 3-hour examination is held at the end of the semester.

Questions used in assignments, quizzes, tests and examinations are used to assess the student's level of understanding of the basic concepts and their ability to use mathematical and statistical techniques in solving problems in science and engineering.</td></tr>
<tr><td rowspan="7">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>• Lecture</td><td>26 Hours</td></tr>
<tr><td>• Tutorial</td><td>13 Hours</td></tr>
<tr><td>• Mid-term Test and Examination</td><td>5 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Assignments and self-study</td><td>73 Hours</td></tr>
<tr><td>Total student study effort:</td><td>117 Hours</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Textbooks:
1. D. McDonald, Elements of Applied Probability: for Engineering, Mathematics and Systems Science, World Scientific, 2004.
2. A.H. Haddad, Probabilistic Systems and Random Signals, Prentice-Hall, 2006.

Reference Books:
1. R.E. Walpole, R.H. Myers, S.L. Myers and K.Y. Ye, Probability and Statistics for Engineers and Scientists, 9th ed., Prentice-Hall, 2012.
2. A.V. Balakrishnan, Introduction to Random Processes in Engineering, Wiley-Interscience, 2005.</td></tr>
<tr><td>Last Updated</td><td colspan="2">July 2019</td></tr>
<tr><td>Prepared by</td><td colspan="2">AMA Department</td></tr>
</table>

Subject Description Form

Subject Code	EIE2901/IC2114
Subject Title	Industrial Centre Training I for EIE
Credit Value	5 training credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	The objective of this subject is to equip students with knowledge and skills through technical training that are fundamental and essential in their study and professional practice in electronic and information engineering (EIE).
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. apply the features and functions of typical CAD system for producing CAD models and drawing with application in engineering, as well as applying 3D CAD drawings for technical communication; 2. explain legal duties related to occupational safety, identify common workplace health and safety hazards, corresponding control measures and apply personal protection equipment; 3. apply and create computer program on scientific computing software for technical analysis and modelling; 4. design electronic circuit on printed wiring board with EDA tool; 5. prescribe and use basic electronic instrument to perform parametric test and analysis on simple electronic circuit, troubleshooting, create and apply virtual instrument and identify common electronic product safety tests; 6. recognize training as an important part for a professional engineering career and the needs for multi-disciplinary training and continual professional development in professional engineering practice. 7. explain the manufacturing, assembly, interconnection, and operation of mechatronic products and machines, specify system components and production process, and construct simple prototype for test and investigation; 8. generate control programmes for building or industrial embedded systems.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. <u>3D CAD Modelling for EIE (18 hours)</u> 1.1. Introduction to Computer-aided Design (CAD); general concepts on 3D computer modeling; parametric feature based solid modelling; construction and detailing of solid features; solid model modification and its limitations; concepts of assembly modeling - bottom up approach for the generation of subassemblies, and final assembly; 1.2. . Generation of 2D drawings from 3D parts and assemblies; data exchange; techniques for export files for different prototyping processes (e.g. 3D printing, laser machining). 2. <u>Industrial Safety Overview (15 hours)</u> 2.1. Safety Management: Overview, essential elements of safety management, safety training, accident management, and emergency procedures. 2.2. Safety Law: F&IU Ordinance and principal regulations, OSH Ordinance and principal regulations.

	2.3. Occupational Hygiene and Environmental Safety: Noise hazard and control; dust hazard and control; ergonomics of manual handling. 2.4. Safety Technology: Mechanical lifting, fire prevention, dangerous substances and chemical safety, machinery hazards and guarding, electrical safety, first aid, job safety analysis, fault tree analysis, personal protective equipment. 3. Application of Computing Tool (21 hours) 3.1. Introduction to Python; interactive calculations and basic operations with basic data type; mathematical operations, matrix and array operations, data analysis and curve fitting; data manipulation and data file processing. 3.2. Script programming & debugging; logic operations & flow control; Use of functions and popular Python packages, such as Numpy, Panda and Matplotlib; Data visualization by using graphics packages. 4. Electronic Circuit Design Practice (18 hours) 4.1. Introduction to electronic design automation (EDA) software; circuit schematics capture and representation; placement of components, capturing, annotation, labelling, net list. Electronic parts library, symbols, decals, physical packages, discrete components, integrated circuits, logic and analogue circuits, electronic parts creation and application. 4.2. Printed Circuit Board (PCB) design, hands on practice on PCB circuit design with EDA tools. 4.3. Wiring diagram and wiring table for electronic and electrical installation, functional representation of circuit, system block diagram, electrical & electronic device symbols and layout, circuit artwork, etching process, prototype PCB fabrication. 5. Electronic Measurement with Product Safety Test and Practice (15 hours) 5.1. Application and use of electronic test instruments: current and voltage measurements, two wire and four wire techniques, power supply and signal sources, oscilloscope probes and oscilloscopes. 5.2. Introduction to Virtual Instrument, application and hands-on practice on LabVIEW. 5.3. Electronic product safety test methods: for example, High Voltage Isolation Test, Insulation Resistance Test, Continuity Test, Leakage Current Measurement. *One of the following streams as decided by hosting programme* **Stream A:** 6. Electronic Workshop Practice for EIE (36 hours) 6.1. Introduction to common electronics parts, use of basic test instruments, best practice and basic troubleshooting techniques, electronic workshop safety. 6.2. Introduction to electronic assembly design and manufacturing process, components, tools and machines. 6.3. Introduction to electronic circuit interconnect technologies like Surface Mounted Technology (SMT) and Chip-on-board (COB). 6.4. Introduction to advanced electronic packaging and assembly process such as: fine-pitch SMT, Ball Grid Array (BGA), Flip-chip and Chip Scale Package (CSP). 6.5. Soldering and de-soldering techniques, mounting and installation of electronic circuits, wiring of subassemblies.

	6.6. Hands-on practice on basic electronic circuit troubleshooting, including both digital & analogue circuitries. 6.7. Introduction to rapid prototyping for electronic design using tools like breadboard and circuit simulation software. 6.8. Introduction to rapid prototyping for mechanical design using 3D printing equipment and CAD tools. 7. Embedded System Application and Practice (27 hours) 7.1. Introduction to a contemporary Microcomputer family and its development tools. 7.2. Hands-on practice on memory, I/O, data communications, ADC operations. 7.3. Hands-on practice on LED and LCD displays. 7.4. Hands-on practice on motor control and sensors. 7.5. Application of Microcomputer on consumer electronic products, mechatronics, home automation products, wired and wireless connectivity. **Stream B:** 8. Basic Mechatronics Practice (27 hours) 8.1. Design approach of mechatronic system design; Key elements of mechatronic system, sensing device, controller, actuators, human-machine interfaces and input & output signal conditioning unit. 8.2. Introduction of design and operation of typical mechatronic systems 8.3. Introduction of controllers and basic programmable control concept, overview of system structure of controllers, Input/Output (I/O), programming languages, instructions and technique, programming software and applications of controllers such as Programmable Logic Controller (PLC). 9. Integrated Building Systems (36 hours) 9.1. Basic concepts and application methods for integrated building system. 9.2. Lighting control systems; dimming functions, blind / shutter controls, light-scene controls. 9.3. Heating/Cooling HVAC system control scheme. 9.4. PID control function loops; BMS control system for industrial applications. 9.5. Building system project planning for realistic work applications; On-line and Off-line program integration test; Fault monitoring and reporting systems.
Teaching/ Learning Methodology	The teaching and learning methods include lectures, workshop tutorials, and practical works. The lectures aim at providing students with an overall and concrete background knowledge required for understanding key issues in engineering communication, use of standard engineering components and systems, and importance of industrial safety. The workshop tutorials aim at enhancing students' in-depth knowledge and ability in applying the knowledge and skills to complete specific tasks. The practical works aim at facilitating students to review the diverse topics covered in this course and perform active learning with research, practice, questioning, and problem solving in a unified activity.

Alignment of Assessment and Intended Subject Learning Outcomes

Specific Assessment Methods/ Task	% Weighting	Intended Subject Learning Outcomes to be Assessed							
		1	2	3	4	5	6	7	8
Continuous Assessment									
• Assignment / Project	50%	✓	✓	✓	✓	✓		✓	✓
• Tests	24%	✓	✓	✓	✓	✓		✓	✓
• Reports & Logbook	26%	✓	✓	✓	✓	✓	✓	✓	✓
Total	100%								

Specific Assessment Methods/ Task	Remarks
Assignment / Project	The projects are designed to facilitate students to reflect and apply the knowledge periodically throughout the training.
Tests	Tests are designed to facilitate students to review the breadth and depth of their understanding on specific topics.
Others (Reports & Logbook)	Report writing is designed to facilitate students to acquire deep understanding on the topics of the training and to present those concepts clearly.

Student Study Effort Expected

Class contact (Time-tabled)	
• Lecture/Tutorial	10 Hours
• Workshop	140 Hours
Other student study effort	0 Hour
Total student study effort	150 Hours

Reading List and References

Reference Software List:

1. SolidWorks from Assault Systemes
2. PADS from Mentor Graphics Inc.
3. LabVIEW from National Instrument
4. CubeMX from STM Electronics
5. uVision IDE from ARM KEIL

Reference Standards and Handbooks:

6. IEEE Standard 315 / ANSI Y32.2 / CSA Z99 Graphic Symbols for Electrical and Electronics Diagrams
7. IEC 61082 Preparation of Documents used in Electrotechnology
8. IPC-D-279-1996, Design Guidelines for Reliable Surface Mount Technology Printed Board Assemblies, IPC.
9. IPC-J-STD-001F-2014, Requirements for Soldered Electrical and Electronic Assemblies, IPC.
10. IPC-A-610F-2014, Acceptability of Electronic Assemblies, IPC.

Reference Books:

11. R.S. Villanucci, A.W. Avtgis, W.F. Megow, *Electronic Techniques: Shop Practices and Construction*, 7th ed., Practice-Hall, 2002.
12. Training material, manual and articles published by Industrial Centre

	13. D. Shetty, R. Kolk, "Mechatronics System Design", PWS Publishing Company, 1997 14. EMSD, Code of Practice for the Electricity (Wiring) regulations, 2003 Edition.
Last Updated	July 2022
Prepared by	Industrial Centre

Subject Description Form

<table>
<tr><td>Subject Code</td><td>AF3625 (for 42470 and 42477)</td></tr>
<tr><td>Subject Title</td><td>Engineering Economics</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>3</td></tr>
<tr><td>Exclusion</td><td>AF2618</td></tr>
<tr><td>Objectives</td><td>This subject aims to equip students with

1. The fundamental concepts of micro- and macroeconomics related to the engineering industry;
2. The fundamental understanding of finance and costing for engineering operations, budgetary planning and control.</td></tr>
<tr><td>Intended Subject Learning Outcomes</td><td>Upon successful completion of this subject, students will be able to:

1. Understand how the relevant economic factors shape the environment within which an engineering company operates;
2. Evaluate the financial condition of a company;
3. Apply the basic cost accounting techniques in the planning and control of engineering and production activities.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td><u>Economic Environment of a Firm</u>
Microeconomic Factors
Scarcity, choice and opportunity cost; Demand, supply and price; Profit-maximizing behavior of the firm; Organization of industry: perfect competition and monopoly

Macroeconomic Factors
International trade and globalization

<u>Engineering Economics</u>
Return on investment; Accounting profit versus economic profit

<u>Fundamentals of Budgetary Planning and Control</u>
Principle types of budgets for production and service operations; Approaches to budgeting and the budgeting process; Investment and source of finance; Cost of capital; Evaluation of investment alternatives</td></tr>
<tr><td>Teaching/ Learning Methodology</td><td>The two-hour lecture each week focuses on the introduction and explanation of key concepts of Engineering Economics. The one-hour tutorial provides students with directed studies to enhance their self-learning capacities. Individual and group activities including discussions and presentations are conducted to facilitate students' understanding and application of the concepts they have learned to tackling real-life problems in Engineering Economics.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="3">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Continuous Assessment</td><td>50%</td><td></td><td></td><td></td></tr>
<tr><td>1. In-class activities</td><td>15%</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Written assignments</td><td>15%</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Test</td><td>20%</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Final Examination</td><td>50%</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="3"></td></tr>
</table>
</td></tr>
</table>

Student Study Effort Required	**Class contact:**	
	• Lecture	26 Hours
	• Tutorial	13 Hours
	Other student study effort:	
	• Study and self-learning	48 Hours
	• Presentation preparation and written assignments	18 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Recommended Textbooks** 1. Parkin and Bade, *Foundations of Microeconomics*, 8th ed., Pearson, 2018. 2. Sullivan, Wicks and Koelling, *Engineering Economy,* 17th ed., Pearson, 2019. **References** 1. Robert H. Frank, *The Economic Naturalist: Why Economics Explains Almost Everything?,* Basic Books, 2011.	
Last Updated	July 2022	
Prepared by	School of Accounting and Finance	

Subject Description Form

Subject Code	CLC3241P (2019-20 onward) / CBS3241P (2018-19 and before)
Subject Title	Professional Communication in Chinese
Credit Value	2
Level	3
Pre-requisite / Co-requisite	Chinese LCR subjects (in Semester 2 of Year 3 or Semester 1 of Year 4)
Objectives	This subject aims to develop the language competence for professional communication in Chinese required by students to communicate effectively with various parties and stakeholders in regard to engineering-related project proposals and reports.
Intended Subject Learning Outcomes	**Upon completion of the subject, and in relation to effective communication with a variety of intended readers/audiences in Chinese, students will be able to:** 1 Plan, organise and produce professionally acceptable project proposals and reports with appropriate text structures and language for different intended readers. 2 Plan, organise and deliver effective project-related oral presentations with appropriate interactive strategies and language for different intended audiences. 3 Adjust the style of expression and interactive strategies in writing and speaking in accordance with different intended readers/audiences.
Subject Synopsis/ Indicative Syllabus	1. Project proposals and reports in Chinese • Planning and organising project proposals and reports • Explaining the background, rationale, objectives, scope and significance of a project • Referring to the literature to substantiate project proposals • Describing the methods of study • Describing and discussing project results, including anticipated results and results of pilot study • Presenting the budget, schedule and/or method of evaluation • Writing executive summaries./abstracts 2. Oral presentations of projects • Selecting content for audience-focused presentations • Choosing language and style appropriate to the intended audience • Using appropriate transitions and maintaining coherence in team presentations • Using effective verbal and non-verbal interactive strategies
Teaching/Learning Methodology	<u>Learning and teaching approach</u> The subject is designed to develop the students' Chinese language skills, both oral and written, that students need to communicate effectively and professionally with a variety of stakeholders of engineering-related projects. It builds upon the language and communication skills covered in GUR language training subjects. The study approach is primarily seminar-based. Seminar activities include instructor input as well as individual and group work, involving drafting and evaluating texts, mini-presentations, discussions and simulations. The learning and teaching activities in the subject will focus on a course-long project which will engage students in proposing and reporting on an engineering-

<table>
<tr><td></td><td>related project to different intended readers/audiences. During the course, students will be involved in:
- planning and researching the project
- writing project-related documents such as project proposals and reports
- giving oral presentations to intended stakeholders of the project</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="3">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th></tr>
<tr><td>1. Project proposal in Chinese</td><td>60%</td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>2. Oral presentation of project proposal</td><td>40%</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="3"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The assessments will arise from the course-long engineering-related project.
• Students will be assessed on written documents and oral presentations targeted at different intended readers/audiences. This facilitates assessment of students' ability to select content and use language and style appropriate to the purposes and intended readers/audiences.
• Students will collaborate in groups in planning, researching, discussing and giving oral presentations on the project. The written proposals will be individual work to ensure that students will be rigorously engaged in the application of language skills for the entire document.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>• Seminars</td><td>26 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Researching, planning, writing, and preparing the project</td><td>44 Hours</td></tr>
<tr><td>Total student study effort:</td><td>70 Hours</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>1. 司有和 (1984) ：《科技寫作簡明教程》，安徽教育出版社。
2. 葉聖陶、呂叔湘、 朱德熙、 林燾 (1992)：《文章講評》 語文出版社。
3. 于成鯤主編（2003）：《現代應用文》，復旦大學出版社。
4. 岑紹基、謝錫金、祈永華 (2006) ：《應用文的語言· 語境· 語用》，香港教育圖書公司。
5. 邵敬敏主編 (2010) ：《現代漢語通論 (第二版)》，上海教育出版社。
6. 于成鯤、陳瑞端、秦扶一、金振邦主編 (2010)：《中國現代應用文寫作規範叢書：科教文與社交文書寫作規範》，復旦大學出版社。
7. 香港特別行政區政府教育局· 課程發展處中國語文教育組 (2012) ： 《常用字字形表》，政府物流服務署印。</td></tr>
<tr><td>Last Updated</td><td>May 2019</td></tr>
<tr><td>Prepared by</td><td>Chinese Language Centre</td></tr>
</table>

Subject Description Form

Subject Code	EIE3100 (for 42470)
Subject Title	Analogue Circuit Fundamentals
Credit Value	3
Level	3
Pre-requisite	EIE2100 Basic Circuit Analysis EIE2102 Basic Electronics
Co-requisite/ Exclusion	Nil
Objectives	This is the main foundation subject introducing the working principles and constructions of analog electronic circuits. The specific aim is to familiarize students with the design and operation of analog building blocks (e.g., mirrors, differential stages, output stages), practical operational amplifiers, frequency response of transistor amplifiers, feedback amplifiers and oscillators.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the operations of transistor devices, e.g., BJT and MOSFET 2. Analyze the small-signal characteristics of transistor amplifiers 3. Design basic analog building blocks 4. Understand the operations and limitations of operational amplifiers 5. Analyze frequency responses and design feedback circuits and oscillators Category B: Attributes for all-roundedness 6. Communicate effectively 7. Think critically and creatively 8. Assimilate new technological development in related field
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Analog Building Blocks 1.1 Simple current mirrors; problem due to Early effect and non-ideality; Wilson and Widlar mirrors; use of mirrors as active loads. 1.2 Differential amplifier (DA) stage; analysis using half-circuit models, common-mode and differential-mode gains; common-mode rejection ratio (CMRR). 1.3 Output stages; class A, class B and class AB output stages; efficiency; harmonic distortions. 2. Operation Amplifier Design 2.1 Typical operational amplifier circuit: input differential stage, CE gain stage, and output stage; details of internal circuit design: active loading, level shift, current sourcing. 2.2 Non-idealities: dc offset, input bias current (causing offset); finite input impedance, etc. 2.3 Slew-rate limitation; gain-bandwidth product; stability design; concept of unity-gain feedback; phase margin; design of low-frequency pole and use of Miller effect for internal compensation. 3 Frequency Responses of Transistor Amplifiers 3.1 Parasitic junction capacitances and their effects on the current gain of transistors. 3.2 Complete high-frequency model of single-stage common-emitter amplifiers. 3.3 Derivation of first roll-off frequency (dominant pole) due to Miller effect.

4 Feedback Circuits and Oscillators

4.1 General feedback configuration; basic amplifier gain, loop gain and closed-loop (overall) gain.

4.2 Effects of feedback on gain, frequency response, distortion, input and output impedances.

4.3 Feedback circuit configurations: shunt-series, shunt-shunt, series-shunt and series-series feedback; stability analysis; phase margins and compensation methods; analysis of feedback circuits via two-port models.

4.4 Oscillation criteria; amplitude limiting and sustained oscillation; Colpitts, Hartley, Wien bridge, phase-shift and crystal oscillators.

Laboratory Experiments:

Each student is required to complete the following three laboratory experiments:

1. Title: Negative Feedback Amplifier
   Objective: To design the feedback network for a given amplifier in order to meet certain specifications.
2. Title: Oscillator
   Objective: To design a Wien-bridge oscillator using an IC amplifier.
3. Title: Characteristics of Operational Amplifier
   Objective: To study the internal operation of an operation amplifier and measure the characteristics of the responses.

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3, 4, 5	Fundamental principles and key concepts of the subject are delivered to students
Tutorials	2, 3, 4, 5, 7, 8	Students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed
Laboratory sessions	3, 4, 5, 6, 7	Students in groups of 2-3 will conduct practical measurement and evaluate the performance of electronic circuits

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/ Task	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)							
		1	2	3	4	5	6	7	8
1. Continuous Assessment (total 40%)									
• Quizzes	5%	✓	✓	✓	✓	✓			
• Laboratory sessions	15%				✓	✓	✓	✓	✓
• Test	20%	✓	✓	✓	✓	✓		✓	
2. Examination	60%	✓	✓	✓	✓	✓		✓	
Total	100%								

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Quizzes	Analytical and design problems are used to evaluate students' ability in applying concepts and skills learnt in the classroom.
Test and examination	Mid-semester test is used to measure the students' ability to remember facts and figures as well as their comprehension of subject materials; Final exam is used to evaluate students' ability to think critically and creatively in order to come up with an effective solution for an existing problem.
Laboratory sessions	Each group of students is required to produce a written report; Accuracy and the presentation of the report will be assessed; Assessment of the reports will focus on both technical knowledge and ability to communicate effectively.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**

Reading List and References

Textbooks:

1. S. Sedra and K.C. Smith, *Microelectronic Circuits,* 8th edition, Oxford University Press, 2021.

Reference Books:

2. Paul R. Gray, Paul J. Hurst, and Stephen H. Lewis, *Analysis and Design of Analog Integrated Circuits,* 5th edition, New York: Wiley, 2009.
3. D.A. Neamen, *Microelectronics Circuit Analysis and Design*, 4th edition, New York: McGraw-Hill, 2010.
4. D.A. Jones and K. Martin, *Analog Integrated Circuit Design*, New York: Wiley, 1997.

Last Updated	June 2021
Prepared by	Dr. K.H. Loo

Subject Description Form

Subject Code	EIE3105
Subject Title	Integrated Project
Credit Value	6
Level	3
Pre-requisites	EIE2211 Logic Design and ENG2002 Computer Programming
Co-requisite/ Exclusion	Nil
Objectives	Provide students with the concepts and techniques in designing embedded software and hardware interfaces. Covering different topics of preceding core subjects, this subject emphasizes the application of knowledge in an integrated manner. Apart from various technical challenges, students will also need to address typical non-technical issues involved in conducting a project or product development.
Intended Subject Learning Outcomes	Upon completion of the subject, students will be able to: Category A: Professional/academic knowledge and skills 1. Understand technical knowledge specific to autonomous robots. 2. Integrate and apply knowledge acquired in previous subjects. 3. Design under cost constraints and with component limitations/tolerances in mind. 4. Locate and resolve practical problems on project development. Category B: Attributes for all-roundedness 5. Search, self-learn and try untaught solutions. 6. Exercise discipline and time-planning to meet deadlines. 7. Present ideas and findings effectively. 8. Work with others in a team collaboratively and exercise leadership.
Subject Synopsis/ Indicative Syllabus	1. Embedded System Hardware Details of a typical microcontroller architecture 2. Microcontroller Internal resources; Electrical characteristics of I/O pins; Timer/counter operations and interrupts; Pulse control using timer/counter; Pulse measurement using timer/counter. 3. I/O Interfacing Output-pin driving limitations; Inductive load driving; Keyboard multiplexing; LCD controllers; Sensors; A/D and D/A converters; Serial interfaces; I/O expansion techniques. 4. Embedded Software Development and Testing Embedded software issues; Tasks and events; Interrupt system: nesting, priority and latencies; C-language Programming. 5. Platform-Specific Anatomy of a Small Autonomous Robot Mechanical structures; Circuit design; Interrupts and tasks; Generic software functions and high-level algorithms; Concurrency and timing issues; Modern control technologies. 6. Project Management Time and progress management; Communication. **Laboratory Experiments:** 1. Introduction to Microcontroller Programming 2. Timer/Counter Programming 3. Interrupt Programming

<table>
<tr><td></td><td>4. Serial Port Programming
5. Interfacing

Project:
1. Hardware:
Construction of a small autonomous robot
2. Software:
Writing program to control the small autonomous robot in order to finish a number of tasks.
3. Presentation and report writing</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>
<table>
<tr><th>Teaching and Learning Method</th><th>Intended Subject Learning Outcome</th><th>Remarks</th></tr>
<tr><td>Lectures</td><td>1, 2</td><td>In lectures, students are introduced to the knowledge of the relevant fields. Students will be able to define and describe key terms and concepts. They will also be able to explain and generalize knowledge about embedded systems.</td></tr>
<tr><td>Laboratories</td><td>1, 2, 3, 4, 5</td><td>By performing hands-on practical experiments, students will be able to apply the acquired knowledge to designing solutions to embedded system problems. They will relate their observation to theories and principles. They will also evaluate performance of their design.</td></tr>
<tr><td>Quizzes</td><td>1, 2, 3</td><td>Students will develop a firm understanding and comprehension of the knowledge taught.</td></tr>
<tr><td>Final Tests</td><td>1, 2, 3</td><td>Students will develop a firm understanding and comprehension of the knowledge taught.</td></tr>
<tr><td>Project</td><td>1 - 8</td><td>It is an engineering development with objectively defined milestones during its progress. The scope to be covered shall include mechanical work, embedded software development and circuit design. It shall provide ample space for the more enthusiastic students to excel. Each student will have chances to play the role of leading the group in accomplishing subtasks assigned. Progress will be measured by functional demonstrations, logbooks and reports.</td></tr>
</table>
</td></tr>
</table>

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)							
		1	2	3	4	5	6	7	8
Continuous Assessment									
1. Exercises	12%	✓	✓	✓					
2. Quizzes	12%	✓	✓	✓					
3. Practical Test	14%	✓	✓	✓					
4. Tests	4%	✓	✓	✓					
5. Project logbook	8%	✓	✓	✓	✓	✓	✓	✓	✓
6. Project report and presentation	10%	✓	✓	✓	✓	✓	✓	✓	✓
7. Project demonstration	40%	✓	✓	✓	✓	✓	✓		✓
Total	100%								

Student Study Effort Expected

Class contact (time-tabled):	
• Lecture	38 Hours
• Tutorial/Laboratory/Practical Classes	42 Hours
• Tests/Quizzes	10 Hours
Other student study effort:	
• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	38 Hours
• Tutorial/Laboratory/Practice Classes: preview of materials, revision and logbook/report writing	42 Hours
• Project Development: preview of materials, revision, self-evaluation and testing of robots	30 Hours
Total student study effort:	**200 Hours**

Reading List and References

1. *The AVR Microcontroller and Embedded Systems: Using Assembly and C*, M. A. Mazidi, S. Naimi, and S. Naimi, Pearson, 2014.
2. D. Lock, *Project Management,* 10th ed., Farnham: Gower, 2013.

Last Updated: May 2020

Prepared by: Dr Lawrence Cheung

Subject Description Form

Subject Code	EIE3109
Subject Title	Mobile Systems and Application Development
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	ENG2002 Computer Programming
Objectives	This course aims at providing students with an understanding of the real-time embedded and mobile systems, and the techniques essential to the design and implementation of mobile applications.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the structure of real-time operating systems for modern mobile computer systems. 2. Understand the programming techniques and tools for developing software that is run in modern mobile computer systems 3. Apply the knowledge to develop practical applications for modern real-time mobile computer systems. Category B: Attributes for all-roundedness 4. understand the creative process when designing solutions to a problem
Subject Synopsis/ Indicative Syllabus	1. Introduction Introduction to Embedded Systems – embedded real-time systems, embedded programming and program models, real-time operating system (RTOS). Introduction to Mobile Systems and Mobile Application Development – advancement of mobile devices, comparison of various mobile platforms (iOS, Android, Windows Phone, Blackberry, etc.), application design process. 2. iOS Application Development Introduction to iOS – system architecture, development environment (Xcode), MVC architecture. Introduction to Swift Programming – basic syntax, optional type, dictionary, closure, property observer, computed properties. 3. Android Application Development Introduction to Android OS – development environment (Android Studio), Android application basic (activity, service, content provider, broadcast receiver, intent resolution). User Interface – layout overview, user interface widget, user interface event handling, user notification. Data Storage – shared preference, internal storage, external storage, SQLite, content provider. Networking – Android network overview and management, socket and HTTP, Wi-Fi and Bluetooth, GPS & telephony. Multimedia – voice recording, image capturing, basic drawing & animation.
Teaching/Learning Methodology	Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&A, discussions and specially designed classroom activities.

<table>
<tr><td></td><td>Tutorials: During tutorials, students will work on/discuss some chosen topics in small group. This will help strengthen the knowledge taught in lectures.

Laboratory and assignments: During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate performance of systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.

While lectures and tutorials will help to achieve the professional outcomes, the open-ended questions in laboratory exercises and assignments will provide the chance to students to exercise their creatively in problem solving.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="4">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. Continuous Assessment (total: 50%)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>• Homework and assignments</td><td>15%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>• Tests</td><td>15%</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>• Laboratory exercises</td><td>20%</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>50%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Assignment, homework and laboratory exercises will require students to apply what they have learnt to solve problems. There will be open-ended questions that allow students to exercise their creativity in making design.

Examination and tests: They assess students' achievement of the learning outcomes more rigorously.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture</td><td>24 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes</td><td>15 hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination</td><td>36 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</td><td>30 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
</table>
</td></tr>
</table>

Reading List and References	**Reference Books:** 1. Raj Kamai, Embedded Systems: Architecture, Programming and Design, 3rd ed., McGraw-Hill, 2015. 2. Sahar, Ahmad ; Clayton, Craig, IOS 13 Programming for Beginners: Get Started with Building IOS Apps with Swift 5 and Xcode 11, 4th Edition, Birmingham: Packt Publishing, Limited 2020. 3. Wei-Meng Lee, Beginning Swift programming, John Wiley & Sons 2015. 4. J. F. DiMarzio, Beginning Android programming with Android studio, Fourth edition, Wrox, a Wiley brand 2017. 5. Ted Hagos, Learn Android Studio 3 with Kotlin: Efficient Android App Development, Apress 2018 6. Dmitry Jemerov Svetlana Isakova, Kotlin in action, Manning Publications Co. 2017
Last Updated	June 2020
Prepared by	Mr Ivan Lau

Subject Description Form

Subject Code	EIE3112
Subject Title	Database System
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	**To introduce:** 1. database design, development, and programming 2. advanced database queries and database security 3. data warehousing and data mining
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Database design, development, and programming 2. Advanced database queries and database security. 3. Data warehousing and data mining Category B: Attributes for all-roundedness 4. Communicate effectively
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Database Design and Development 1.1 DBMS systems; Client-server architecture; Database architectures and the web 1.2 SQL: data manipulation; data definition; 1.3 DB Development: DB applications and views; 1.4 Advanced SQL: SQL programming language; stored procedures; functions; triggers; cursors; exception handling 1.5 ER Modelling: ER diagrams; Transforming ER diagrams to relations 1.6 Normalization: Data redundancy and update anomalies; functional dependencies; normalization processes; normal forms 2. Managing Database Environments 2.1 Database Security: Database security best practices; SQL injection; Preventing SQL injection 3. Data Warehouse and Data Mining 3.1 Architectures of data warehouse; applications of data warehouse; data warehouse tools and technologies 3.2 Data warehouse queries; OLTP versus OLAP; 3.3. Data-mining processes; Data representation; 3.4. Classification, regression, and cluster Analysis **Laboratory Experiments** Lab 1: Database Implementation and SQL Lab 2: Advanced SQL Lab 3: Data Mining and Data Analysis
Teaching/Learning Methodology	Lectures: Fundamental principles and key concepts of the subject are delivered to students. Tutorials: Students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed. Students will be given programming exercises and

<table>
<tr><td></td><td>use database development tools to design database.

Laboratory Sessions: Students will do some programming exercises to enhance their understanding on database design and development.</td></tr>
<tr><td>Alignment of Assessment and Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="4">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. Continuous Assessment (Total: 50%)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>• Assignment</td><td>10%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>• Test / quizzes</td><td>20%</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>• Laboratory</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>50%</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Total</td><td>100%</td><td></td><td></td><td></td><td></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Short quizzes: These can measure the students' understanding of the theories and concepts as well as their comprehension of subject materials.

Test & Examination: End-of-chapter-type problems are used to evaluate the students' ability in applying concepts and skills learnt in the classroom; students need to think critically and to learn independently in order to come up with an appropriate design.

Laboratory: Each student is required to produce a report; the accuracy and presentation of the report will be assessed.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture/Tutorial</td><td>30 Hours</td></tr>
<tr><td>• Laboratory/Practice Classes</td><td>9 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination</td><td>36 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</td><td>30 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>1. Thomas Connolly and Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation, and Management, 6/E, Pearson, 2015.
2. Mark L. Gillenson, Fundamentals of database management systems, Wiley, 2nd ed., Wiley, 2012.
3. I.H. Witten, Data Mining: Practical Machine Learning Tools and Techniques, 3rd ed., Morgan Kaufmann, 2011</td></tr>
<tr><td>Last Updated</td><td>July 2019</td></tr>
<tr><td>Prepared by</td><td>Dr Pauli Lai and Mr Ivan Lau</td></tr>
</table>

Subject Description Form

Subject Code	EIE3123
Subject Title	Dynamic Electronic Systems
Credit Value	3
Level	3
Pre-requisite / Co-requisite / Exclusion	Basic calculus
Objectives	**To enable students to gain knowledge and understanding in the following aspects:** 1. Modelling dynamic electronic systems using Laplace Transform technique. 2. Analysis of the stability, steady-state error, and transient response performances of dynamic electronic systems. 3. Using scientific computing software in control systems design. 4. Application of different feedback compensator design techniques to meet a set of given specifications. 5. Implementation of designed feedback compensator on real electronic systems and verify their performances.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the fundamentals of dynamic electronic systems and the importance of feedback control. 2. Design feedback compensator to meet a set of given specifications and constraints. 3. Use scientific computing software to analyse dynamic electronic systems and solve control problems. 4. Implement feedback compensator on real electronic systems. Category B: Attributes for all-roundedness 5. Communicate effectively. 6. Think critically and creatively. 7. Work with others as a team during practical classes.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Modelling of Dynamic Systems Laplace Transform; transfer functions; examples of modelling dynamic electronic systems. 2. Transient Response Poles and zeros; effect of pole locations; first-order systems; second-order systems; time-domain specifications; effects of zeros and additional poles. 3. Stability Stability of linear time-invariant systems; Routh-Hurwitz stability criterion; Nyquist stability criterion; stability margins. 4. Steady-State Errors Steady-state error for unity feedback systems; system types; static error constants; steady-state error for disturbances; steady-state error for non-unity feedback systems. 5. Design via Root Locus Techniques The root locus concept; properties of root locus; gain adjustment; lag

compensation; lead compensation; lead-lag compensation.

6. Design via Frequency Response Techniques
   Frequency response; Bode plots; gain adjustment; lag compensation; lead compensation; lead-lag compensation.

7. Tuning PID Controllers
   Ziegler-Nichols tuning method; Cohen-Coon tuning method.

8. Digital Control Systems
   Basic structure of digital control system, *z*-Transform, discrete transfer function, stability/steady-state error/transient performances of digital control systems, concept of discrete equivalents, digital compensator design in *z*-plane, implementation of digital compensator.

Laboratory Experiments:

1. Virtual (software-based) control lab
2. Mini-project

Teaching/Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3, 6	In lectures, students will be introduced to the fundamental knowledge of the subject, and comprehension is strengthened through interactive Q&A. They will be able to explain and generalize knowledge in the analysis and control design of dynamic electronic systems.
Tutorials	1, 2, 3, 5, 6	In tutorials, students will apply the knowledge learned in lectures in analysing the cases and solving the problems given by the tutor. They will analyse the given information, compare and contrast different scenarios and propose solutions or alternatives.
Mini-project (practical works)	1, 2, 3, 4, 5, 6, 7	Students will acquire hands-on skills in using scientific computing software to analyse dynamic electronic systems and design feedback compensator. They will apply the knowledge learned in lectures / tutorials to complete a mini-project on the design and implementation of feedback compensator on real electronic systems.
Take-home assignment	1, 2, 3, 5, 6	By working on take-home assignment, students will develop a firm understanding of the knowledge related to the subject. They will analyse the available information and apply the knowledge learned in solving problem. For some design problems, they will have to synthesize solutions by evaluating different alternatives.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)						
		1	2	3	4	5	6	7
1. Continuous Assessment (total 50%)								
• Take-home assignment	5%	✓	✓	✓		✓	✓	
• Mini-project	35%	✓	✓	✓	✓	✓	✓	✓
• Mid-semester test	10%	✓	✓				✓	
2. Examination	50%	✓	✓				✓	
Total	100 %							

The continuous assessment consists of one take-home assignment, one test, and one mini-project.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Take-home assignment	One take-home assignment will be given to students to assess their competence level of knowledge and comprehension, ability to analyze given information, ability to apply knowledge and skills in different situations, ability to synthesize structure, and ability to evaluate given data to make judgment. The criteria (i.e. what to be demonstrated) and level (i.e. the extent) of achievement will be graded according to six levels: (A+ and A), Good (B+ and B), Satisfactory (C+ and C), Marginal (D) and Failure (F). These will be made known to students before the assignment is handed out. Feedback about their performance will be given promptly to students to help them improve their learning.
Mini-project (practical works)	Students will be required to complete a mini-project and submit a report. The emphasis is on assessing their ability to use scientific computing tools to analyze dynamic electronic systems and design feedback compensator to meet a given set of specifications, and implement the design on real electronic systems. Expectation and grading criteria are similar to the case of take-home assignment.
Mid-semester test	There will be a mid-semester test to evaluate students' understanding and ability to apply all the key concept. Feedback about their performance will be given promptly to students to help them improve their learning. Expectation and grading criteria are similar to the case of take-home assignment.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Books:** 1. Norman S. Nise, *Control Systems Engineering*, 7th ed., John Wiley and Sons, Inc., 2015. 2. Richard C. Dorf and Robert H. Bishop, *Modern Control Systems*, 13th ed., Pearson, 2016. 3. Gene F. Franklin, J. David Powell, and Abbas Emami-Naeini, *Feedback Control of Dynamic Systems*, 8th ed., Pearson, 2019. 4. K. Ogata, *Modern Control Engineering*, 5th ed., Prentice Hall, 2010. 5. Karl J. Astrom and Richard M. Murray, *Feedback Systems: An Introduction for Scientists and Engineers*, Princeton University Press, 2008.	
Last Updated	Mar 2019	
Prepared by	Dr K.H. Loo	

Subject Description Form

Subject Code	EIE3305
Subject Title	Integrated Analogue and Digital Circuits
Credit Value	3
Level	3
Pre-requisite	EIE2100 Basic Circuit Analysis EIE2102 Basic Electronics EIE3100 Analogue Circuit Fundamentals
Co-requisite/ Exclusion	Nil
Objectives	To develop an in-depth understanding of the design principles and applications of integrated analogue and digital circuits.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. An understanding of the fundamental principles and applications of digital logic circuits. 2. An ability to design periodic signal generators from digital logic circuits. 3. An understanding of filter design principles and circuit technologies. 4. An ability to apply theory and realize analog filter circuits. 5. An understanding of output stage design of analog circuits. 6. An overview of advanced logic circuit families. Category B: Attributes for all-roundedness 7. An ability to communicate effectively 8. An ability to think critically and creatively 9. An ability to assimilate new technological development in related field
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Integrated Analog Circuits 1.1 *Analog filters*: Filter type and specifications, transfer function, Butterworth and Chebyshev filters, first-order and second-order filter functions, passive second-order LCR filters, active second-order filters based on inductor replacement / two-integrator-loop / single-amplifier biquad, switched-capacitor filters 1.2 *Waveform generators*: Basic principles of sinusoidal oscillators, oscillator feedback loop and oscillation criteria, op-amp-RC oscillator circuits (Wien-Bridge oscillator, phase-shift oscillator, quadrature oscillator), LC and crystal oscillators, bistable multivibrators, monostable multivibrators, 555 integrator circuit timer 1.3 *Output stage design*: Classification of output stages, Class A / B / AB output stages, biasing circuit design, transfer characteristic, signal waveform, power dissipation and conversion efficiency, harmonic distortion 2. Integrated Digital Circuits 2.1 *CMOS logic*: Basic logic inverter, voltage transfer characteristic, noise margins, propagation delay, inverter sizing, power dissipation, pull-up and pull-down networks, synthesis method for CMOS logic-gate circuits, transistor sizing, fan-in and fan-out 2.2 *Advanced logic circuit families – an overview*: Pseudo-NMOS logic, pass-transistor logic, dynamic MOS logic, emitter-coupled logic (ECL), bipolar CMOS (BiCMOS) logic

2.3 *Memory circuits*: Flip-flop (basic principles and applications), memory-chip organization, random-access memory (RAM) – static and dynamic RAM, sense amplifiers, address decoders, read-only memory (ROM) – programmable ROM (PROM), erasable PROM (EPROM), electrically EPROM (EEPROM)

Laboratory Experiments:

1. Design of Butterworth / Chebyshev filter.
2. Sinusoidal, square-wave, and triangular waveform generators.
3. Characterization of basic CMOS logic inverter.

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3, 4, 5, 6	Fundamental principles and key concepts of the subject are delivered to students
Tutorials	1, 2, 3, 4, 5, 6	Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Problems and application examples are given and discussed
Laboratory sessions	1, 2, 3, 4, 7, 8, 9	Students in groups of 2-3 will conduct practical measurement and evaluate the performance of electronic circuits

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)								
		1	2	3	4	5	6	7	8	9
1. Continuous Assessment	(40%)									
• Assignment	13%	✓	✓	✓	✓	✓	✓			
• Tests	13%	✓	✓	✓	✓	✓	✓			
• Laboratory sessions	14%	✓	✓	✓	✓			✓	✓	✓
2. Examination	60%	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total	100%									

The continuous assessment consists of assignments, quizzes and two tests.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Short quizzes	Mainly objective tests (e.g., multiple-choice questions, true-false, and matching items) conducted to measure the students' ability to remember facts and figures as well as their comprehension of subject materials
Tests and examination	End-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom; Students need to think critically and creatively in order to come with an alternate solution for an existing problem
Laboratory sessions	Each group of students are required to produce a written report; Accuracy and the presentation of the report will be assessed

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 hours
	Other student study effort:	
	• Lecture: preview/review of notes; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**

Reading List and References

Textbooks:

1. Adel S. Sedra and Kenneth C. Smith, *Microelectronic Circuits*, 6th ed., Oxford University Press, 2011.
2. Jacob Millman and Arvin Grabel, *Microelectronics*, 2nd ed., McGraw-Hill,1987.

Reference Books:

1. Thomas L. Floyd, *Digital Fundamentals*, 10th ed., Pearson, 2009.
2. Rolf Schaumann and Mac E. Van Valkenburg, *Design of Analog Filters*, Oxford University Press, 2001.
3. John P. Hayes, *Introduction to Digital Logic Design*, Addison-Wesley, 1993.
4. Paul Horowitz and Winfield Hill, *The Art of Electronics*, 2nd ed, Cambridge University Press, 1989.

Last Updated	May 2018
Prepared by	Dr S. C. Wong

Subject Description Form

Subject Code	EIE3311 (for 42470 and 42375)
Subject Title	Computer System Fundamentals
Credit Value	3
Level	3
Pre-requisite	For 42470: EIE2211 Logic Design For 42375: EIE2261 Logic Design
Co-requisite/ Exclusion	Nil
Objectives	To provide a broad treatment of the fundamentals of computer systems.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Apply knowledge of mathematics, science, and engineering appropriate to a basic computer system. 2. Use computer tools with an understanding of the processes and limitations. 3. Understand the fundamentals of computer systems and associated technologies. Category B: Attributes for all-roundedness 4. Communicate effectively.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Microprocessors and Microcomputers The following topics will be discussed in detail with references to one or two well-established (contemporary) microprocessor systems. 1.1 CPU architecture: instruction fetch and execution, pipelining, instruction types, examples of assembly language programs, processor control units and micro-programmed control unit, real mode and protected mode of x86 processors, advanced processors, Graphics Processing Units (GPUs) and general-purpose computing. 1.2 Memory interface and memory management: memory devices, address decoding, memory interface, banking, bus buffering and driving, bus cycle and wait state, memory segmentation and paging. 1.3 Basic I/O interface: memory-mapped I/O, I/O port address decoding, programmable peripheral interface, handshaking. 1.4 Interrupts: polling, programmed I/O, interrupt I/O; basic interrupt processing, software interrupt, expanding the interrupt structure. 1.5 Direct Memory Access and DMA-controlled I/O: basic DMA operation, DMA controller, shared-bus operation. 1.6 Cache memory: mapping, associativity, replacement policies, write policies, performance. 1.7 Computer buses: evolution of bus architectures, PCI (PCIe) local bus, USB bus 2. Introduction to Operating System 2.1 File systems: secondary memory, disk formatting, file allocation table, file management, directory entry and file control block. 2.2 Multitasking and time-sharing: time-slicing, process states and process control block, context-switching mechanism, scheduling schemes and process priorities.

2.3 Boot-up ROM, firmware, hardware, device drivers.
2.4 Extension of OS and computing system to cloud Computing.

3. Computer Arithmetic
3.1 Data formats: signed/unsigned numbers, binary/decimal/BCD numbers, ASCII, fixed/floating point numbers, IEEE standard.
3.2 Arithmetic algorithms: fast addition, multiplication and division algorithms.

Laboratory Experiment:

1. x86 registers and memory architecture
2. x86 assembly language programming
3. Cache memory
4. I/O interface and Interrupt I/O

Teaching/ Learning Methodology

Teaching and Learning Method	**Intended Subject Learning Outcome**	**Remarks**
Lectures	1, 2, 3	fundamental principles and key concepts of the subject are delivered to students
Tutorials and Assignments	1, 2, 3, 4	supplementary to lectures and are conducted with a smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed Students take home more questions after each tutorial session and hand in their answers in the subsequent tutorial session
Laboratory sessions	1, 2, 3, 4	students will make use of a x86 assembler and debugger to develop an assembly program; software to simulate various OS management techniques and evaluate their performance; and circuit board to study various interfacing techniques and evaluate their efficiency and performance

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/ Task	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**			
		1	**2**	**3**	**4**
1. Continuous Assessment (Total: 50%)					
• Assignments	15%	✓	✓	✓	✓
• Laboratory Exercises	10%	✓	✓	✓	✓
• Tests	25%	✓		✓	✓
2. Examination	50%	✓		✓	✓
Total	100%				

<table>
<tr><td></td><td>
The continuous assessment consists of short quizzes, assignments, laboratory reports and tests.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:
<table>
<tr><th>Specific Assessment Methods/Tasks</th><th>Remark</th></tr>
<tr><td>Assignments, tests and examination</td><td>end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;</td></tr>
<tr><td>Laboratory exercises</td><td>each student is required to produce a written report;
accuracy and the presentation of the report will be assessed;</td></tr>
</table>
</td></tr>
<tr><td rowspan="7">Student Study Effort Expected</td><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture</td><td>24 Hours</td></tr>
<tr><td>• Tutorial/Laboratory</td><td>15 hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Lecture/Tutorial: preview/review of notes; assignments; preparation for test/examination</td><td>54 Hours</td></tr>
<tr><td>• Laboratory: preview of materials, revision and/or reports writing</td><td>12 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Reference Books:

1. B.B. Bery, The Intel Microprocessors 8086/8088, 80186/80188, 8086, 80386, 80486, Pentium, Pentium pro processor, Pentium II, Pentium III, Pentium 4 and Core2 with 64-bit extensions: Architecture, Programming, and Interfacing, 8th ed., Pearson Prentice Hall, 2009.
2. C. Hamacher, Z. Vranesic, S. Zaky, and N. Manjikian, Computer Organization and Embedded Systems, 6th ed., McGraw-Hill, 2012.
3. W. Stallings, Computer Organization & Architecture: Designing for Performance, 10th ed., Prentice Hall, 2016.
4. Muhammad A. Mazidi and Janice G. Mazidi, The 80x86 IBM PC and Compatible Computers: Assembly Language, Design, and Interfacing, International Edition, 5th ed., Pearson Education, 2010.
5. J. Uffenbeck, The 80x86 Family: Design, Programming, and Interfacing, 3rd ed., Prentice Hall, 2002.
6. T. Erl, Z Mahmood, and R. Puttini, Cloud Computing: Concepts, Technology & Architecture, Prentice Hall, 2013.</td></tr>
<tr><td>Last Updated</td><td colspan="2">April 2022</td></tr>
<tr><td>Prepared by</td><td colspan="2">Dr Lawrence Cheung</td></tr>
</table>

Subject Description Form

Subject Code	EIE3312 (for 42470 and 42375)
Subject Title	Linear Systems
Credit Value	3
Level	3
Pre-requisite	Mathematics I (AMA2111)
Co-requisite/ Exclusion	Nil
Objectives	1. To provide students with basic concepts and techniques for the modelling and analysis of linear continuous-time and discrete-time signals and systems. 2. To provide students with an analytical foundation for further studies in Communication Engineering and Digital Signal Processing.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the representations and classifications of the signals and systems. 2. Understand the modelling of linear systems. 3. Use different techniques to analyze and design systems. 4. Apply software tools to laboratory exercises for experimenting with theories, and to the analysis and design of signals and systems. 5. Appreciate the advantages and disadvantages of using the different representations and modeling approaches. Category B: Attributes for all-roundedness 6. Present ideas and findings effectively. 7. Think critically and learn independently. 8. Work in a team and collaborate effectively with others.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Signal Representation Signal Classification, Continuous and Discrete-Time Signals, Random Signals. Time-Domain and Frequency-Domain Representations. 2. Continuous-Time and Discrete-Time Systems Impulse Representation and Convolution, Linear Time-Invariant Systems. Properties of Systems: Causality, Time Invariance, Linearity, Systems with Memory, Inverse of a System, Stability. LTI Systems: Differential and Difference Equation Representation, Block Diagram Representations. 3. Fourier Representations for Signals Reviews on Periodic and Nonperiodic Signals, Continuous and Discrete Signal, Fourier Series and Transform, Frequency Spectra. Properties of Fourier Representations, Time Functions, Applications on System Frequency Response and Signal Frequency Spectrum. Frequency Response of LTI Systems, Sampling. Discrete-Time Fourier Transform, 4. Laplace Transform Definition and Properties of Laplace Transform, Inversion of Laplace Transform, Bilateral Laplace Transform. Transform Analysis of LTI Systems, Poles and Zeros. Relationship of Laplace Transform and Fourier Transform.

5. Analogue Filters
Ideal Filters, Bode Plots. Filter Design: Butterworth Filters, Chebyshev Filters, Frequency Transformations.

Laboratory Experiments:

1. Fundamentals of Signals
2. Linear Time-Invariant Systems
3. Fourier Analysis of Continuous-time Signals
4. Sampling
5. Fourier Analysis of Discrete-time Signals

Teaching/ Learning Methodology

Teaching and Learning Method	**Intended Subject Learning Outcome**	**Remarks**
Lectures	1, 2, 3, 5, 7	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1, 2, 3, 5, 7	These are supplementary to lectures and are conducted with smaller class sizes; students will be able to clarify concepts and to gain a deeper understanding of the lecture material; problems and application examples are given and discussed.
Laboratory sessions	4, 6, 7, 8	Students will make use of the software MATLAB to simulate the various theories and visualize the results.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/ Task	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Continuous Assessment	45%								
• Assignments	15%	✓	✓	✓		✓	✓	✓	
• Laboratory sessions	10%				✓		✓		✓
• Tests	20%	✓	✓	✓		✓	✓	✓	
2. Examination	55%	✓	✓	✓		✓	✓	✓	
Total	100%								

	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: **Specific Assessment Methods/Tasks** / **Remark** Short quizzes — These can measure the students' understanding of the theories and concepts as well as their comprehension of subject materials. Assignments, tests and examination — End-of-chapter-type problems are used to evaluate the students' ability in applying concepts and skills learnt in the classroom; students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem. Laboratory sessions — Each student is required to produce a written report; the accuracy and presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each student to evaluate his/her technical knowledge and communication skills.	
Student Study Effort Required	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Books:** 1. Ed. Kamen and Bonnie Heck, *Fundamentals of Signals and Systems Using the Web and Matlab*, 3/e, Prentice-Hall, 2007. 2. M.J. Roberts, *Fundamentals of Signals & Systems,* McGraw-Hill, 2008 3. Simon Haykin and Barry Van Veen, *Signals and Systems*, Wiley, 2003. 4. Charles L. Phillips, et al., *Signals, Systems, and Transforms,* 3/e, Prentice-Hall, 2003.	
Last Updated	June 2021	
Prepared by	Prof. Kenneth Lam	

Subject Description Form

Subject Code	EIE3320
Subject Title	Object-Oriented Design and Programming
Credit Value	3
Level	3
Pre-requisite	For 42470 and 42477: ENG2002 Computer Programming For 42375: EIE2264 Computer Programming/EIE2111 Computer Programming
Co-requisite/ Exclusion	Nil
Objectives	This subject will provide students with the principles of object-oriented software design and programming from the perspective of Java implementation and UML. Students are expected to learn the concepts of and practical approaches to object-oriented analysis, design and programming using UML and Java.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the principles of object oriented design. 2. Apply Java in object oriented software development. 3. Apply UML in object oriented software modeling. 4. Apply object oriented approach to developing computer software. Category B: Attributes for all-roundedness 5. Learn independently and be able to search for the information required in solving problems. 6. Present ideas and findings effectively. 7. Think critically. 8. Work in a team and collaborate effectively with others.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction to Software Engineering Software products; software processes; software process models; 2. Java Programming Basic Java technologies; Java platform; Java language basic: variables, operators, expressions, statements, blocks, control flow, methods, arrays. 3. Object-Oriented Programming with Java Objects and classes; class definition; fields, constructors and methods; object interaction; grouping objects; array and collections; designing classes; inheritance and polymorphism; managing inheritance: creating subclasses and super-classes, hiding member variables, overriding methods. Interfaces and packages. 4. Data Structures with Java Implementation-dependent structures such as array and linked list; Implementation-independent structures such as stack, queue, list, map, tree, graph; Fundamental algorithms such as searching and sorting. 5. Unified Modelling Language (UML) Purposes of modelling. Structural Modelling: classes, relationships, class Diagrams, interfaces, packages, and object diagrams. Behavioural

modelling interactions and use case diagrams. Architectural modelling: components, deployment, and collaborations. Mapping UML diagrams to Java Code.

Laboratory Experiment:

Students will be requested to use integrated development environment (IDE) to write and debug Java programs during tutorial and lab sessions.

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3	fundamental principles and key concepts of the subject are delivered to students
Quizzes/Tests	1, 2, 3	students' knowledge on understanding of certain topics can be easily estimated, and the corresponding teaching time will be adjusted accordingly
Assignments	2,4,5,7	Programming exercises are used to reinforce the knowledge taught in lectures.
Laboratory sessions	2,3,4,5,6,7,8	Students will need to design, develop, test, and document Java programs.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/ Task	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)							
		1	2	3	4	5	6	7	8
1. Continuous Assessment (Total: 100%)									
• Assignments	8%		✓		✓	✓		✓	
• Lab reports	20%		✓	✓	✓	✓	✓	✓	✓
• Knowledge Tests/ Quizzes	32%	✓		✓					
• Practical Tests	40%		✓		✓				
Total	100%								

The continuous assessment consists of programming assignments, laboratory reports, knowledge tests/quizzes and practical tests.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

	Specific Assessment Methods/Tasks	**Remark**
	Knowledge Tests/Quizzes	Short questions will be used to test and enhance students' understanding about the topics covered in lectures. End-of-chapter problems will be used to evaluate students' ability in applying concepts and skills learnt in the classroom.
	Assignments	Students will be asked to write Java programs and test the programs. Students will need to think critically and creatively in order to come up with a good solution for an existing problem.
	Lab reports	Each group of students are required to produce a written report for the Laboratory sessions. Students will be assessed based on the quality of their programs and the clarity of their reports. Students will be asked to work as a team to develop a Java application. Each of them will be responsible for part of the software. They will also need to use UML diagram to illustrate the structure of their programs. Students will need to think critically and creatively in order to come up with a good solution for an existing problem.
	Practical Tests	Students will be given programming problems and asked to write Java programs to solve the problems.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	26 Hours
	• Tutorial/Laboratory/Practice Classes	13 hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**

Reading List and References

Reference Books:

1. G. Booch, I. Jacobson and J. Rumbaugh, *The Unified Modeling Language User Guide*, 2nd ed., Addison-Wesley, 2005.
2. D.J. Barnes and M. Kolling, *Objects First with Java: A Practical Introduction using BlueJ*, 5th ed., Prentice-Hall, 2012.
3. Nell Dale, Daniel T. Joyce, and Chip Weems. *Object-Oriented Data Structures Using Java (4th. ed.)*. Jones and Bartlett Publishers, Inc., USA. 2018.
4. H.M. Deitel and P.J. Deitel, *Java: How To Program (Early Objects)*, 10th ed., Prentice-Hall, 2014.
5. J. Lewis and W. Loftus, Java Software Solutions, 8th Edition, Pearson, 2015.
6. J. Rumbaugh, I. Jacobson and G. Booch, *The Unified Modeling Language Reference Manual*, 2nd ed., Addison-Wesley, 2004.

Last Updated	July 2020
Prepared by	Dr Pauli Lai and Mr Richard Pang

Subject Description Form

Subject Code	EIE3331
Subject Title	Communication Fundamentals
Credit Value	3
Level	3
Pre-requisite	AMA2111 Mathematics I
Co-requisite/ Exclusion	Nil
Objectives	Telecommunication plays an important role in modern societies that rely heavily on a knowledge economy. Telecommunication systems enable the transfer and exchange of information over communication channels that are corrupted by disturbances and noises in a cost-effective manner. The major objectives of this subject are for the students to establish a firm foundation for the understanding of telecommunication systems, and the relationship among various technical and socio-economic factors when such systems are designed and operated.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Identify various elements, processes, and parameters in telecommunication systems, and describe their functions, effects, and interrelationship. 2. Analyze, measure, and evaluate the performance of a telecommunication system against given criteria. 3. Design typical telecommunication systems that consist of basic and essential building blocks. Category B: Attributes for all-roundedness 4. Communicate effectively. 5. Think critically and creatively. 6. Assimilate new technological development in related field.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction (2 hour) 1.1 Introduction to telecommunication systems, their past and present development; elements of a basic communication system; examples of practical telecommunication systems. 2. Analog Communications (18 hours) 2.1 Amplitude Modulation (AM): double sideband, double sideband with suppressed carrier, single sideband, frequency spectrum and power of the AM signal, Frequency Division Multiplexing. 2.2 Demodulation of AM signals: coherent detector, direct demodulation 2.3 Frequency modulation: bandwidth of FM signals, Stereo FM. 2.4 Demodulation of FM signals: Phase-Locked Loop (PLL) detector. 2.5 Comparison of AM and FM performance: bandwidth, signal-to-noise ratio 3. Analog to Digital Conversion (4 hours) 3.1 Sampling theorem; pulse amplitude modulation 3.2 Quantizing: uniform quantization and quantization noise, SNR (e.g.: Audio CD standard), non-uniform quantization (e.g. A-law, u-law) 3.3 Pulse code modulation (PCM) 3.4 Time division multiplexing: T1 multiplexing system

4. Digital Modulation and Demodulation (9 hours)

4.1 ASK, FSK, PSK, DPSK, QPSK (e.g. satellite system), OQPSK, QAM (e.g. Microwave link applications), constellation diagram, bandwidth.
4.2 Coherent demodulation
4.3 Non-coherent demodulation (e.g. DPSK, OQPSK)
4.4 BER performance over Additive White Gaussian Noise (AWGN) channel
4.5 Effects of bandwidth, distortion, noise, timing error on detection, eye diagram

Practical:

- Matlab/Python simulation/experiments in communication systems (6 hours)

Teaching/ Learning Methodology

Teaching and Learning Method	**Intended Subject Learning Outcome**	**Remarks**
Lectures, supplemented with interactive questions and answers, and short quizzes	1,2,3,5,6	In lectures, students are introduced to the *knowledge* of the telecommunication field; *comprehension* of the knowledge is strengthened with interactive Q&A and short quizzes. The students will be able to *define* and *describe* key terms and concepts about telecommunication. They will also be able to *explain* and *generalize* knowledge about telecommunication (e.g. different modulation techniques and their performance, difference between analog and digital modulation techniques)
Tutorials where case studies are conducted, and problems are given to students for them to solve	1,2,3,4,5,6	In tutorials, students *apply* what they have learnt in analyzing cases (e.g. superheterodyne receiver structure) and solving problems (e.g. calculating the channel capacity of a given channel). They will *analyze* the given information, *compare* and *contrast* different scenarios and propose solutions or alternatives.
Lab, where students will conduct simulations/experiments on communication systems	2,3,4,5,6	By performing hands-on authentic tasks, the students will be able to *synthesize* a structure of knowledge by *designing* a solution to a communication problem. They will *relate* the observation to theories and principles. They will also *evaluate* outcomes of the tasks they perform and *interpret* the data they gather.

	Lab/ homework, quizzes, tests, end-of-chapter problems	1,2,3,4,5,6	Through working assignment and homework, online quizzes, and end-of-chapter problems in text books, students will develop a firm understanding and *comprehension* of the *knowledge* taught. They will *analyze* given information and *apply* knowledge in solving problems. For some design type of questions (e.g. design a communication link with a given S/N ratio), they will have to *synthesize* solutions by *evaluating* different alternatives.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific Assessment Methods/Tasks	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**					
		1	**2**	**3**	**4**	**5**	**6**
1. Continuous Assessment (total 50%)							
•							
• Lab assignment	10%		✓	✓	✓	✓	✓
• Quiz	20%	✓	✓	✓	✓	✓	
• Test	20%	✓	✓	✓	✓	✓	
2. Examination	50%	✓	✓	✓	✓	✓	
Total	100 %						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	**Remark**
Quizzes/ tests/examination	Quizzes, tests, and examinations are given to students to assess their competence level of *knowledge* and *comprehension*, ability to *analyze* given information, ability to *apply* knowledge and skills in new situation, ability to *synthesize* structure, and ability to evaluate given data to make judgment. The criteria (i.e. *what* to be demonstrated) and level (i.e. the *extent*) of achievement will be graded according to six levels: Excellent (A+ and A), Good (B+ and B), Satisfactory (C+ and C), Marginal (D) and Failure (F). These will be made known to the students. Feedback about their performance will be given promptly to students to help them improvement their learning.
Lab assignment	Students are required to conduct Matlab/Python simulations/experiments on communication systems. The emphasis is on assessing their ability to *apply* knowledge and skills learned in *designing*, *synthesizing* and ev*aluating* and ability to take data and relate the measurement results to theory. Expectation and grading criteria will be given as in the case of quizzes and tests.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Lab/Practice Classes	15 hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Lab/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Books:** 1. B. P. Lathi, Z. Ding, *Modern Digital and Analog Communication Systems*, 5th ed., Oxford University Press, 2019 2. H. Stern, S. A. Mahmoud, *Communication Systems: Analysis and Design*, Pearson, 2004 3. S. Haykin, *Communication Systems*, 4th ed., John Wiley, 2001 4. J. Proakis and M. Salehi, *Fundamentals of Communication Systems*, 2nd ed., Pearson, 2014	
Last Updated	June 2022	
Prepared by	Dr S. Zhang	

Subject Description Form

Subject Code	EIE3333
Subject Title	Data and Computer Communications
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide solid foundation to students about the architectures and operations of communication networks. 2. To enable students to master the knowledge about computer networking in the context of real-life applications. 3. To prepare students to learn and to critically evaluate new knowledge and emerging technology in communication networks.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the services, functions, and inter-relationship of different layers in communication network models 2. Describe how components in different layers inter-operate and analyze their performance. 3. Understand and apply the principles and practices of communication networks. 4. Learn new techniques and to align new technologies to existing network infrastructure. Category B: Attributes for all-roundedness 5. Present ideas and findings effectively. 6. Learn independently.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Computer Networks, Services, and Layered Architectures Evolution of networking and switching technology. Protocol and services. Layered network architectures: OSI 7-layer model, TCP/IP architecture. 2. Digital Transmission and Protocols in Data Link Layer Line coding techniques, error detection and correction. Automatic Repeat Request (ARQ) protocol and reliable data transfer service. Sliding-window flow control. Framing and point-to-point protocol, flow control and error controls. High level data link control (HDLC) protocol and point-to-point protocol (PPP). 3. Local Area Networks (LANs) and Wireless LANs Media Access Control (MAC) protocols: the IEEE802.3 Ethernet and IEEE802.11 wireless LAN standards. Interconnection of LANs: bridge, switch, and virtual LAN. 4. Network Layer Protocols Network layer operations, connection oriented and connectionless services. Internet protocol (IP): IP datagram format, IP addressing, subnetting, IP routing and router operations. Internet control message protocol (ICMP), dynamic host configuration protocol (DHCP), network address translation (NAT).

5. Transport Layer Protocols
Transmission control protocol (TCP) and user datagram protocol (UDP)

Possible Laboratory Experiments:
1. Cisco router configuration and programming.
2. Static and Dynamic routing.
3. Network monitoring and analysis
4. Address resolution, ARP, IP, and TCP.

Teaching/ Learning Methodology

Teaching and Learning Method	**Intended Subject Learning Outcome**	**Remarks**
Lectures	1, 2, 3, 4	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1, 2, 3, 4, 5	Supplementary to lectures. Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Problems and application examples are given and discussed.
Laboratory sessions	3, 5, 6	Students will conduct practical exercises to reinforce concepts and techniques learned.

Alignment of Assessment and Intended Subject Learning Outcomes

Specific Assessment Methods/ Task	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**					
		1	**2**	**3**	**4**	**5**	**6**
1. Continuous Assessment	50%						
• Mid-Term Test	15%	✓	✓	✓	✓	✓	
• End-of-Term Test	15%	✓	✓	✓	✓	✓	
• Assignments	8%	✓	✓	✓	✓	✓	
• Laboratories	12%			✓		✓	✓
2. Examination	50%	✓	✓	✓	✓	✓	
Total	100%						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/ Tasks	Remark
Assignments, Tests and examination	These can measure the students' understanding of the theories and the concepts of the subject. End-of-chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom; Assignments of reading report type to assess students' ability in acquiring new knowledge related to communication networks; Students need to think critically and creatively in order to come with an alternate solution for an existing problem.
Laboratory sessions	Each group of students is required to complete work-sheets, to indicate their understanding and correct completion of the laboratories. Accuracy and the presentation of the work-sheets will be assessed;

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Textbook :** 1. Behrouz A. Forouzan, *Data Communications & Networking,* 5th ed., McGraw-Hill, 2012. **Reference Books:** 1. Behrouz A. Forouzan, *Computer Networks: A Top-Down Approach*, McGraw-Hill, 2012. 2. William Stallings, *Data and Computer Communications*, 9th ed., Pearson/ Prentice-Hall, 2012. 3. Douglas Comer, *Computer Networks and Internets*, 5th ed., Pearson/ Prentice-Hall, 2009.	
Last Updated	July 2020	
Prepared by	Dr K.T. Lo	

Subject Description Form

Subject Code	EIE3901/IC382
Subject Title	Multidisciplinary Manufacturing Project
Credit Value	3 Training Credits
Level	3
Pre-requisite	ME39002/IC348 or EIE2901/IC2114 or AAE3103/IC381
Objectives	The subject provides opportunity for students to work in a multidisciplinary project team to accomplish realistic engineering goals. Through the project, students will apply and integrate the engineering knowledge and practical skills acquired from prior engineering subjects and industrial trainings. Students will also be able to analyse engineering problems from multiple perspectives, and synthesize a solution from ideas contributed by teammates of multiple disciplines.
Intended Learning Outcomes	**Upon completion of the subject, students will be able to**: 1. apply engineering knowledge in carrying out an industrial project starting from problem definition, design, manufacturing, down to assembly, testing and evaluation; 2. select and use appropriate technology building blocks, components and manufacturing processes to develop a solution to meet given specifications and constraints; 3. Work collaboratively and effectively in a multidisciplinary team to accomplish mutual project goals; and 4. Communicate effectively in a multidisciplinary project team.
Subject Synopsis/ Indicative Syllabus	Students will be divided into groups to design and manufacture an engineering product that satisfy an existing demand in IC or a certain customer from the industry. Throughout the project, students will encounter situations that reinforce the following skills: 1) **Project specification**: Identification of client needs and wants; Identification of resource constraints such as time, manpower, equipment, budget; Formulation of project plan. 2) **Engineering design**: Selection of design methodology; collaborative design; Make-or-buy decisions; Design prototyping; Testing and simulation. 3) **Product manufacturing:** Material procurement; Component machining; PCB fabrication; Programming; Assembly and fine-tuning. 4) **Project collaboration:** Determination of project stages and milestones; CAD and PDM; Leadership and Collaborative decision making; Tolerances and fits; Project documentations.
Learning Methodology	Students will be divided into groups of 5-8 to design and manufacture an engineering product. Each project group will be formed by students from two or more engineering streams. The project topics will be provided by the subject supervisor team. Topics will be either initiated by supervisors or by commercial clients. All topics shall demand two or more skillsets including Mechanics, Electronics, and IT. Typical topics include: automated production equipment, mobility products, robotic toys, airframe structures, cabin installations, aircraft maintenance tools, jigs and

gauges, *etc*.

The subject is divided into two stages:

- Design Stage

  During this period, the project team, under the guidance of the supervisors and clients, have to discover, understand and analyze the requirement of the project; and apply their knowledge to design a solution. Furthermore, students are required to search and track down parts and components with suppliers to obtain materials for the following manufacturing stage.

- Manufacturing stage

  During this period, the project team will fabricate, test, and debug the product they designed. The supervisors will guide and monitor the groups on personal commitment, cooperation and coordination among team members.

Regular group tutorials in the form of student-centred project meeting will be arranged between project group and respective supervisors.

Assessment Methods in Alignment with Intended Learning Outcomes

Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed			
		1	2	3	4
1. Quality of final product	30%	✓	✓		
2. Report	20%	✓	✓	✓	✓
3. Presentation and demonstration	20%			✓	✓
4. Reflective Journal	30%	✓	✓	✓	✓
Total	100%				

Group assessment components

Quality of final product will be assessed by the supervisor team during demonstration. The assessment is to determine how well the group's solution meets with client's requirement in terms of completeness and functionality. The assessment also determines how well the group has carried out the manufacturing in terms of accuracy and craftsmanship. This addresses the intended learning outcomes (1) & (2).

Report submitted at the end of project will be summative evidence of how well the group applied knowledge and made decisions collectively. Compulsory report chapters include: Technical description of final design; Justification of technology building blocks used; Critical review on project execution; and Record of internal communications. This addresses the intended learning outcomes (1), (2), (3) & (4).

Individual assessment components

Oral presentation and demonstration in an exhibition booth setting allow individual members to demonstrate their ability in presenting engineering contents clearly and logically. Through Q&A session supervisors can also determine the effectiveness of individual members' effort toward the final product outcomes. This addresses the intended learning outcomes (3) & (4).

Individual reflective journal serves as summative evidence of how well the student has functioned in the group and embrace the multidisciplinary collaboration concept. Compulsory journal contents include: Technical description of design and manufacturing tasks performed; Critical review of technical ideas proposed and adapted; Critical review on personal performance in the project execution and the collaboration experience. This addresses the intended learning outcomes (1), (2), (3) & (4).

Student Study Effort Required	**Class Contact**	
	• Project works	78 Hours
	• Tutorial	12 Hours
	Other Study Effort	**0 Hour**
	Total Study Effort	**90 Hours**
Reading List and References	1. E. Tebeaux and S. Dragga, 'Chapter.9 Proposals and Progress Reports', in *The Essentials of Technical Communication*, 3rd ed., New York: Oxford, 2012 2. J. Abarca et al, 'Teamwork and Working in Teams', in *Introductory Engineering Design: A Projects-Based Approach*, 3rd ed., University of Colorado at Boulder, 2000. 3. J. Tropman, *Effective meetings*. Thousand Oaks, Calif.: Sage Publications, 3rd ED. 2014. 4. P. Harpum, 'Design Management', in *Engineering Project Management*, 3rd ed., N. Smith, Ed. Oxford: Blackwell, 2008, pp. 234-254. 5. Alur, Rajeev. Principles of Cyber-physical Systems. Cambridge, Massachusetts: MIT, 2015. 6. Valvano, Jonathan W. Introduction to ARM Cortex-M Microcontrollers. Fifth ed. , Jonathan W. Valvano, 2017	
Last Updated	July 2021	
Prepared by	Industrial Centre	

Subject Description Form

Subject Code	ELC3531 (for 42470, 42477, 42375 and 42480)
Subject Title	Professional Communication in English for Engineering Students
Credit Value	2
Level	3
Pre-requisite / Co-requisite	English LCR subjects
Objectives	This subject aims to develop the language competence for professional communication in English required by students to communicate effectively with various parties and stakeholders in regard to engineering-related project proposals.
Intended Subject Learning Outcomes	**Upon completion of the subject, and in relation to effective communication with a variety of intended readers/audiences in English, students will be able to**: 1. plan, organise and produce professionally acceptable project proposals with appropriate text structures and language for different intended readers 2. plan, organise and deliver effective project-related oral presentations with appropriate interactive strategies and language for different intended audiences 3. adjust the style of expression and interactive strategies in writing and speaking in accordance with different intended readers/audiences
Subject Synopsis / Indicative Syllabus	1. Project proposal in English • Planning and organising a project proposal • Explaining the background, rationale, objectives, scope and significance of a project • Referring to the current situation or existing literature to substantiate a project proposal • Describing the methods of study • Describing and discussing anticipated project results and (if applicable) results of a pilot study • Presenting the budget, schedule and (if applicable) method of evaluation • Writing an executive summary 2. Oral presentation of project proposal in English • Selecting content for an audience-focused presentation • Choosing language and style appropriate to the intended audience • Using appropriate transitions and maintaining coherence in a team presentation • Using effective verbal and non-verbal interactive strategies
Teaching/Learning Methodology	The subject is designed to develop the English language skills, both oral and written, that students need to use to communicate effectively and professionally with a variety of stakeholders of engineering-related projects. It builds upon the language and communication skills covered in GUR language training subjects. The study approach is primarily seminar-based. Seminar activities include instructor input as well as individual and group work, involving drafting and evaluating texts, mini-presentations, discussions and simulations. The learning and teaching activities in the subject will focus on a course-long project which will engage students in proposing and reporting on an

engineering-related project to different intended readers/audiences. During the course, students will be involved in:

- planning and researching the project
- writing project-related documents such as project proposals
- giving oral presentations to intended stakeholders of the project

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)		
		1	2	3
1. Project proposal in English	40%	✓		✓
2. Oral presentation of project proposal in English	60%		✓	✓
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The assessments will arise from a course-long engineering-related project. Students will collaborate in groups in planning, researching, discussing and giving oral presentations on the project. They will be assessed on written documents and oral presentations targeted at different intended readers/audiences. This facilitates assessment of students' ability to select content and use language and style appropriate to the purposes and intended readers/audiences.

Assessment type	Intended readers/audience	Timing
1. Project proposal in English Each team writes a proposal of 2000-2500 words; and each member writes a report of 200-250 words explaining his/her contribution to the project	Mainly engineering experts	Week 8
2. Oral presentation of project proposal in English Each team delivers a speech (30 minutes for a team of four), simulating a presentation of the final proposal	Mainly non-experts	Weeks 12-13

Student Study Effort Expected

Class contact:	
• Seminars	26 hours
Other student study effort:	
• Researching, planning and writing the project • Rehearsing the presentation	52 hours
Total student study effort:	78 hours

Reading List and References	**Course material:** Learning materials developed by the English Language Centre **Recommended references:** 1. D. F. Beer, Ed., *Writing and Speaking in the Technology Professions: A practical guide*, 2nd ed. Hoboken, NJ: Wiley, 2003. 2. R. Johnson-Sheehan, *Writing Proposals*, 2nd ed. New York: Pearson/Longman, 2008. 3. S. Kuiper and D. Clippinger, *Contemporary Business Reports*, 5th ed. Mason, OH: South-Western, 2013. 4. M. H. Markel, *Practical Strategies for Technical Communication*, 2nd ed. New York: Bedford/St. Martin's, 2016. 5. D. C. Reep, *Technical Writing: Principles, strategies, and readings*, 8th ed. Boston: Pearson/Longman, 2011. 6. E. D. Zanders and L. Macleod, *Presentation Skills for Scientists: A practical guide*, 2nd ed. Cambridge: Cambridge University Press, 2018.
Last Updated	July 2021
Prepared by	English Language Centre

Subject Description Form

Subject Code	ENG3003 (for 42470 and 42477)
Subject Title	Engineering Management
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject provides students with: 1. A practical introduction to management and a comprehensive guide to the tools and techniques used in managing people and other resources. 2. Opportunities to trace the historical development and describe the functions of management, from planning, and decision making to organizing, staffing, leading, motivating, and controlling. It also includes a discussion on engineering ethics. 3. Opportunities to explore the core business strategy, technology, and innovation, and examine how these functions intertwine to play a central role in structural design, as well as supporting an organization's overall success.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. Perform tasks in an organization related to organizing, planning, leading and controlling project and process activities; 2. Select appropriate management techniques for improving organizational structures, work procedures, and quality performance of operational tasks; 3. Analyze the factors that affect changes in the work environment, and be aware of the approaches in implementing change in an organization; 4. Be aware of the imperatives of ethical and business behaviors in engineering organizations in a fast-changing business environment.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. <u>Introduction</u> General management concepts in organizations; Functions and types of industrial organizations; Organizational structures; Corporate objectives, strategy, and policy 2. <u>Industrial Management</u> Roles of managers: Process of management, leadership, planning, organizing, motivating, and control of social and engineering activities; Quality management: Related tools and techniques 3. <u>Project Management</u> Project scope and objectives; Network analysis; Tools that support engineering operations and task scheduling 4. <u>Management of Change</u> Change leadership; Organizational change; Phases of planned change; Stress management; Factors that affect the execution of change 5. <u>Effects of Environmental Factors</u> The effects of extraneous factors on the operations of engineering organizations, such as ethics and corporate social responsibilities issues

<table>
<tr><td>Teaching/Learning Methodology</td><td>A mixture of lectures, tutorial exercises, and case studies are used to deliver various topics in this subject. Some topics are covered by problem-based format whenever applicable in enhancing the learning objectives. Other topics are covered by directed study so as to develop students' "life-long learning" ability.

The case studies, largely based on real experience, are designed to integrate the topics covered in the subject and to illustrate the ways various techniques are inter-related and applied in real life situations.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="4">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. Coursework
• Group learning activities (10%)
• Presentation (individual) (30%)</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Final examination</td><td>60%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The coursework of this subject involves students working in groups to study cases that reflect the realities of management situations in an engineering setting. Through such exercises, students' ability to apply and synthesize acquired knowledge can be assessed on the basis of their performance in group discussion, oral presentations, and the quality of their written reports on these case studies. A written final examination is also designed to assess the intended learning outcomes.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>• Lectures and review</td><td>27 Hours</td></tr>
<tr><td>• Tutorials and presentations</td><td>12 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Research and preparation</td><td>30 Hours</td></tr>
<tr><td>• Report writing</td><td>10 Hours</td></tr>
<tr><td>• Preparation for oral presentation and examination</td><td>37 Hours</td></tr>
<tr><td>Total student study effort:</td><td>116 Hours</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>
1. John R. Schermerhorn, Jr., 2013, Introduction to Management, 12th ed., John Wiley
2. Robbins, S P, DeCenzo, D A, and Coulter, M, 2013, Fundamentals of Management Essential Concepts and Applications, 8th ed., Pearson
3. Morse, L C and Babcock, D L, 2010, Managing Engineering and Technology: an Introduction to Management for Engineers, 5th ed., Prentice Hall
4. White, M A and Bruton, G D, 2011, The Management of Technology and Innovation: A Strategic Approach, 2nd ed., South-Western Cengage Learning
</td></tr>
<tr><td>Last Updated</td><td>July 2016</td></tr>
<tr><td>Prepared by</td><td>Faculty of Engineering</td></tr>
</table>

Subject Description Form

Subject Code	ENG3004
Subject Title	Society and the Engineer
Credit Value	3
Level	3
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	This subject is designed for engineering students as a complementary subject on the role of the professional engineer in practice and their responsibilities toward the profession, colleagues, employers, clients, and the public. The objectives of the subject are to enable students to 1. appreciate the historical context of modern technology and the nature of the process whereby technology develops and the relationship between technology and the environment, as well as the implied social costs and benefits; 2. understand the social, political, legal, and economic responsibilities and accountability of the engineering profession and the organizational activities of professional engineering institutions; 3. be aware of the short-term and long-term effects related to safety and health, and the environmental impacts of technology; 4. observe professional conduct, as well as the legal and other applicable constraints, related to various engineering issues; and 5. develop a strong vision to optimize their contribution to sustainable development.
Intended Learning Outcomes	**Upon completion of the subject, students will be able to** 1. identify and evaluate the effects of technology as it applies to the social, cultural, economic, legal, health, safety, and environmental dimensions of society; 2. explain the importance of local and international professional training, professional conduct and ethics, and responsibilities in various engineering disciplines, particularly the Washington Accord; 3. evaluate and estimate, in a team setting, the impact of contemporary issues, planned projects, and unforeseen technological advances related to engineers; effectively communicate and present the findings to laymen and peers.
Subject Synopsis/ Indicative Syllabus	1. <u>Impact of Technology on Society</u> Historical cases and trends of technological innovation explored through their impact on social and cultural developments of civilization and their commonalities. 2. <u>Environmental Protection and Related Issues</u> Roles of the engineer in energy conservation, ecological balance, and sustainable development. 3. <u>Global Outlook for Hong Kong's Economy and Industries</u> Support organizations, policies and their impacts on industrial and economic development in Greater China, the Pacific Rim, and the world.

4. Regulatory Organizations and Compliance

Discussion of engineer's responsibilities within different regulatory frameworks and environments; Examples from various entities such as the Labor Department and the Occupational Health and Safety Council; Legal dimensions to engineering such as liability, contract law, and industrial legislation.

5. Professional Institutions

Local and overseas professional institutions; Washington Accord and the qualifications and criteria of professional engineers.

6. Professional Ethics

Prevention of bribery and corruption; The work of the Independent Commission Against Corruption (ICAC); Social responsibilities of engineers.

Teaching/ Learning Methodology

Class comprises short lectures to provide essential knowledge and information on the relationships between society and the engineer under a range of dimensions.

Other methods include in-class discussions, case studies, and seminars to develop students' in-depth analysis of the relationships.

Each student will submit two assignments based on their weekly learning activities, which will be part of the subject's evaluation. The assignments will deal with important issues of social, cultural, economic, legal, health, safety, and environmental dimensions of society.

Students are assembled into groups; throughout the course, they will work on engineering cases by completing the following learning activities:

1. Case analysis where students explore the relationships between society and the engineering issues of a project under specific dimensions;

2. Construction and assembly of a case portfolio which includes
   i. Presentation slides
   ii. Feedback critiques
   iii. Individual Reflections

3. Final oral presentation

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	**% weighting**	**Intended subject learning outcomes to be assessed**		
		1	**2**	**3**
1. Continuous assessment	70%			
• Group weekly learning activities	(20%)	✓	✓	✓
• Individual Assignments (2)	(20%)	✓	✓	
• Individual final presentation	(15%)	✓	✓	
• Individual reflection statement	(5%)	✓	✓	
• Group project	(10%)	✓	✓	✓
2. Take-home Assignment	30%	✓	✓	
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The coursework requires students to work in groups to study cases from the perspectives of the eight dimensions in an engineering setting. Based on these

<table>
<tr><td></td><td colspan="2">exercises, students' ability to apply and synthesize acquired knowledge can be assessed through their performance during groups' discussion, oral presentations, and the quality of their portfolio reports on the case studies.

The take-home assignment is used to assess students' critical thinking and problem-solving skills when working on their own and give students more time and flexibility to complete an assignment. It provides students the opportunity to review and extend what they have learnt in class and to check their understanding and progress.</td></tr>
<tr><td rowspan="7">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lectures and review</td><td>27 Hours</td></tr>
<tr><td>▪ Presentation</td><td>12 Hours</td></tr>
<tr><td>Other student study efforts:</td><td></td></tr>
<tr><td>▪ Research and preparation</td><td>55 Hours</td></tr>
<tr><td>▪ Report and Assignments writing</td><td>25 Hours</td></tr>
<tr><td>Total student study effort</td><td>119 Hours</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Reference Books & Articles:

1. Education for Sustainable Development - An Expert Review of Processes and Learning, UNESCO, 2011

2. Poel, Ibo van de, and Lambèr M. M. Royakkers. Ethics, Technology, and Engineering : an Introduction. Wiley-Blackwell, 2011

3. Engineering-Issues, Challenges and Opportunities for Development, USECO, 2010

4. Engineering for Sustainable Development: Guiding Principles, Royal Academy of Engineering, 2005

5. Securing the future: delivering UK sustainable development strategy, 2005

6. Johnston, F S, Gostelow, J P, and King, W J, 2000, Engineering and Society Challenges of Professional Practice, Upper Saddle River, N.J.: Prentice Hall

7. Hjorth, L, Eichler, B, and Khan, A, 2003, Technology and Society A Bridge to the 21st Century, Upper Saddle River, N.J.:Prentice Hall

8. The Council for Sustainable Development in Hong Kong, http://www.enb.gov.hk/en/susdev/council/

9. Poverty alleviation: the role of the engineer,

http://publications.arup.com/publications/p/poverty_alleviation_the_role_of_the_engineer

Reading materials:

Engineering journals:
- Engineers by The Hong Kong Institution of Engineers
- Engineering and Technology by The Institution of Engineers and Technology</td></tr>
</table>

	Magazines: Time, Far East Economic Review Current newspapers: South China Morning Post, China Daily, Ming Pao Daily
Last Updated	June 2021
Prepared by	FENG

Subject Description Form

Subject Code	EIE4100
Subject Title	Computer Vision and Pattern Recognition
Credit Value	3
Level	4
Pre-requisite	For 42477: EIE2106 Signal and System Analysis / EIE2108 Fundamentals of Internet and Multimedia Technologies and EIE3103 Digital Signals and Systems
Objectives	1. To introduce students the fundamentals of image formation; 2. To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition; 3. To develop an appreciation for various issues in the design of computer vision and object recognition systems; and 4. To provide the student with programming experience from implementing computer vision and object recognition applications.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Comprehend the fundamentals of image formation. 2. Comprehend the major ideas, methods, and techniques of image processing and computer vision. 3. Appreciate typical pattern recognition techniques for object recognition. 4. Implement basic image processing and computer vision techniques. 5. Develop simple object recognition systems. Category B: Attributes for all-roundedness 6. Present ideas and findings effectively. 7. Think critically. 8. Learn independently.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** • Image Formation and Image Models Radiometry; Sources, Shadows and Shading; Colour; Cameras. • Early Vision with One Image Linear Filters; Edge Detection; Texture; Digital Libraries. • Early Vision with Multiple Images The Geometry of Multiple Views; Stereopsis. • Mid-Level Vision Segmentation and Fitting; Tracking with Linear Dynamic Models. • High-Level Vision Correspondence and Pose; Registration in Medical Imaging Systems. • Finding Templates Using Classifiers Classifiers; Building Classifiers from Class Histograms; Feature Selection. • Category-Level Recognition Current Approaches to Object Recognition; Decision Trees; Nearest Neighbour Rule (NNR); Support Vector Machine; Artificial Neural Networks; Deep Learning.

Teaching/Learning Methodology

Lectures:
1. fundamental principles and key concepts of the subject are delivered to students;
2. guidance on further readings, applications and implementation is given.

Tutorials:
1. supplementary to lectures and are conducted with a smaller class size;
2. students will be able to clarify concepts and to have a deeper understanding of the lecture material;
3. problems and application examples are given and discussed

Laboratory sessions:
1. students will make use of the software tools to construct simple computer vision applications.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Continuous Assessment (total: 45%)									
• Tests	25%	✓	✓	✓					
• Assignments	10%	✓	✓	✓			✓	✓	✓
• Lab exercises and lab reports	10%		✓	✓	✓	✓	✓	✓	✓
2. Examination	55%	✓	✓	✓					
Total	100%								

Student Study Effort Expected

Class contact (time-tabled):	
• Lecture	24 Hours
• Tutorial/Laboratory/Practice Classes	15 hours
Other student study effort:	
• Lecture: preview/review of notes; homework/assignments; preparation for test/quizzes/examination	36 Hours
• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
Total student study effort:	**105 Hours**

Reading List and References

Recommended Textbook:

1. D.A. Forsyth and J. Ponce, *Computer Vision: a Modern Approach,* Pearson, 2012.

Reference Books:

1. M. Negnevitsky, *Artificial Intelligence: A Guide to Intelligent Systems*, 3rd Edition, Pearson/Addison Wesley, 2011.

	2. C.M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006. 3. L.G. Shapiro and G. Stockman, *Computer Vision*, Prentice-Hall, 2001. 4. R. Schalkoff, *Pattern Recognition – Statistical, Structural & Neural Approaches*, John Wiley, 1992. 5. C.H. Chen and P.S.P. Wang (Editors), *Handbook of Pattern Recognition and Computer Vision*, World Scientific, 2005.
Last Updated	January 2018
Prepared by	Prof. Kenneth Lam and Dr Zheru Chi

Subject Description Form

Subject Code	EIE4102
Subject Title	IP Networks
Credit Value	3
Level	4
Pre-requisite	EIE3333 Data and Computer Communications
Co-requisite/ Exclusion	Nil
Objectives	1. Give a practical treatment on the design, implementation, and management of IP networks. 2. Introduce the variety of facilities, technologies, and communication systems to meet future needs of network services. 3. Evaluate critically the performance of existing and emerging global communication networking technologies.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Describe the operational and functional attributes of different components of IP networks. 2. Evaluate critically the design, implementation, and performance of IP networks with regard to different criteria. Category B: Attributes for all-roundedness 3. Think and evaluate critically. 4. Take up new technology for life-long learning. 5. Work in a team, and collaborate effectively with other members.
Subject Synopsis/ Indicative Syllabus	1. Basic Protocol Functions IP address, IP datagram structure, basic IP operations, delivery and forwarding IP packets 2. Protocols in TCP/IP ARP, RARP, ICMP, IGMP, UDP, TCP 3. Routing Protocols RIP, OSPF, BGP, Multicast Routing 4. Applications Over TCP/IP DNS, TELNET, FTP, Email, HTTP 5. Other Issues About IP IP over ATM, Mobile IP, Multimedia, Voice over IP, SIP, H.323, IPv6, IPSec Laboratory Experiments: 1. Voice over IP Experiment 2. IP Security

Teaching/Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1, 2, 3, 4, 5	Supplementary to lectures. Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Problems and application examples are given and discussed.
Laboratory sessions	2,3,4,5	Students will conduct practical exercises to reinforce concepts and techniques learned.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)				
		1	2	3	4	5
1. Continuous Assessment (total: 50%)						
• Assignments	10%	✓	✓	✓		
• Laboratory reports	10%		✓	✓	✓	✓
• Mid-Term Test	15%	✓	✓	✓	✓	
• End-of-Term Test	15%	✓	✓	✓	✓	
2. Examination	50%	✓	✓	✓	✓	
Total	100%					

Student Study Effort Expected

Class contact (time-tabled):	
• Lecture	24 Hours
• Tutorial/Laboratory/Practice Classes	15 Hours
Other student study effort:	
• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
Total student study effort:	**105 Hours**

Reading List and References

1. Behrouz A. Forouzan, *TCP/IP Protocol Suite*, 3rd ed., McGraw-Hill, 2006.
2. Howser, Gerry, *Computer Networks and the Internet: A Hands-On Approach*, Cham: Springer International Publishing AG, 2019.

Last Updated: July 2020

Prepared by: Dr K.T. Lo

Subject Description Form

Subject Code	EIE4104
Subject Title	Mobile Networking
Credit Value	3
Level	4
Pre-requisite	EIE3333 Data and Computer Communications
Co-requisite/ Exclusion	Nil
Objectives	1. Introduce the basic knowledge of mobile networks. 2. Introduce the variety of facilities, technologies, and communication systems to meet future needs of mobile network services. 3. Evaluate critically the performance of existing and emerging global mobile networking technologies.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Describe the operational and functional attributes of different components of mobile networks. 2. Evaluate critically the design, implementation, and performance of mobile networks with regard to different criteria. Category B: Attributes for all-roundedness 3. Think and evaluate critically. 4. Take up new technology for life-long learning.
Subject Synopsis/ Indicative Syllabus	1. Mobile Communication Systems Handoff schemes, allocation of resources, routing, security 2. Existing Wireless Systems AMPS, GSM, PCS, 3G, GPS, TCP over Wireless 3. Ad Hoc and Sensor Networks Characteristics of Ad Hoc networks, Ad Hoc routing, characteristics of sensor networks, MAC protocol for wireless sensor networks 4. Wireless MANs, LANs, and PANs WMANs, WLANs, WPANs 5. Recent Advances Ultra-wideband technology, multicast in wireless networks, mobility (location) management, Bluetooth networks, threads and security issues Laboratory Experiments: 1. Computing efficiency and throughput of MAC protocols for wireless networks 2. Location determination of a mobile station
Teaching/Learning Methodology	Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&A, discussions and specially designed classroom activities. Tutorials: During tutorials, students will work on/discuss some chosen problems. This will help strengthen the knowledge taught in lectures. Laboratory/Mini-project and assignments: During laboratory exercises/mini-project, students will perform hands-on tasks to practice what they have

<table>
<tr><td></td><td>learned. They will evaluate the performance of various systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.

While lectures and tutorials will help to achieve the professional outcomes, the open-ended questions in laboratory exercises/mini-project and assignments will provide the chance to students to exercise their creativity in problem solving.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="5">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr>
<tr><td>1. Continuous Assessment (total: 50%)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>• Assignments</td><td>8%</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>• Laboratories/Mini-Project</td><td>14%</td><td></td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>• Mid-Term Test</td><td>14%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>• End-of-Term Test</td><td>14%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>2. Examination</td><td>50%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Total</td><td>100%</td><td colspan="5"></td></tr>
</table>
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture</td><td>24 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Mini-Project</td><td>15 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination</td><td>36 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</td><td>30 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>1. D.P. Agrawal and Q. Zeng, Introduction to Wireless and Mobile Systems, 4th ed., Cengage Learning, 2016.</td></tr>
<tr><td>Last Updated</td><td>July 2020</td></tr>
<tr><td>Prepared by</td><td>Dr K.T. Lo</td></tr>
</table>

Subject Description Form

Subject Code	EIE4105
Subject Title	Multimodal Human Computer Interaction Technology
Credit Value	3
Level	4
Pre-requisite	For 42477: EIE3103 Digital Signals and Systems or EIE3124 Fundamentals of Machine Intelligence For 42470: EIE3312 Linear Systems
Co-requisite/ Exclusion	Nil
Objectives	This course aims at providing students with the theories and applications of multimodal human-computer interaction (HCI) technologies. In particular, it enables students to understand how machine learning and deep learning can be applied to various HCI systems.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the capability and benefits of various HCI technologies. 2. Understand the theories of machine learning and deep learning. 3. Understand how machine learning and deep learning can be applied to various HCI systems. Category B: Attributes for all-roundedness 4. Understand the creative process when designing solutions to a problem.
Subject Synopsis/ Indicative Syllabus	1. HCI and Their Applications 1.1 Applications of HCI in daily life 1.2 Advantages of multimodal HCI 1.3 Trends in HCI technologies 1.4 Virtual reality, augmented reality, mixed reality, and metaverse 1.5 Real-life examples of HCI 2. Fundamental of Statistical Learning 2.1 Probability and random variables 2.2 Probability densities and distributions 2.3 Sampling distributions 2.4 Expectations and covariance 2.5 Bayes rule and Bayes decision theory 2.6 Curse of dimensionality 3. Machine Learning for HCI 3.1 Structure of pattern recognition systems. 3.2 Unsupervised Learning: principal component analysis; Eigenface, K-means clustering; Gaussian mixture models; hidden Markov models 3.3 Supervised Learning: linear discriminant analysis; support vector machines 3.4 Deep Learning: deep neural networks; backpropagation; gradient-based optimization; convolutional neural networks; representation learning; deep learning development platforms 3.5 Applications to handwriting recognition and face recognition. 4. Voice Computing 4.1 Voice computing: Interacting with computer through voice

<table>
<tr><td></td><td>4.2 Acoustic features
4.3 HMM and DNN for speech recognition
4.4 Language modelling
4.5 Speaker recognition: GMM-UBM, GMM-SVM, i-vectors, x-vectors, DNN speaker embedding, LDA, and PLDA
4.6 Applications of voice computing: voice search, spoken dialog systems, natural language processing, speech emotion recognition, speaker recognition, voice cloning.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&A, discussions, and specially designed classroom activities.

Tutorials: During tutorials, students will work on/discuss some chosen topics. This will help strengthen the knowledge taught in lectures.

Laboratory and assignments: During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate performance of systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.

While lectures and tutorials will help to achieve the professional outcomes, the open-ended questions in laboratory exercises and assignments will provide the chance to students to exercise their creatively in problem solving.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="4">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. Continuous Assessment (total: 50%)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>• Homework and assignments</td><td>15%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>• Tests and Quizzes</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>• Laboratory exercises</td><td>15%</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>50%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Assignment, homework, and laboratory exercises will require students to apply what they have learnt to solve problems. There will be open-ended questions that allow students to exercise their creativity in making design.

Examination and tests: They assess students' achievement of the learning outcomes in a more formal manner.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture</td><td>24 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes</td><td>15 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination</td><td>36 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</td><td>30 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
</table>
</td></tr>
</table>

Reading List and References	**Reference Materials:** 1. M.W. Mak and J.T. Chien, *Machine Learning for Speaker Recognition*, Cambridge University Press, 2020. 2. I. Goodfellow, Y. Bengio and A. Courville, *Deep Learning*, MIT Press, 2016. 3. S.Y. Kung, M.W. Mak and S.H. Lin, *Biometric Authentication: A Machine Learning Approach*, Prentice Hall, 2005. 4. R. Haeb-Umbach, *et al*. "Speech Processing for Digital Home Assistants: Combining Signal Processing with Deep-learning Techniques", *IEEE Signal Processing Magazine*, Nov. 2019. 5. C.M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006. 6. S.J.D. Prince, *Computer Vision: Models, Learning, and Inference*, Cambridge University Press, 2012. 7. J.P. Thiran, F. Marques and H. Bourlard, *Multimodal Signal Processing, Theory and Applications for Human Computer Interaction*, Elsevier, 2010. 8. S. Greengard, *Virtual Reality*, MIT Press Essential Knowledge Series, 2019.
Last Updated	June 2022
Prepared by	Prof. M.W. Mak

Subject Description Form

Subject Code	EIE4106
Subject Title	Network Management and Security
Credit Value	3
Level	4
Pre-requisite	EIE3333 Data and Computer Communication
Co-requisite/ Exclusion	Nil
Objectives	This course aims at training students to master the basic principles, knowledge, and skills about network management and network security. They will learn how to apply these principles in various scenarios by using appropriate hardware and software tools to design solutions for network management and security problems, and to evaluating performance.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Describe some common features about network security systems and network management systems 2. Perform basic network security tasks with appropriate tools and techniques 3. Describe some network security services and functions 4. Analyze and evaluate some common security features of computer networks 5. Design simple network management and security systems Category B: Attributes for all-roundedness 6. Work in a team and collaborate effectively with others 7. Understand the creative process when designing a solution to a problem
Subject Synopsis/ Indicative Syllabus	1. Network Management Functional areas in network management, network management station, agent, management information base (MIB), Simple Network Management Protocol (SNMP) 2. Network Security Security services and mechanisms, basic cryptography, authentication protocols, digital signature and public key infrastructure, firewall and virtual private network (VPN) and application layer security
Teaching/Learning Methodology	Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&A, discussions and specially designed classroom activities. Tutorials: During tutorials, students will work on/discuss some chosen topics in small group. This will help strengthen the knowledge taught in lectures. Laboratory: During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate performance of systems and design solutions to problems.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)						
		1	2	3	4	5	6	7
1. Continuous Assessment (total: 100%)								
• Tutorial/in-class exercises	10%	✓			✓			✓
• Practical assignments	15%	✓		✓	✓	✓	✓	✓
• Tests	30%	✓		✓	✓		✓	
• Laboratory exercises	20%	✓				✓		✓
• Case study project, report and peer review	25%	✓	✓	✓	✓	✓	✓	✓
Total	100%							

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Assignments require students to apply what they have learnt to solve problems. Students need to evaluate the security problems and meet network management and security requirements.

Laboratory exercises: students will be assessed about their performance on hands-on tasks such as setting up a VPN, capturing and analyzing packets, perform tasks to design and implement network management and security features.

Tests will require the students to solve network management and security problems within a specific time and without access to other materials. This is a good way to assess students' mastery of knowledge and understanding.

Case study project: Students are required to set up the company network and describe the common security issues arising from SME and data networks.

They must identify and solve the network security problems by applying knowledge learnt and using appropriate tools and techniques in the project demonstration. Also, they need to submit a case study report on the findings.

Student Study Effort Expected

Class contact (time-tabled):	
• Lecture	18 Hours
• Tutorial/Laboratory/Practice Classes	21 Hours
Other student study effort:	
• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
Total student study effort:	**105 Hours**

Reading List and References	**Reference Books:** **A set of comprehensive lecture notes will be provided to students for the study of this subject. Students may refer to the following suggested reading lists for more in-depth and extensive discussion of topics covered and end-of chapter problem sets (when applicable):** 1. Stewart, J., & Kinsey, D., *Network security, firewalls, and VPNs (Third ed., Jones & Bartlett Learning information systems security & assurance series)*. Burlington, MA: Jones and Bartlett Learning, ISBN: 9781284183696, c2021. 2. Fiedelholtz, *The Cyber Security Network Guide (Vol. 274, Studies in Systems, Decision and Control)*. Cham: Springer International Publishing AG, (online access from PolyU Library), ISBN: 3030615901, ISBN: 9783030615901, c2020. 3. Stallings, W., *Cryptography and network security: Principles and Practice (Seventh ed.)*. Hoboken, New Jersey: Pearson, c2017. ISBN: 0134444280. 4. Ian Neil, *CompTIA security+ certification guide: master IT security essentials and exam topics for CompTIA security+ SY0-501 certification*, Birmingham: Packt Publishing 2018, (eBook, online access) 5. Robin M. Abernathy, Troy McMillan, *Certified information systems security professional Cert guide*, Indianapolis, Indiana: Pearson Education 2016 Second edition. 6. Subramanian, Mani, *Network management: principles and practice*, Pearson, 2nd ed., 2011 (PolyU Library Acc. No.: TK5105.5 .S92 2011). **General References and standards:** 1. Ding, Jianguo, *Advances in network management*, Books24x7, CRC Press : Auerbach Publications, 2010 (eBook, online access). 2. Clemm, Alexander, *Network Management Fundamentals*, Indianapolis, Ind.: Cisco Press, 2007 (PolyU Library Call Number: TK5105.5 .C576 2007) 3. James Henry Carmouche, *IPsec virtual private network fundamentals*, Indianapolis, Ind.: Cisco Press, 2007 (PolyU Library Call Number: TK5105.567 .C37 2007). **Classics Paper** Shannon, Claude Elwood, *Claude Elwood Shannon: collected papers*, Institute of Electrical and Electronics Engineers, c1993 (PolyU Library Call Number: TK5101 .S448 1993).
Last Updated	June 2022
Prepared by	Dr Doris Lin

Subject Description Form

Subject Code	EIE4108 (for 42470 and 42477)
Subject Title	Distributed Systems and Cloud Computing
Credit Value	3
Level	4
Pre-requisite	EIE3320 Object Oriented Design and Programming
Co-requisite/ Exclusion	Nil
Objectives	This subject will provide students with the principles of distributed systems and cloud computing. It enables students to master the development skills to deliver and construct distributed services on the Web and cloud. Through a series of lab exercises, students will be able to develop interoperable and distributed Web and cloud applications.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the concepts of distributed systems, cloud computing, and big data 2. Identify the key components in distributed systems, cloud services, and big data analytics 3. Build distributed systems. 4. Understand the advantages and limitations of different distributed systems and cloud architectures. 5. Understand the enabling technologies for building distributed systems. 6. Understand the different components of distributed systems. 7. Set up and configure a distributed application. Category B: Attributes for all-roundedness 8. Think critically. 9. Learn independently. 10. Work in a team and collaborate effectively with others. 11. Present ideas and findings effectively.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction to Distributed Systems and Cloud Computing 1.1. Definition and Examples of Distributed Systems; 1.2. Technologies for Network-Based Systems: multi-core and multi-threading; 1.3. Distributed and Cloud Computing Models: client-server; clusters; grids; peer-to-peer; remote procedure call; remote method invocation 1.4. Enabling Technologies: Socket programming; datagram sockets; stream-mode sockets 2. Service-Oriented Architecture for Distributed Computing 2.1. Service and Service-Oriented Architectures 2.2. Web Services: simple object access protocol (SOAP); building web services with SOAP; web services description language (WSDL); role of WSDL in Web services; remote web-services invocation using WSDL; Web service implementation 2.3. RESTful Web Services: architectural principles of REST; REST vs. SOAP; AJAX; RESTful implementation; JAX-RS 3. Cloud Platform Architecture and Programming Environments 3.1. Cloud Concepts Overview 3.2. AWS Global Infrastructure Overview

3.3. AWS Cloud Security
3.4. Networking and Content Delivery
3.5. AWS Compute, Storage, Databases
3.6. Cloud Architecture
3.7. Auto Scaling and Monitoring
3.8. Cloud Programming Environments

4. Big Data Analytics
   4.1. Introduction to Big Data: 3Vs to 6Vs; big data use cases; source of big data
   4.2. Storing Big Data: unstructured databases; NoSQL; key-value stores; document stores
   4.3. Distributed Computing with MapReduce: map and reduce tasks
   4.4. Hadoop: Hadoop clusters; Hadoop distributed file systems; implementation examples

Programming Exercises and Laboratory Experiments:

1. Multi-Threading
2. Socket Programming
3. Web Services
4. Cloud Computing

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1,2,4,5,6	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials/Practice Classes	1,3,4,5,6,8,9	Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Programming exercises will be provided to strengthen students' hands-on experiences.
Laboratory sessions	2,3,6,7,8,9,10, 11	Students will go through the development process of various distributed systems and evaluate their performance.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/ Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)										
		1	2	3	4	5	6	7	8	9	10	11
1. Continuous Assessment	60%											
• Assignments	15%	✓	✓		✓	✓	✓		✓	✓		
• Quiz(zes)/Test	15%	✓	✓		✓	✓	✓		✓	✓		
• Lab works	30%		✓	✓			✓	✓	✓	✓	✓	✓
2. Examination	40%	✓	✓		✓	✓	✓		✓	✓		
Total	100 %											

The continuous assessment consists of assignments, laboratory reports, quizzes and/or test.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Short quizzes	Short multiple choice quizzes are conducted to measure the students' understanding of the theories and concepts as well as their comprehension of subject materials.
Assignments, test and examination	Assignments are of two types: (1) short questions on distributed systems and cloud computing (2) programming exercises demonstrating the operating principles of different distributed systems. The purposes are to strengthen students' understanding on the topics they learnt in classes. Students will be assessed based on their ability in applying concepts and skills learnt in the classroom. Students need to think critically and creatively in order to come with an alternate solution for an existing problem. Test and examination are given to students to assess their competence level of knowledge and comprehension and their ability to apply knowledge and skills in new situations.
Laboratory sessions and lab reports	Students are required to build two to three distributed systems and web services during the lab sessions. They are also required to write reports to explain the architecture and operating principle of their systems. Students will be assessed based on (1) their ability to apply knowledge that they learn in classes to build distributed systems and (2) their ability to write a clear report that explains the principle of operation and architecture of the systems that they have created.

Student Study Effort Expected

Class contact (time-tabled):	
• Lecture	26 Hours
• Tutorial/Laboratory/Practice Classes	13 Hours
Other student study effort:	
• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
Total student study effort:	**105 Hours**

Reading List and References

References:

1. S. Mathew (2021, Aug 5). *AWS Whitepaper*. Amazon Web Services. https://docs.aws.amazon.com/whitepapers/latest/aws-overview/introduction.html
2. P. S. Kocher, *Microservices and Containers*, Pearson and Addison-Wesley, 2018.

	3. I. Foster and D.B. Gannon, *Cloud Computing for Science and Engineering*", MIT Press, 2017. 4. O. Mendelevitch, C. Stella, and D. Eadline, *Practical Data Science with Hadoop and Spark: Designing and Building Effective Analytics at Scale*, Addison Wesley, 2017 5. H. Luu, *Beginning Apache Spark 2: With Resilient Distributed Datasets, Spark SQL, Structured Streaming and Spark Machine Learning Library*, Apress, 2018. 6. T. Erl et al. *SOA with REST: Principles, Patterns & Constraints for Building Enterprise Solutions with REST*, Prentice Hall 2013. 7. M.P. Papazoglou, *Web Services and SOA: Principles and Technology*, 2nd Edition, Prentice-Hall, 2013. 8. G. Coulouris, *Distributed Systems: Concepts and Design*, 5th ed., Addison-Wesley, 2011. 9. T. Erl, *Cloud Computing: Concepts, Technology and Architecture*, Prentice-Hall, 2013. 10. V. Mayer-Schönberger and K. Cukier, Big Data: A Revolution That Will Transform How We Live, Work, and Think, John Murray Pub., 2013. 11. T. White, "Hadoop: The Definitive Guide", O'Reilly, 3rd Ed. 2012
Last Updated	Nov 2021
Prepared by	Dr Pauli Lai

Subject Description Form

Subject Code	EIE4110
Subject Title	Introduction to VLSI and Computer-Aided Circuit Design
Credit Value	3
Level	4
Pre-requisite	EIE3100 Analogue Circuit Fundamentals
Co-requisite/ Exclusion	Nil
Objectives	**To enable students to gain knowledge and understanding in the following aspects:** 1. Fundamentals of VLSI circuits and systems. 2. VLSI design CAD tools. 3. Hardware Description Languages (VHDL) 4. VLSI design prototyping using Field Programmable Gate Arrays (FPGAs)
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the fundamentals of CMOS VLSI and associated technologies. 2. Solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption. 3. Acquire hands-on skills of using CAD tools in VLSI design. 4. Appreciate the design process in VLSI through a mini-project on the design of a CMOS sub-system. Category B: Attributes for all-roundedness 5. Communicate effectively. 6. Think critically and creatively. 7. Assimilate new technological and development in related field.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Overview of VLSI Design VLSI design methodology; functional, logic and physical design; gate arrays and standard cells, programmable logic devices; system-on-chip. 2. CMOS Fabrication and Layout Fabrication processes in CMOS VLSI; latch-up; characteristics of devices in VLSI; mask layout techniques and design rules. 3. CMOS Logic Circuits Transmission gates; static and dynamic gates and flip flops; domino logic. 4. High Speed CMOS Logic Design Delay estimation and transistor sizing; device and interconnect capacitance; optimal delay design of buffers 5. Logic Synthesis Synthesis of Hardware Description Languages (HDL) e.g. VHDL or Verilog into gate-netlists. Timing and area optimizations. 6 High-Level Synthesis Synthesis of behavioural descriptions e.g. ANSI-C into Register Transfer Level Descriptions (i.e. synthesizable – Verilog or VHDL). Review of three main steps: (1) Resource allocation, (2)scheduling and (3) binding

	7 Physical Design Logic netlist partitioning methods, floor planning, placement of gate-netlists and routing 8. Power Grid and Clock Design Design of VLSI power grids and clock trees 9. VLSI Power and Thermal Considerations Power (static and dynamic power) estimation. Main factors that impact power consumption and how to reduce them e.g. Clock gating, Dynamic Voltage and Frequency Scaling (DVFS), voltage island. 10 Design for Test (DFT) Testability of ICs, scan chain, boundary scan, ATPG **Laboratory Experiment/Mini-project:** 1. Practice of CAD tools for VLSI design: circuit simulation and FPGA implementation using a FPGA prototyping board 2. Mini-project: design of a VLSI sub-system for computer or communication applications.
Teaching/ Learning Methodology	

Teaching and Learning Method	**Intended Subject Learning Outcome**	**Remarks**
Lectures, supplemented with interactive questions and answers, and short quizzes	1, 2, 6, 7	In lectures, students are introduced to the *knowledge* of the subject, and *comprehension* is strengthened with interactive Q&A and short quizzes. They will be able to *explain* and *generalize* knowledge in VLSI.
Tutorials where design problems are discussed, and are given to students for them to solve	1, 2, 5, 6	In tutorials, students *apply* what they have learnt in analyzing the cases and solving the problems given by the tutor. They will *analyze* the given information, *compare* and *contrast* different scenarios and propose solutions or alternatives.
Laboratory sessions, where students will perform a mini-project on a subsystem design using CAD tools. They will have to write a report on their mini-projects.	2, 3, 4, 5, 6	Students *acquire* hands-on experience in using CAD tools in VLSI design, and *apply* what they have learnt in lectures/tutorials to do a mini-project on the design of a sub-system.
Assignment and Homework	1, 2, 3, 4, 5, 6	Through working assignment and homework, students will develop a firm understanding and *comprehension* of the *knowledge* taught. They will *analyze* given information and *apply* knowledge in solving problem. For some design type of questions, they will have to *synthesize* solutions by *evaluating* different alternatives.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)						
		1	2	3	4	5	6	7
1. Continuous Assessment (total 50%)								
• Min-project	20%	✓	✓	✓	✓		✓	✓
• Individual Assignment	15%	✓	✓			✓		
• Laboratory works and reports	15%		✓	✓	✓	✓		
2. Examination	50%	✓	✓	✓	✓		✓	
Total	100%							

The continuous assessment will consist of a mini-project, a number of laboratory sessions.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/ Tasks	Remark
Mini-project	Students are required to conduct one mini-project in teams of 3-4 students. The emphasis is on assessing their ability to apply knowledge and skills learned in designing a complex VLSI system, ability in working with other people and ability to take data and relate the measurement results to theory. Expectation and grading criteria will be given.
Individual assignment	The students will work on a small individual assignment to as demonstrate the development an analytical skills related the design of VLSI circuits.
Laboratory works and reports	Students will be required to perform 6-7 laboratory sessions and write an individual laboratory report. The emphasis is on assessing their ability to *use* VLSI CAD tools effectively to perform VLSI *design*. Expectation and grading criteria will be given as in the case of mini-project.
Examination	There will be an end-of-semester examination to assess students' achievement of all the learning outcomes. Expectation and grading criteria will be given as in the case of mini-project.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Books:** 1. D.A. Hodges, H.G. Jackson and R.A. Saleh, *Analysis and Design of Digital Integrated Circuits,* 3rd ed., New York: McGraw-Hill, 2003. 2. W. Wolf, *Modern VLSI Design: System-on-chip Design*, 3rd ed., Englewood Cliffs: Prentice-Hall, 2002. 3. P. Ashenden, The Designers Guide to VHDL,3rd ed., Morgan Kaufmann, 2008.	
Last Updated	June 2015	
Prepared by	Dr Benjamin CARRION SCHAFER	

Subject Description Form

Subject Code	EIE4113
Subject Title	Wireless and Mobile Systems
Credit Value	3
Level	4
Pre-requisite	For 42480 EIE3120 Network Technologies and Security For 42470 EIE3333 Data and Computer Communications
Exclusion	Mobile Networking (EIE4104)
Objectives	This subject aims to provide students with an understanding of various security concerns in wireless networks (e.g., WiFi and mobile cellular networks) and mobile systems and applications (e.g., Android and iOS).
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the security threats, concerns, and vulnerabilities in wireless and mobile systems, and the corresponding security mechanisms and authentication procedures 2. Understand the strategies for developing secure mobile applications, and the use of mobile security penetration tools for evaluating the robustness of mobile applications 3. Apply the knowledge to develop practical applications that are robust against mobile platform attack tools Category B: Attributes for all-roundedness 4. Understand the creative process when designing solutions to a problem
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction to Mobile and Wireless Networks Mobile cellular networks (3G/4G LTE), IEEE wireless networks (IEEE 802.11, IEEE 802.15), mobile networks (NEMO, MANET). 2. Vulnerability of Wireless Networks Threats and risks to telecommunication systems, vulnerabilities from wired to wireless communications, fundamental security mechanisms. 3. WiFi Security Attacks on wireless networks, security in the IEEE 802.11 standard, security in 802.11i, authentication in wireless networks, layer 3 security mechanisms. 4. Security in Mobile Telecommunication Networks Vulnerability of signaling systems, GSM and GPRS security, 3G security, network interconnection. 5. Mobile Systems and Development Strategies Top issues facing mobile devices, tips for secure mobile application development, mobile HTML security, SMS security, mobile geolocation. 6. Android and iOS Security Android IPC mechanisms, security model, permission review, security tools. iOS security testing, application format, permissions and user controls. Mobile security penetration testing tools.

Teaching/Learning Methodology

Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&A, discussions and specially designed classroom activities.

Tutorials: During tutorials, students will work on/discuss some chosen topics in small group. This will help strengthen the knowledge taught in lectures.

Laboratory and assignments: During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate the vulnerability of systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.
While lectures and tutorials will help to achieve the professional outcomes, the open-ended questions in laboratory exercises and assignments will provide the chance to students to exercise their creativity in problem solving.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**			
		1	**2**	**3**	**4**
1. Continuous Assessment	(50%)				
• Homework and assignments	10%	✓	✓	✓	✓
• Tests	10%	✓	✓		
• Laboratory exercises	30%			✓	✓
2. Examination	50%	✓	✓		✓
Total:	100%				

Student Study Effort Expected

Class contact (time-tabled):	
• Lecture	24 Hours
• Tutorial/Laboratory/Practice Classes	15 Hours
Other student study effort:	
• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
Total student study effort:	**105 Hours**

Reading List and References

Reference Books:

1. H Chaouchi, M Laurent-Maknavicius, *Wireless and Mobile Network Security*, Wiley, 2009.
2. P. Venkataram, B. Sathish Babu, *Wireless and Mobile Network Security*, Tata McGraw-Hill, 2010.
3. H. Dwivedi, C. Clark, D. Thiel, *Mobile Application Security*, McGraw-Hill, 2010.

Last Updated

November 2014

Prepared by

Dr Ivan Ho

Subject Description Form

Subject Code	EIE4114 (for 42480 and 42470)
Subject Title	Digital Forensics for Crime Investigation
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide students with basic concepts about digital forensic techniques for crime investigation 2. To appreciate how different forensic techniques are used for information security
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand different approaches for digital forensics 2. Use different techniques for forensic investigation Category B: Attributes for all-roundedness 3. Present ideas and findings effectively
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Digital and Computational Forensics Context Introduction to digital and computational forensics; Historical aspects in digital and computational forensics; Introduction to techniques for multimedia manipulation; different classes of techniques for forensics: basic idea, framework and applications. 2. Forensics based on Intrinsic/Extrinsic Data Models of digital data capturing device; idea of the use of intrinsic data in digital forensic investigation; introduction to forensics techniques using intrinsic data; applications in source device identification, device linking and integrity verification. Introduction to techniques for multimedia content protection and authentication; attacks modelling. 3. Machine Learning Forensics Different types of ML-based Forensics; Extractive Forensics; Inductive forensics; deductive forensics. Example use cases in ML-based Forensics. 4. Digital Evidence Models of digital evidence; event analytics: surveillance, monitoring, forensic and security; file carving: idea, different classes of techniques; software tools for file carving. 5. Robustness of Forensic Techniques Robustness and security of forensic techniques; adversary model; case studies of reliabilities of forensic techniques. **Laboratory Experiments:** Practical Works: 1. Evaluation of forensic techniques based on intrinsic data. 2. Evaluation of forensic techniques based on extrinsic data. 3. Forensic analysis of digital evidence.

Teaching/Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1, 2	Supplementary to lectures; Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Problems and application examples are given and discussed.
Laboratory sessions	2, 3	Students will evaluate different kinds of forensic techniques.
Mini-project	1, 2, 3	Students are required to study a problem in forensic application. Students will need to submit a written report and make a presentation.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)		
		1	2	3
1. Continuous Assessment (total 50%)				
• Tests	14%	√	√	
• Laboratory sessions	19%		√	√
• Mini-project	17%		√	√
2. Examination	50%	√	√	
Total	100%			

The continuous assessment consists of tests, laboratory exercises and a mini-project.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Tests and examination	end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom; students need to think critically in order to come with a solution for a problem.
Laboratory sessions, mini-project	oral examination will be conducted to evaluate student's technical knowledge and communication skills.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	21 Hours
	• Tutorial/Laboratory/Practice Classes	18 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Books:** 1. JoakimKavrestad, "*Fundamentals of Digital Forensics: Theory, Methods, and Real-Life Applications*", Springer, 2020. 2. Darren R. Hayes, "*A Practical Guide to Digital Forensics Investigations*", Pearson IT Certification, 2020. 3. Nihad A Hassan, "*Digital Forensics Basics: A Practical Guide using Windows OS*", Apress 2019. 4. Anders Flaglien, Inger Marie Sunde, AusraDilijonaite, Jeff Hamm, Hens Petter Sandvik, PetterBjelland, Katrin Franke, Stefan Axelsson, "*Digital Forensics: an academic introduction*", John Wiley & Sons, 2018. 5. Husrev Taha Sencar and Nasir Memon (editors), *"Digital Image Forensics"*, Springer, 2013. 6. Frank Y. Shih, *"Multimedia Security Watermarking, Steganography and Forensics"*, CRC Press, 2013. 7. Li Chang-Tsun, "*Emerging Digital Forensics Applications for Crime Protection, Prevention and Security",* IGI Global 2013, doi:10.4018/978-1-4666-4006-1, 2013. 8. Li Chang-Tsun and Anthony T.S. Ho, *"Crime Prevention Technologies and Applications for Advancing Criminal Investigation",* IGI Global 2012, doi:10.4018/978-1-4666-1758-2, 2012.	
Last Updated	November 2021	
Prepared by	Dr Wen Chen and Dr Bonnie Law	

Subject Description Form

Subject Code	EIE4116
Subject Title	Surveillance Studies and Technologies
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This course aims at providing students with thorough understanding of recent surveillance technologies and their emerging trends. They will also learn the pros and cons of various surveillance technologies.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Introduce a brief history to provide context for the evolution of today's surveillance technologies 2. Understand the different surveillance technologies 3. Understand the system design principle of CCTV and other related video security and surveillance technologies Category B: Attributes for all-roundedness 4. Understand professional, ethical, legal, security and social issues and responsibilities
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Overview of Surveillance Studies Brief history, key developments leading to current surveillance technologies; public controversy and accountability. 2. Surveillance Technologies and Techniques Visual surveillance; audio surveillance; aerial surveillance; radio-wave surveillance; GPS surveillance; sensors; computer, Internet and social media surveillance; data cards; biochemical surveillance; animal surveillance; Biometrics; pros and cons of surveillance technologies. 3. Case Study: Video and CCTV Surveillance Video's critical role in the security plan; the evolution of video and CCTV surveillance systems, network videos; cameras – analog, digital and network, cameras technologies; analog and digital video; video compression technologies; video processing equipments; video recorders, servers and storage; video management; video motion detectors; video analytics. 4. Privacy and Legislation Ubiquity of surveillance devices; balance between the needs of law enforcement of the privacy of law-abiding citizens. **Laboratory Experiments:** 1. Analysis of video compression in surveillance systems 2. Critical scene detection in surveillance systems 3. Video signal analysis.

Teaching/Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3, 4	fundamental principles and key concepts of the subject are delivered to students
Tutorials	1, 2, 3, 4	supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed
Laboratory sessions	3	students will make use of the software to develop surveillance applications.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)			
		1	2	3	4
1. Continuous Assessment (total 40%)					
• Short quizzes/ Assignments	10%	✓	✓	✓	✓
• Tests	20%	✓	✓	✓	✓
• Laboratory sessions	10%			✓	
2. Examination	60%	✓	✓	✓	✓
Total	100%				

The continuous assessment will consist of laboratory reports, a number of short quizzes, assignments, and tests.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Short quizzes	mainly objective tests (e.g., multiple-choice questions, true-false, and matching items) conducted to measure the students' ability to remember facts and figures as well as their comprehension of subject materials
Assignments, tests and examination	end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom; students need to think critically and creatively in order to come with an alternate solution for an existing problem
Laboratory sessions	Each students is required to produce a written report; accuracy and the presentation of the report will be assessed; oral examination based on the laboratory exercises will be conducted for each student to evaluate his/her technical knowledge and communication skills

Student Study Effort Expected		
	Class contact (time-tabled):	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**

Reading List and References

Reference Books:

1. J.K. Petersen, *Introduction to Surveillance Studies*, CRC Press, 2013.
2. Vlado Damjanovski, *CCTV: Networking and Digital Technology*, Elsevier, 2005.
3. Herman Kruegle, *CCTV Surveillance: Analog and Digital Video Practices and Technology*, Elsevier Butterworth-Heinemann, 2007.
4. Fredrik Nilsson and Axis Communications, *Intelligent Network Video: Understanding Modern Video Surveillance Systems*, CRC Press, 2009.
5. Daniel Neyland, *Privacy, Surveillance and Public Trust*, Palgrave Macmillan, 2006.
6. Fredrika Bjorklund and Ola Svenonius, *Video Surveillance and Social Control in a Comparative Perspective*, Routledge, 2013.

Last Updated	November 2014
Prepared by	Dr YL Chan

Subject Description Form

Subject Code	EIE4118 (for 42480 and 42470)
Subject Title	Intrusion Detection and Penetration Test
Credit Value	3
Level	4
Pre-requisite	For 42480: EIE3120 Network Technologies and Security For 42470: EIE4106 Network Management and Security
Co-requisite/ Exclusion	Nil
Objectives	1. To provide a solid foundation to the students in network security with a focus on intrusion detection and penetration test; 2. To enable the students to master the knowledge about intrusion detection and penetration test in the context of real-life applications; 3. To prepare the students for understanding, evaluating critically, and assimilating new knowledge and emerging technology in network security.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the physical location, the operational characteristics and the various functions performed by the intrusion detection/prevention system 2. Describe how components in different layers inter-operate in the intrusion detection/prevention system 3. Understand the current network security vulnerabilities and effective procedures of penetration test 4. Learn new techniques and to align new security technologies to existing network infrastructure Category B: Attributes for all-roundedness 5. Present ideas and findings effectively 6. Learn independently
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Vulnerabilities and Security Threats to Computer Networks Sources of vulnerabilities, types of attacks, attacks against various security objectives, countermeasures of attacks. 2. Penetration Test Methodologies and Procedures White-box / grey-box testing, security surfaces for evaluation, automated tools for vulnerability scan and penetration test. 3. Intrusion Detection and Prevention Technologies Host-based intrusion detection system (IDS) / intrusion prevention system (IPS), network-based IDS/IPS. Intrusion detection techniques, misuse detection: pattern matching, policy-based and state-based; anomaly detection: statistical based, honeypots-based; hybrid detection. 4. IDS and IPS Architecture Tiered architectures, single-tiered, multi-tiered, peer-to-peer. Sensor: sensor functions, sensor deployment and security. Agents: agent

functions, agent deployment and security. Alert management: alert types, alert manager deployment and security. Information flow in IDS and IPS, defending IDS/IPS.

5. Network Security Monitoring
   Network traffic collection and storage, detection mechanisms and indicators of compromise, packet analysis, friendly and threat intelligence.

6. Deployment of IDS/IPS
   Case study on commercial and open-source IDS.

Possible Laboratory Experiments:

1. Vulnerability scan and penetration test
2. Protocol and traffic analysis
   Intrusion detection using Snort

Teaching/Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3, 4	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1, 2, 3, 4, 5, 6	Supplementary to lectures and are conducted with smaller class size; Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Problems and application examples are given and discussed.
Laboratory sessions	3, 5, 6	Students will conduct practical exercises in intrusion detection and prevention to reinforce concepts and techniques learned.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/ Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)					
		1	2	3	4	5	6
1. Continuous Assessment	70%						
• Quiz	15%	✓	✓	✓		✓	
• Project	30%	✓	✓	✓	✓	✓	✓
• Laboratory demonstration and reports	25%	✓	✓	✓		✓	
2. Examination	30%						
• Practical Test	30%	✓	✓	✓		✓	
Total	100%						

	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: **Specific Assessment Methods/Tasks** / **Remark** Project — Students need to think critically and creatively in order to come with a solution for a practical problem. Quiz — Mainly objective quizzes conducted to measure the students' understanding of the theories and concepts as well as their comprehension of subject materials. Examination (Practical Test) — Hands-on type problems emulate real-life penetration test and intrusion detection scenarios, which are used to evaluate students' ability in applying concepts and skills learnt in the classroom. Laboratory sessions — Each student is required to produce a real-life demo and/or a written report to evaluate his/her technical knowledge and communication skills.
Student Study Effort Expected	**Class contact (time-tabled):**
	1. Lecture — 27 Hours
	2. Tutorial/Laboratory/Practice Classes — 12 Hours
	Other student study effort:
	3. Lecture: preview/review of notes; homework/assignment; preparation for test/examination — 24 Hours
	4. Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing — 42 Hours
	Total student study effort: — **105 Hours**
Reading List and References	**Reference Books:** 1. C. Endorf, E. Schultz and J. Mellander, *Intrusion Detection & Prevention,* McGraw-Hill/Osborne, 2004. 2. Ali A. Ghorbani, *Network intrusion detection and prevention concepts and techniques,* Springer, 2010. 3. J. M. Kizza, *Computer Network Security*, Springer, 2005. 4. D. Jacobson, *Introduction to Network Security*, CRC Press, 2009. 5. Chris Sanders and Jason Smith, Applied Network Security Monitoring: Collection, Detection, and Analysis, Syngress, 2013. 6. Richard Bejtlich, The Practice of Network Security Monitoring: Understanding Incident Detection and Response, No Starch Press, 2013. 7. Peter Kim, The Hacker Playbook 3: Practical Guide To Penetration Testing, May 2018.
Last Updated	November 2021
Prepared by	Dr H. Hu

Subject Description Form

Subject Code	EIE4119
Subject Title	Mobile Device System Architecture
Credit Value	3
Level	4
Pre-requisite	EIE3311 Computer System Fundamentals and EIE3331 Communication Fundamentals
Co-requisite/ Exclusion	Nil
Objectives	This course aims at providing students with an understanding of the hardware architecture and the techniques for the design and implementation of the computer and communication systems of mobile devices.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. Understand the hardware architecture and design constraints of mobile computers. 2. Understand the functions and features of different sub-systems of a mobile computer. 3. Understand the basic concepts of RF and wireless technologies used in mobile devices. 4. Analyse the performances of RF building blocks and subsystems with practical design parameters.
Subject Synopsis/ Indicative Syllabus	1. Essentials of Mobile Handset Design: Generations of mobile communication capability. Development of mobile handset. Basic functional blocks of mobile handset. 2. Mobile Computers and Their Applications: Mobile computers and their applications in daily life. Complex systems and microprocessors. The embedded system design process. Formalisms for system design. 3. Central Processing Units for Mobile Computers: Instruction set architecture, data operations, flow of control. Programming input and output. Memory system mechanisms. CPU performance. CPU power consumption. Case study: ARM processor. 4. Multiprocessors and co-processors: Why multiprocessors, CPUs and accelerators. Multiprocessor performance analysis. 3D graphics on embedded systems, principle of mobile 3D graphics system design, mobile 3D graphics APIs, real chip implementations. 5. Basic concept of RF and overview of mobile front-end system: frequency, bandwidth, wavelength, electromagnetic waves, electromagnetic spectrum, attenuation, power, decibels (dB) and transmission lines, overview of mobile front-end systems and its hardware architecture. 6 Basic component building blocks in mobile front-end system: Building blocks and components used in RF transmitters and receivers. Functionality and key technical characteristics. Introduction to active components such as power amplifier (PA), low noise amplifier (LNA), and passive components such as filters.

7. Linearity in mobile front-end systems: Effects of non-linearity in RF blocks and systems. Non-linear behaviour in AM-AM and AM-PM conversion. Intermodulation distortion and spurious emission in RF transceiver systems.

Teaching/Learning Methodology

Method	**Remarks**
Lectures and quizzes	The subject matters will be delivered through lectures. Students will be engaged in the lectures through quizzes, discussions and specially designed classroom activities.
Tutorials	During tutorials, students will work on/discuss some chosen topics in small group. This will help strengthen the knowledge taught in lectures.
Laboratory and assignments	During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate performance of systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.

Teaching/Learning Methodology	**Intended Subject Learning Outcomes**			
	1	**2**	**3**	**4**
Lectures and quizzes	✓	✓	✓	✓
Tutorials	✓	✓	✓	✓
Laboratory sessions		✓		✓

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**			
		1	**2**	**3**	**4**
1. Quizzes	5%	✓	✓	✓	✓
2. Tests	18%	✓	✓	✓	✓
3. Assignments	10%	✓	✓	✓	✓
4. Laboratory demonstration and reports	12%		✓		✓
5. Examination	55%	✓	✓	✓	✓
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Quizzes	Small exercises conducted to measure the students' basic understanding of the theories, concepts and the analysis methods taught during the lectures or tutorial classes.
Tests and examination	End-of chapter type problems used to evaluate students' understanding of the theories, concepts and the analysis methods taught in the subject. Their ability in applying them in solving problems will also be assessed.
Assignments	Examination type questions to measure the students' understanding of the theories, concepts and the analysis methods taught during the lectures or tutorial classes.
Laboratory sessions	During the laboratory sessions, students will be given some practical tasks so as to examine their understanding of the functions and features of different sub-systems of a mobile computer. They also require them to analyse the performances of RF building blocks and subsystems. Each student is required to produce a report on the laboratory work they conduct. Each student also needs to make a demonstration on the open-ended question set out in each laboratory work.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture/Tutorial	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Homework and self-study	66 Hours
	Total student study effort	**105 Hours**

Reading List and References

Reference Book:

1. Abhi Naha and Peter Whale, *Essential of Mobile Handset Design*, Cambridge University Press, 2012.
2. J. Hennessy and D. Patterson, *Computer Architecture – A Quantitative Approach*, 6th Edition, Morgan Kaufmann, 2017.
3. J.H. Woo, J.H. Sohn, B.G. Nam and H.J. Yoo, *Mobile 3D graphics SoC: From algorithm to chip*, John Wiley & Sons, 2010.
4. Behzad Razavi, *RF Microelectronics*, 2nd ed., Prentice Hall, 2014.
5. John Rogers, *Radio Frequency Integrated Circuit Design*, 2nd ed., Artech House, 2010.
6. David M. Pozar, *Microwave Engineering*, 4th ed., Wiley, 2011.

Last Updated	January 2019
Prepared by	Dr Daniel Lun

Subject Description Form

Subject Code	EIE4122 (for 42470, 42477)
Subject Title	Deep Learning and Deep Neural Networks
Credit Value	3
Level	4
Pre-requisite	**For 42477:** EIE3124: Fundamentals of Machine Intelligence **For 42470:** AMA2104 Probability and Engineering Statistics
Co-requisite/ Exclusion	Nil
Objectives	This course is for students who would like to equip themselves with cutting-edge AI knowledge and know-how to join the AI profession. Students will learn the foundations of deep learning and how to construct deep neural networks for real-world applications and AI systems. Students will also learn the trends in deep learning and deep neural networks.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the benefits of deep learning and deep neural networks. 2. Understand the basic theories in deep learning and deep neural networks. 3. Understand how deep learning and deep neural networks are applied in real-world applications and AI systems. Category B: Attributes for all-roundedness 4. Understand the creative process when designing solutions to a problem.
Subject Synopsis/ Indicative Syllabus	1. A High-Level Perspective of Deep Learning and Deep Neural Networks 1.1 What are neural networks and deep neural networks? 1.2 Relationship among AI, machine learning, deep learning, and DNNs 1.3 Neural networks: From shallow to deep 1.4 How DNNs learn from data? 1.5 Examples of real-life applications: Computer vision, speech, text analysis, and healthcare 2. Machine Learning 2.1 Vectors, matrices, tensors, and vector space 2.2 Random variables and probability distributions 2.3 Bayes theorem and its applications 2.4 Supervised learning versus unsupervised learning 2.5 Overfitting, underfitting, and dimension reduction 2.6 Gaussian mixture models and Support vector machines 3. From ANN to DNN 3.1 Biological Neurons versus artificial neurons 3.2 Perceptrons and multi-layer perceptrons 3.3 Relationship between MLP, GMM, and SVM 3.4 Why going deep? 3.5 DNN for classification and regression 4. Deep Architectures 4.1 Autoencoders and denoising autoencoders 4.2 Convolutional neural networks 4.3 Residual networks and DenseNet 4.4 Recurrent neural networks 4.5 Long short-term memory and gate recurrent unit

<table>
<tr><td></td><td>
4.6 Sequence-to-sequence models
4.7 Transformer models and attention mechanism

5. <u>Deep Learning</u>
5.1 Loss functions: MSE and cross-entropy (softmax) loss
5.2 Gradient-based optimization: momentum and learning rate schedule
5.3 Backpropagation
5.4 Gradient vanishing
5.5 Batch normalization and layer normalization
5.6 Regularization: Dropout, weight decay, L1 and L2 regularization, data augmentation, and early stopping
5.7 Representation learning: embedding and statistics pooling
5.8 Adversarial learning
5.9 End-to-end training

6. <u>Software and Hardware Tools</u>
6.1 Software stack: CUDA, cuDNN, Tensorflow, PyTorch, and Keras
6.2 Cloud platforms: Amazon EC2, Azure, Google Cloud, Nvidia GPU cloud, Alibaba Cloud, Google Colab, etc.
6.3 Hardware: GPU, TPU, Nvidia Jetson
</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>
Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&A, discussions and specially designed classroom activities. The background theories on DL and DNNs will be accompanied by various real applications.

Tutorials: During tutorials, students will work on/discuss some chosen topics. This will help strengthen the knowledge taught in lectures.

Laboratory and assignments: During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate performance of systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.

While lectures and tutorials will help to achieve the professional outcomes, the open-ended questions in laboratory exercises and assignments will provide the chance for students to exercise their creatively in problem solving.
</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/Tasks</th><th rowspan="2">% Weighting</th><th colspan="4">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. Continuous Assessment (total: 50%)</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>• Homework and assignments</td><td>15%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>• Tests and Quizzes</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>• Laboratory exercises</td><td>15%</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination</td><td>50%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Assignment, homework, and laboratory exercises will require students to apply what they have learnt to solve problems. There will be open-ended questions that allow students to exercise their creativity in making design.

Examination and tests: They assess students' achievement of the learning outcomes in a more formal manner.
</td></tr>
</table>

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Materials:** 1. I. Goodfellow, Y. Bengio and A. Courville, *Deep Learning*, MIT Press 2016 2. M.W. Mak and J.T. Chien, *Machine Learning for Speaker Recognition*, Cambridge University Press, 2020. 3. C.M. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006. *4.* J. Langr and V. Bok, *GANs in Action*: *Deep Learning with Generative Adversarial Networks (GANs)*, Manning Publications, 2018. *5.* F. Chollet, *Deep Learning with Python*, Manning Publications, 2018.	
Last Updated	March 2022	
Prepared by	Prof. M.W. Mak	

Subject Description Form

Subject Code	EIE4402
Subject Title	Power Electronics
Credit Value	3
Level	4
Pre-requisite / Co-requisite / Exclusion	Basic knowledge in electric circuit theory and electronic circuits
Objectives	**To enable students to gain knowledge and understanding in the following aspects:** 1. Fundamentals of power electronics. 2. The concepts and operating principles of power electronics circuits. 3. Design procedures and techniques of power electronics systems. Sustainable development is one of the emerging societal objectives in China and the world at large. The knowledge & experience gained from this subject provide some of the technical fundamentals to address this kind of development.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the fundamental principles and applications of power electronics circuits. 2. Solve problems and design switching regulators according to specifications. 3. Use computer-aided techniques for the design of power converter circuits. 4. Appreciate the latest developments in power electronics. Category B: Attributes for all-roundedness 5. Communicate effectively. 6. Think critically and creatively. 7. Assimilate new technological development in related field.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction to Power Electronics Overview of power electronics systems: applications and areas of future development. 2. Basic Switching Regulator Topologies Basic operations. Critical inductance criterion. Continuous- and discontinuous-conduction modes. Practical considerations. Merits and drawbacks. 3. Mathematical Modelling of Switching Regulators Small-signal approximation for linearity. Applications of approximation techniques. Switching regulator transfer functions and salient features. 4. Switching Regulators with Transformer Isolation Flyback converter. Forward converter. Half- and full-bridge converters. Push-pull converter. Areas of application. 5. Feedback Control Design Classical control design. Bode plot and Nyquist stability criterion. Voltage- and current-mode controls. 6. Magnetic Components Inductor. Transformer. Saturation, hysteresis, and residual flux.

<table>
<tr><td></td><td>7. Latest Development in Power Electronics

Laboratory Experiments:

1. Computer-aided design of switching regulator.
2. Design of a closed-loop controlled power converter circuit.</td></tr>
<tr><td>Teaching/ Learning Methodology</td><td>
<table>
<tr><th>Teaching and Learning Method</th><th>Intended Subject Learning Outcome</th><th>Remarks</th></tr>
<tr><td>Lectures, supplemented with interactive questions and answers, and short quizzes</td><td>1, 2, 3, 4, 5, 6, 7</td><td>In lectures, students are introduced to the knowledge of the subject, and comprehension is strengthened with interactive Q&A and short quizzes. They will be able to explain and generalize knowledge in the design of power converter circuits.</td></tr>
<tr><td>Tutorials where design problems are discussed, and are given to students for them to solve</td><td>1, 2, 5, 6</td><td>In tutorials, students apply what they have learnt in analyzing the cases and solving the problems given by the tutor. They will analyze the given information, compare and contrast different scenarios and propose solutions or alternatives.</td></tr>
<tr><td>Laboratory sessions, where students will perform a mini-project by computer simulations and experimental verifications. They will have to write a report on their mini-projects.</td><td>1, 2, 3, 4, 5, 6, 7</td><td>Students acquire hands-on experience in using CAD tools in power converter design, and apply what they have learnt in lectures/tutorials to do a mini-project on the design of a power converter circuit.</td></tr>
<tr><td>Assignment/Homework</td><td>1, 2, 3, 5, 6</td><td>Through working assignment and homework, students will develop a firm understanding and comprehension of the knowledge taught. They will analyze given information and apply knowledge in solving problem. For some design type of questions, they will have to synthesize solutions by evaluating different alternatives.</td></tr>
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Assessment Methods in Alignment with Intended Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)						
		1	2	3	4	5	6	7
1. Continuous Assessment	(total 50%)							
• 1 Assignment	15%	✓	✓	✓		✓	✓	
• Laboratory works and reports	20%	✓	✓	✓	✓	✓	✓	✓
• Mid-semester test	15%	✓	✓			✓	✓	
2. Examination	50%	✓	✓		✓	✓	✓	✓
Total	100 %							

The continuous assessment consists of assignments, quizzes, and two tests.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Assignment/ Homework	Assignment/Homework and case study reports are given to students to assess their competence level of *knowledge* and *comprehension*, ability to *analyze* given information, ability to *apply* knowledge and skills in new situation, ability to *synthesize* structure, and ability to evaluate given data to make judgment. The criteria (i.e. *what* to be demonstrated) and level (i.e. the *extent*) of achievement will be graded according to six levels: (A+ and A), Good (B+ and B), Satisfactory (C+ and C), Marginal (D) and Failure (F). These will be made known to the students before an assignment/homework is given. Feedback about their performance will be given promptly to students to help them improvement their learning.
Laboratory works (mini-project) and report	Students will be required to perform a mini-project and submit a report. The emphasis is on assessing their ability to *use* CAD tools effectively to perform *power supply design* and *hands-on skills* on hardware design and prototyping. Expectation and grading criteria will be given as in the case of assignment/homework.
Mid-semester test	There will be a mid-semester test to evaluate students' achievement of all the learning outcomes and give feedback to them for prompt improvement. Expectation and grading criteria will be given as in the case of assignment/homework.
Examination	There will be an end-of-semester examination to assess students' achievement of all the learning outcomes. These are mainly summative in nature. Expectation and grading criteria will be given as in the case of assignment/homework.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	18 hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	27 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Books:** 1. R.W. Erickson, D. Maksimovic, *Fundamentals of Power Electronics*, 2nd ed., Kluwer Academic Publishers, 2001. 2. M.K. Kazimierczuk, *Pulse-width Modulated DC-DC Power Converters*, Wiley, 2008. 3. A.I. Pressman, K. Billings, T. Morey, *Switching Power Supply Design*, 3rd ed., McGraw-Hill, 2009. 4. C. Basso, *Switch-Mode Power Supplies Spice Simulations and Practical Designs*, McGraw-Hill, 2008. 5. N.S. Nise, *Control System Engineering*, 6th ed., Wiley, 2010. 6. R.C. Dorf, R.H. Bishop, *Modern Control Systems*, 12th ed., 2010	
Last Updated	Jan 2019	
Prepared by	Dr K.H. Loo	

Subject Description Form

Subject Code	EIE4413
Subject Title	Digital Signal Processing
Credit Value	3
Level	4
Pre-requisite	EIE3312 Linear Systems
Co-requisite/ Exclusion	Nil
Objectives	This is an essential subject to provide fundamental digital signal processing (DSP) techniques important to many communications and multimedia subjects. Both theory and practical realisation are stressed.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the basic concepts of Fourier analysis of digital signals and apply them to practical problems. 2. Design and realize simple digital filters for practical applications. 3. Understand the importance of random signal processing in DSP, and its application in statistical measures, prediction and data modelling. 4. Design and simulate simple DSP systems. Category B: Attributes for all-roundedness 5. Think critically. 6. Learn independently.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction 1.1 Why DSP? Typical DSP system. Typical steps to construct a DSP system. 2. Discrete Fourier Transform and Convolution 2.1 Fourier series and continuous-time Fourier transform, Gibbs phenomenon, Shannon sampling theorem. Discrete Fourier transform (DFT), properties of DFT, Fourier analysis using DFT. The fast Fourier transform (FFT) algorithm. 2.2 DSP systems. Linear convolution and its implementation. Convolution theorem. Convolution by section. 3. Design of Finite Impulse-response (FIR) and Infinite Impulse-response (IIR) Digital Filters 3.1 Design stages for FIR filters. Design method – Windowing. Designing low-pass, band-pass, and high-pass FIR filters. Linear phase response filters and their design. 3.2 Difference equation, impulse response and transfer function of IIR filters. IIR filter implementation. Poles, zeros and stability of IIR filters. Frequency response of IIR filters. Case study: first and second order IIR filter design. Designing higher order IIR filters. 4. Random Signal Processing 4.1 Revision on Random Processes, probability distribution function, expected values, variance and standard derivation. Application – Finding correlation: covariance, cross correlation, unbiased cross correlation, auto-correlation. Application – Denoising: white and coloured noises, power spectral density, periodogram, Welch's method.

5. Advanced DSP and Applications
   To discuss not less than one of the following topics:
   5.1 Architectures of digital signal processors and DSP chips.
   5.2 Denoising using the Wiener filter: Basic Wiener filter theory, Wiener filter in frequency domain. Application example.
   5.3 Multirate digital signal processing: Concepts of multirate signal processing, design of practical sampling rate converters. Application examples.

Laboratory Experiments:

The student will carry out at least three laboratory exercises on the topics below:
1. Laboratory 1: MATLAB for DSP laboratory exercises.
2. Laboratory 2: FIR filter analysis and design.
3. Laboratory 3: IIR filter analysis and design.
4. Laboratory 4: Properties of DFT and the fast Fourier transform.
5. Laboratory 5: Statistical digital signal processing.

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3, 5	Fundamental principles and key concepts of the subject are delivered to students
Tutorials	1, 2, 3, 5	Supplementary to lectures, tutorials are conducted with smaller class size. Students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed.
Laboratory sessions	1, 2, 3, 4, 5, 6	Students will make use of the software tool to simulate the various theories and visualize the results.

Assessment Methods in Alignment of Assessment and Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)					
		1	2	3	4	5	6
1. Continuous Assessment (total 40%)							
• Short exercises	5%	✓	✓	✓		✓	
• Tests	20%	✓	✓	✓		✓	
• HW Assignment	5%	✓	✓	✓		✓	✓
• Laboratory sessions	10%	✓	✓	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓		✓	
Total	100%						

The continuous assessment will consist of a number of assignments, laboratory reports, short exercises, and two tests.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Short exercises	Small exercises conducted to measure the students' basic understanding of the theories, concepts and physical meanings of subject materials during the lectures or tutorial classes.
Tests and examination	End-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom, and their comprehension of subject materials. Students need to think critically in order to come with a good solution for the problem given.
Assignment	Students have to learn independently, to search, digest and analyze data.
Laboratory sessions	Each student is required to produce a report on the laboratory work they conduct. Each student also needs to make a demonstration on the open-ended question set out in each laboratory work.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	26 Hours
	• Tutorial/Laboratory/Practice Classes	13 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/ assignment; preparation for tests/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**

Reading List and References

Textbooks:

1. S.K. Mitra, *Digital Signal Processing*, McGraw-Hill Education (Asia), 3rd ed., 2009.
2. E.C. Ifeacher and B.W. Jervis, *Digital Signal Processing - A Practical Approach,* Prentice-Hall (Pearson Education), 2002.

Reference Books:

1. J.G. Proakis and D.G. Manolakis, *Digital Signal Processing: Principles, Algorithms and Applications*, *4*/e., Pearson International Edition, 2007.
2. *Ulrich Karrenberg, An Interactive Multimedia Introduction to Signal Processing,* 2nd ed., Springer, 2007.

Last Updated	January 2018
Prepared by	Dr Daniel P.K. Lun

Subject Description Form

Subject Code	EIE4428
Subject Title	Multimedia Communications
Credit Value	3
Level	4
Pre-requisite	EIE3333 Data and Computer Communications
Co-requisite/ Exclusion	Nil
Objectives	To study the technical issues and system solutions for providing multimedia communications on the Internet.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the current state-of-the-art developments in Internet technologies for multimedia communications. 2. Appreciate the principles used in designing multimedia protocols, and so understand why standard protocols are designed the way that they are. 3. Understand the system design principles of multimedia communications systems. 4. Solve problems and design simple networked multimedia systems. Category B: Attributes for all-roundedness 5. Think critically and learn independently.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Terminal/Codec Support for Multimedia Communications Scalable Coding: SNR Scalability, Spatial Scalability, Temporal Scalability and Fine Granularity Scalability (FGS) Error Control: Error Propagation, Error Resilience Coding Techniques Rate Control: Concepts for Rate Control, MPEG TM5 Rate Control Algorithms 2. Transport Layer Support for Multimedia Communications TCP congestion control, TCP Delay Analysis, TCP Throughput Analysis, Bandwidth Allocation. Media transport protocols: Real Time Protocol (RTP) and Real Time Control Protocol (RTCP); Signalling Protocols: Real-Time Streaming Protocol (RTSP) 3. Quality of Services (QoS) Integrated services (intserv): Architecture and Service Model, Resource Reservation Protocol (RSVP), Packet Scheduling Disciplines in the Internet Differentiated Services (diffserv): Framework and Concept, Assured and Expedited Services, Packet Classification, Routers Internals and Packet Dropping Techniques 4. Multimedia Streaming Systems Streaming architecture: Real-time Streaming and On-demand Streaming, Content Delivery Network (CDN), Data Sharing Techniques, Support of Interactive Operations, Peer-to-Peer (P2P) video streaming techniques, Case Studies on Video on Demand and IPTV **Laboratory Experiments/Mini-projects:** 1. Multimedia networking 2. Multimedia streaming

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3	fundamental principles and key concepts of the subject are delivered to students
Tutorials	1, 2, 3, 4, 5	supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed
Laboratory sessions/Mini-projects	4, 5	students will make use of network simulators to simulate various types of communication networks and evaluate their performance, or students will develop a simple multimedia streaming system by integrating different components together using some existing tools.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)				
		1	2	3	4	5
1. Continuous Assessment	(total 50%)					
• Assignments	8%	✓	✓	✓		✓
• Mid-Term Test	13%	✓	✓	✓	✓	✓
• End-of-Term Test	13%	✓	✓	✓	✓	✓
• Mini-Project	16%				✓	✓
2. Examination	50%	✓	✓	✓	✓	✓
Total	100%					

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Assignments, tests and examination	end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom; students need to think critically and creatively in order to come with an alternate solution for an existing problem
Laboratory sessions / mini-projects	each group of students are required to produce a written report; accuracy and the presentation of the report will be assessed.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Books:** 1. J.K. Kurose, *Computer Networking: A Top-down Approach Featuring the Internet*, 6th ed., Pearson, 2012. 2. Ze-Nian Li and Mark S. Drew and J. Liu, *Fundamentals of Multimedia*, Springer, 2nd Edition, 2014. 3. K.R. Rao, Z.S. Bojkovic and D.A. Milovanovic*, Multimedia Communication Systems: Techniques, Standards, and Networks,* Prentice-Hall PTR, 2002.	
Last Updated	July 2020	
Prepared by	Dr K.T. Lo	

Subject Description Form

Subject Code	EIE4432
Subject Title	Web Systems and Technologies
Credit Value	3
Level	4
Pre-requisite	ENG2003 Information Technology
Co-requisite/ Exclusion	Nil
Objectives	This subject will provide students with the principles and practical programming skills of developing Internet and Web applications. It enables students to master the development skill for both client-side and server-side programming, especially for database applications. Students will have opportunity to put into practice the concepts through programming exercises based on various components of client/server web programming.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the enabling technologies for building Internet and Web database applications. 2. Understand the different components for developing client/server applications. 3. Apply the techniques and features of the client/server development languages to construct a database application based on Internet. 4. Develop the web database applications through programming exercises. Category B: Attributes for all-roundedness 5. Present ideas and findings effectively. 6. Think critically. 7. Learn independently.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction to Client/Server Computing The basic principles of client/server computing; Distinguished characteristics of client/server systems and application areas; Comparison of two tier versus three tier client/server solutions; Web programming model; Interactive web. 2. Web Programming Client-Side Web Programming: Benefits and limitation of client-side web programming. Basic concepts and development based on Java applet / JavaScript / dynamic HTML (DHTML). Server-Side Web Programming: Approaches to server-side programming. Benefits and limitations of server-side web programming. Development framework for server-side programming based on PHP / Servlet / JSP. Web application development. Development of a web application using synchronous and asynchronous techniques 3. Web Database Database Design and Implementation: Relation model; Mapping an ER model to relational model; Foundations of relational implementation; Structured query language.

Web Database Applications: Multi-tier architecture; Principle of web database applications: store, manage and retrieve data.

4. Data Analysis
Introduction to data mining; Concepts of data analysis; web data mining; Introduction to big data analysis; Techniques of big data analysis.

Laboratory Experiments:

Practical Works:
1. Client-side web application programming.
2. Server-side web application programming.
3. Database-driven web design.
4. Web database Applications.

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 6	fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1, 2, 6	supplementary to lectures; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed.
Laboratory sessions	3, 4, 6, 7	students will develop client-side and server-side web applications.
Project	3, 4, 5, 6, 7	students in groups of 2/3 are required to develop a database-driven web application. Each group is required to perform a detailed study and make a presentation.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)						
		1	2	3	4	5	6	7
1. Continuous Assessment	(total 45%)							
• Tests	18%	✓	✓	✓	✓		✓	
• Quiz	18%	✓	✓	✓	✓		✓	
• Laboratory sessions	9%			✓	✓		✓	✓
2. Project	55%	✓	✓	✓	✓	✓	✓	✓
Total	100%							

The continuous assessment consists of tests, quiz, and laboratory exercises.

<table>
<tr><td></td><td colspan="2">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

<table><tr><th>Specific Assessment Methods/Tasks</th><th>Remark</th></tr><tr><td>Tests, quiz</td><td>end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;
students need to think critically and creatively in order to come with an alternate solution for an existing problem.</td></tr><tr><td>Laboratory sessions, Project</td><td>oral examination based on the laboratory exercises will be conducted to evaluate student's technical knowledge and communication skills.</td></tr></table></td></tr>
<tr><td rowspan="7">Student Study Effort Expected</td><td>Class contact (time-tabled):</td><td></td></tr>
<tr><td>• Lecture</td><td>24 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes</td><td>15 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes</td><td>36 Hours</td></tr>
<tr><td>• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</td><td>30 Hours</td></tr>
<tr><td>Total student study effort:</td><td>105 Hours</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Reference Books:

1. Max Bramer, Web Programming with PHP and MySQL: A Practical Guide, Springer, 2015.
2. Mike O'Kane, A Web-based Introduction to Programming: Essential Algorithms, Syntax, and Control Structures using PHP, HTML and MariaDB/MySQL, 4th ed., Carolina Academic Press, 2017.
3. Robin Nixon, PHP: 20 Lessons to Successful Web Development, McGraw-Hill Education, 2015.
4. Kevin Tatroe, Peter MacIntyre, Programming PHP: Creating Dynamic Web Pages, O'Reilly Media, 2020.</td></tr>
<tr><td>Last Updated</td><td colspan="2">July 2020</td></tr>
<tr><td>Prepared by</td><td colspan="2">Dr Ye Qingqing</td></tr>
</table>

Subject Description Form

Subject Code	EIE4433
Subject Title	Honours Project
Credit Value	6
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	Engineering is the science of solve problems by applying scientific principles and technology in order to improve human life. This may take the form of invention, design, implementation, so on and so forth. It is important for students to have the chance to design and implement solutions to existing problems while considering various constraints. They will also have the chance to apply the knowledge they have learned throughout the curriculum. The Honours Project (also called Final-Year Project or FYP in short) in the curriculum is designed with the following objectives: 1. To provide the opportunity to the students so that they can apply what they have learnt in previous stages in a real-life engineering context. 2. To enable the students to acquire and practise project management skills and discipline while pursuing the Honours Project. 3. To enable the student to apply engineering knowledge in analysis of problems and synthesis of solution while considering various constraints.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** <u>Category A: Professional/academic knowledge and skills</u> 1. Understand the background, the requirements, objectives, and deliverables to be produced for the specific project. 2. Apply knowledge and skills relevant to electronic and information engineering to achieve the objectives of the project. 3. Learn to use new tools and facilities, and to gather new information, for the conduction of the project. <u>Category B: Attributes for all-roundedness</u> 4. Work under the guidance of a supervisor while exercising self-discipline to manage the project. 5. Communicate effectively with related parties (supervisor, peers, vendors, ..etc.). 6. Work with others (team partners, outsource company, technical support staff, ...etc.) collaboratively. 7. Realize different constraints when designing solutions.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** The progression of the project will consist of the following stages. <u>Project Specification</u> In this stage, the student will work in conjunction with the project supervisor to draw up a concrete project plan specifying at least the following: 1. Background of the project 2. Aims and objectives 3. Deliverables 4. Methodology to be adopted 5. Schedule

Project Execution

After the specification is done, the project will be pursued so that the objectives are to be met; the deliverables are to be produced in accordance with the schedule. The student and the project supervisor will meet constantly to discuss the progress. In particular the following should be demonstrated:

1. Adherence to the schedule
2. Achievement of objectives by the student's work
3. Initiatives of the students to work, design, and to solve problems
4. Inquisitiveness of the student (e.g. to probe into different phenomena or to try different approaches)
5. Diligence of the students to spend sufficient effort on the project
6. Systematic documentation of data, design, results, …etc. during the process of working out the project

Project Report

After the project is finished, it is important that the student is competent in disseminating the results for others to review. Through this dissemination process, project achievements can be communicated, experience can be shared, knowledge and skills learnt can be retained and transferred. The following elements will be important as evidence of students' achievement:

1. Project log book (documenting the work done over the year)
2. Project report (hardcopy and softcopy)
3. Presentation
4. Performance in a Question-and-Answer session
5. Demonstration

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/ Task	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**						
		1	**2**	**3**	**4**	**5**	**6**	**7**
Continuous Assessment	100%	✓	✓	✓	✓	✓	✓	✓
Total	100%							

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	**Remark**
Continuous assessment	The assessment of the project work is done continuously throughout the whole project period. The evidence of students' achievement will be documented in log book and the reports submitted in various stages. The student will be required to give a presentation and demonstration so that he/she can communicate the project design, methodology, and achievement to other parties.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Structured Study (regular meetings with supervisor)	78 Hours
	Other student study effort:	
	• Guided Study/Reading/Experiment	90 Hours
	• Reports	30 Hours
	• Presentation and demonstration	12 Hours
	Total student study effort:	**210 Hours**
Reading List and References	**Reference Books and Papers:** *To be specified by the project supervisor for each project.*	
Last Updated	June 2015	
Prepared by	Dr. C.K. Leung	

Subject Description Form

Subject Code	EIE4435
Subject Title	Image and Audio Processing
Credit Value	3
Level	4
Pre-requisite	EIE3312 Linear Systems or EIE3103 Digital Signals and Systems
Co-requisite/ Exclusion	Nil
Objectives	To provide a broad treatment of the fundamentals in image and audio processing.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the fundamentals of image and audio signal processing and associated techniques. 2. Understand how to solve practical problems with some basic image and audio signal processing techniques. 3. Have the ability to design simple systems for realizing some multimedia applications with some basic image and audio signal processing techniques. Category B: Attributes for all-roundedness 4. Present ideas and findings effectively. 5. Learn independently.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Image processing 1.1 Fundamentals of digital image: Digital image representation and visual perception, image sampling and quantization. 1.2 Image enhancement: Histogram processing; Median filtering; Low-pass filtering; High-pass filtering; Spatial filtering; Linear interpolation, Zooming. 1.3 Image coding and compression techniques: Scalar and vector quantizations; Codeword assignment; Entropy coding; Transform image coding; Wavelet coding; Codec examples. 1.4 Image analysis and segmentation: Feature extraction; Histogram; Edge detection; Thresholding. 1.5 Image representation and description: Boundary descriptor; Chaincode; Fourier descriptor; Skeletonizing; Texture descriptor; Moments. 2. Audio processing 2.1 Fundamentals of digital audio: Sampling; Dithering; Quantization; psychoacoustic model. 2.2 Basic digital audio processing techniques: Anti-aliasing filtering; Oversampling; Analog-to-digital conversion; Dithering; Noise shaping; Digital-to-analog Conversion; Equalisation. 2.3 Digital Audio compression: Critical bands; threshold of hearing; Amplitude masking; Temporal masking; Waveform coding; Perceptual coding; Coding techniques: Subband coding and Transform coding. 2.4 Case Study of Audio System/Codecs: MP3; MP3-Pro; CD; MD; DVD-Audio; AC-3; Dolby digital; Surround; SRS Surround system; Digital Audio Broadcasting, etc.

Laboratory Experiments:

1. Image processing techniques
2. Image compression
3. Audio compression
4. Psychoacoustic behaviour

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	2, 3, 5	These are supplementary to lectures and are conducted with smaller class sizes; students will be able to clarify concepts and to gain a deeper understanding of the lecture material; problems and application examples are given and discussed.
Laboratory sessions	4, 5	Students will make use of software to simulate the various theories and visualize the results.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)				
		1	2	3	4	5
1. Continuous Assessment	40%					
• Short quizzes	10%	✓	✓	✓		
• Tests	16%	✓	✓	✓		
• Laboratory sessions	14%	✓			✓	✓
2. Examination	60%	✓	✓	✓	✓	✓
Total	100 %					

The continuous assessment will consist of a number of assignments, laboratory reports, and two tests.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Short quizzes	These can measure the students' understanding of the theories and concepts as well as their comprehension of subject materials.
Assignments, tests and examination	End-of chapter type problems are used to evaluate the students' ability in applying concepts and skills learnt in the classroom; students need to think critically and to learn independently in order to come up with an alternative solution to an existing problem.

	Laboratory sessions	Students are required to conduct some laboratory works, and produce the written reports; The accuracy and presentation of the report will be assessed; the emphasis is on assessing the students' ability to apply knowledge and skills learned in lectures, and their ability to relate the taken data and results to the most relevant theory.
Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Textbooks:** 1. R.C. Gonzalez and R.E. Woods, *Digital Image Processing*, 2nd ed., Prentice-Hall, 2002. 2. Ken C. Pohlmann, *Principles of Digital Audio*, 4th ed., McGraw-Hill, 2000. **Reference Books:** 1. Ze-Nian Li and Mark S. Drew, *Fundamentals of Multimedia*, Pearson Prentice-Hall, 2004. 2. M. Mandal*, Multimedia Signals and Systems,* Kluwer Academic Publishers, 2003.	
Last Updated	January 2018	
Prepared by	Dr Chris Chan	

Subject Description Form

Subject Code	EIE4449
Subject Title	Optical Communication Systems and Networks
Credit Value	3
Level	4
Exclusion	EIE581 Optical Wavelength Division Multiplexing Networks
Objectives	To provide students with the design and operating principles of modern optical communication systems and networks. Upon completion of the subject, students should be familiar with commonly used components and subsystems in optical communication and network systems and be able to design a simple optical communication link.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the basic operating principles of single mode and multimode fibres. 2. Understand the basic operating principles of light sources, detectors and amplifiers. 3. Understand the basic operating principles of passive optical devices. 4. Have the ability to design a simple optical communication link. 5. Appreciate the principles of optical communication networks. Category B: Attributes for all-roundedness 6. Present ideas and findings effectively. 7. Think critically. 8. Learn independently.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Optical Fibre 1.1 Principles of optical waveguiding, single mode and multimode fibres and their transmission characteristics. 2. Active and passive components 2.1 Light emitting diodes (LEDs) and semiconductor lasers: operating principles and characteristics. Semiconductor optical detectors: PINs and APDs. Optical amplifiers: Erbium doped fibre amplifiers (EDFAs). 2.2 Coupler, isolator, circulator, wavelength division multiplexer and demultiplexer. 3. Optical communication systems 3.1 Transmission impairments: noise, dispersion, nonlinearity and crosstalk. Bit error rate (BER), Q factor and receiver sensitivity. 3.2 Point to point link design: power budget and power penalty. 3.3 Wavelength division multiplexing (WDM). Design of multi-span WDM links. 4. Optical communication networks 4.1 WDM add/drop multiplexer, WDM optical crossconnect, Basic architecture of a WDM optical network. Passive optical networks (PONs). **Laboratory Experiments:** Practical Works: 1. Optical fibre passive component measurement 2. Common fibre optic test and measurement techniques

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1,2,3,4,5	Fundamental principles and key concepts of the subject are delivered to students.
Tutorials	1,2,3,4,5,7,8	Supplementary to lectures and are conducted with smaller class size; Students will be able to clarify concepts and to have a deeper understanding of the lecture material; Assignments and application examples are given and discussed.
Laboratory sessions	1,2,3,6,7	Students will enhance their understanding of the concepts learnt through measuring the characteristics of various fibre components. Students are given the opportunity to analyze results obtained and to solve practical problem encountered.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)							
		1	2	3	4	5	6	7	8
1. Continuous Assessment (total 40%)									
• Tests	20%	✓	✓	✓	✓	✓			
• Assignments	10%	✓	✓	✓	✓	✓		✓	✓
• Laboratory sessions	10%	✓	✓	✓			✓	✓	
2. Examination	60%	✓	✓	✓	✓	✓		✓	✓
Total	100 %								

The continuous assessment consists of a number of assignments, laboratory reports and tests.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Specific Assessment Methods/Tasks	Remark
Tests	Objective tests (e.g., multiple-choice questions, true-false, and matching items) conducted to measure the students' ability to remember facts and figures as well as their comprehension of subject materials and end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom
Assignments and examination	End-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom; Students need to think critically and creatively in order to come with an alternate solution for an existing problem. They need to find additional information independently in order to solve a given problem
Laboratory sessions	Each group of students are required to produce a written report; Accuracy and the presentation of the report will be assessed.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**

Reading List and References

Text Books:

1. G. Kaiser, *Optical Fiber Communications*, 5th ed., McGraw-Hill, 2015.
2. John Senior, *Optical Fiber Communications: Principles and Practice*, 3rd ed., Pearson Education, 2009.

Reference Books:

1. Jeff Hecht, *Understanding Fiber Optics,* 4th ed., Prentice-Hall, 2002.

Last Updated	June 2015
Prepared by	Prof. C. Lu

Subject Description Form

Subject Code	ENG4001
Subject Title	Project Management
Credit Value	3
Level	4
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	This subject provides students with knowledge in: 1. project management tools in business organizations, taking into account the time-cost relationships, resources, processes, risks, the project life cycle, organization, and management principles; 2. project management methodologies and their application; 3. choosing project variables for effective project management; and 4. various developments of project management.
Intended Learning Outcomes	**Upon completion of the subject, students will be able to**: 1. demonstrate good understanding of definition of a project, the characteristics and project life cycle; 2. identify appropriate project variables and practices that are applicable to engineering projects; 3. perform project planning, cost/resources estimation, evaluate and monitor of project progress; and 4. propose project management solutions, taking into consideration the project objectives and constraints.
Subject Synopsis/ Indicative Syllabus	1. <u>Project Overview, Management Principles, and the Systems Approach</u> Characteristics of projects and project management. Management principles. Project organization. Team development. Systems concepts and principles. Conflict management. 2. <u>Project Methodologies and Planning Techniques</u> Constraints: time, cost, and technical performance. Work breakdown structure. Management of scope. Scheduling tools: Gantt charts, network analysis techniques, time-phased networks, CPA, PERT, and resource smoothing. 3. <u>Cost Estimation and Cost Control for Projects</u> Types of estimates. Budgeting project costs. Experience curve. Cost schedules and forecasts. Cost control systems. 4. <u>Evaluation and Control of Projects</u> Earned value measurement system. Managing project risks. Status reporting. Project closeout and termination.
Teaching/Learning Methodology	A mixture of lectures, tutorial exercises, case studies, and laboratory work are used to deliver the various topics in this subject. Some material is covered using a problem-based format where this advances the learning objectives. Other material is covered through directed study to enhance the students' "learning to learn" ability. Some case studies are from best practices of projects, based on a literature review. They are used to integrate the topics and demonstrate to students how the various techniques are interrelated and applied in real-life situations.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		1	2	3	4
1. Tutorial exercises/ written report	10%		✓	✓	
2. Oral presentation	10%		✓	✓	
3. End Term Test	20%	✓	✓	✓	
4. Written examination	60%	✓	✓	✓	✓
Total	100%				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Continuous assessment (1), (2), and (3): Test, written reports, oral presentation, and tutorial exercises are used to assess students' understanding and application of the knowledge that they have learnt relative to learning outcomes (1), (2) and (3).

Written examination: questions are designed to assess learning outcomes (1), (2), (3), and (4).

Student Study Effort Expected

Class contact:	
▪ Lectures (3 hours/week for 9 weeks)	27 Hours
▪ Tutorials / Case studies (3 hours/week for 4 weeks)	12 Hours
	39 Hours
Other student study effort:	
▪ Preparation for assignments, short tests, and the written examination	79 Hours
Total student study effort	118 Hours

Reading List and References

1. Meredith, J. R., Shafer, S. M., Mantel Jr, S. J., 2017, *Project Management: a Strategic Managerial Approach*. John Wiley & Sons.
2. Kerzner, H. 2017, *Project Management: a Systems Approach to Planning, Scheduling, and Controlling,* John Wiley & Sons.
3. Project Management Institute, 2013, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide),* Fifth Edition.
4. Smith, NJ (ed.) 2008. *Engineering Project Management*, Blackwell, Oxford

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Prepared by	FENG

Different types of GPA, and their calculation methods

Types of GPA	Purpose	Rules for GPA calculation
GPA	Determine Progression/ Graduation	(1) All academic subjects taken by the student throughout his study, both inside and outside the programme curriculum, are included in the GPA calculation. (2) IC training subjects will be included in the GPA calculation while WIE/Sandwich Training will not. (3) For retake subjects, only the last attempt will be taken in the GPA calculation. (4) Level weighting, if any, will be ignored.
Semester GPA	Determine Progression	Similar to the rules for GPA as described above, except that only subjects taken in that Semester, including retaken subjects, will be included in the calculation.
Weighted GPA	To give an interim indication on the likely Award GPA	(1) Similar to the rules for GPA, except that only subjects inside the programme curriculum concerned will be included in the calculation. Subjects outside the programme curriculum will be excluded. (2) Only academic subjects will be counted towards the Weighted GPA. (3) For retake subjects, only the last attempt will be taken in the Weighted GPA calculation. (4) A weighting of 2 for Level 1 and 2 subjects, and a weighting of 3 for Level 3, 4 and 5 subjects, will be included in the calculation to determine the Honours classifications for Bachelor's degree programmes. (5) The weighted GPA will be the same as the Award GPA unless a student has taken more subjects than required.
Award GPA	For determination of award classification	If the student has not taken more subjects than required, the Award GPA will be as follows: (1) For programmes with level weightings: Award GPA = Weighted GPA (2) For Major/Minor programmes: Award GPA = Major GPA If students have taken more subjects than required, refer to Section 28.3.

University Graduation Requirements for 4-year Full-time Undergraduate Degree Programmes Offered from 2021/22 Onward

All candidates qualifying for a 2-year Full-time Undergraduate Degree offered from 2022/23 onward must meet:

1. the University Graduation Requirements, and
2. the specific graduation requirements of their chosen programme of study.

The minimum University Graduation Requirements are explained in the sections below. For the graduation requirements of specific programmes of study, candidates should refer to the relevant section of the Programme Requirement Document or consult the programme-offering Departments concerned.

Summary of University Graduation Requirements for Senior Year Intake

To be eligible for a PolyU Bachelor's Degree under the revised framework for new Senior Year degree Programme, a student must:

1. Complete successfully a minimum of 60 credits.

Minimum credit requirement for graduation ▪ General University Requirements (GUR) ▪ Discipline-Specific Requirements (DSR)	 9 credits 51 credits	 60 credits
Maximum total credits allowed without incurring a higher tuition fee*		75 credits

2. Earn a cumulative GPA of 1.70 or above at graduation.
3. Complete successfully the mandatory Work-Integrated Education (WIE) component as specified by their programme.
4. Satisfy the residential requirement for at least 1/3 of the credits to be completed for the award the student is currently enrolled, unless the professional bodies stipulate otherwise.
5. Satisfy the 9 credits of GUR distributed as follows:

Area and Credit Requirement	**Curriculum Requirement**
Cluster-Area Requirements (CAR) [6 credits from the following two Cluster Areas: 1) Human Nature, Relations and Development (CAR - English Language) 2) Chinese History and Culture (CAR M)]	• Students should take one 3-credit subject from both CAR M and a specially designed CAR with English Language. • Students need to fulfill the Chinese reading and writing requirements. • Students may apply for a waiver if they have fulfilled the Chinese reading and writing requirements in their previous studies.
Service Learning [3 credits]	-

No further credit transfer will be given to the required GUR unless the student is admitted on qualification more advanced than Associate Degree/Higher Diploma [1] and had also completed comparable components in their earlier studies.

Regarding Language and Communication Requirements (LCR), this is normally not required. Only those students not meeting the equivalent standard of the Undergraduate Degree LCR (based on their previous studies in AD/HD programmes and their academic performance) will be required to take degree LCR subjects on top of the normal curriculum requirement. The Programme offering department will refer to the guidelines provided by the Language Centres (ELC and CLC) to determine whether a new student has met the equivalent standard. Non-Chinese speakers and those students whose Chinese standards are at junior secondary level or below will by default be exempted from the DSR - Chinese and CAR - Chinese Reading and Writing requirements. However, this group of students would still be required to take one Chinese LCR subject to fulfil their Chinese LCR.

(a) Language and Communication Requirements (LCR)

English

All undergraduate students must successfully complete two 3-credit English language subjects as stipulated by the University, according to their English language proficiency level (**Table A**). These subjects are designed to suit students' different levels of English language proficiency at entry, as determined by their HKDSE score or the English Language Centre (ELC) entry assessment (when no HKDSE score is available, e.g. in the case of non-local students).

Students entering the University with specified attainment grades in certain public examinations can be given credit transfer or exemption for one or both LCR English subjects.

Table A: English LCR subjects (each 3 credits)

English language competence level/ Subject	***Practical English for University Studies***	***English for University Studies***	**Any LCR Proficient level elective subject in English (Table B)**
HKDSE Level 4 and above or equivalent	--	Subject 1	Subject 2
HKDSE Level 3 or equivalent	Subject 1	Subject 2	--

Table B: Proficient level elective subjects for DSE Level 4 students and above (or equivalent) (each 3 credits)

LCR Proficient level elective subjects	Advanced English for University Studies
	Advanced English Reading and Writing Skills
	English in Literature and Film
	Persuasive Communication

Chinese

All undergraduate students are required to successfully complete one 3-credit Chinese language subject as stipulated by the University, according to their Chinese language proficiency level (**Table C**).

[1] The admission of students to UGC-funded Articulation Degree programmes and Senior Year intakes on the basis of qualification(s) more advanced than Associate Degree/Higher Diploma is subject to the conditions stipulated by UGC governing the UGC-funded Senior Year places.

Table C: Chinese LCR subjects

Categories of students	Required subject
For Chinese speaking students	A Chinese LCR subject
For non-Chinese speakers or students whose Chinese standards are at junior secondary level or below	One subject from **Table D** below

Table D: Chinese LCR subjects for non-Chinese speakers or students whose Chinese standards are at junior secondary level or below

Subject (3 credits)	**Pre-requisite/exclusion**
Chinese I (for non-Chinese speaking students)	For non-Chinese speaking students at beginners' level
Chinese II (for non-Chinese speaking students)	• For non-Chinese speaking students; and • Students who have completed Chinese I or equivalent
Chinese III (for non-Chinese speaking students)	• For non-Chinese speaking students at higher competence levels; and • Students who have completed Chinese II or equivalent
Chinese IV (for Non-Chinese speaking students)	• For non-Chinese students at intermediate competence levels; and • Students who have completed Chinese III or equivalent
Chinese Literature – Linguistics and Cultural Perspectives (for non-Chinese speaking students)	For non-Chinese speaking students at higher competence levels

Students who have obtained verified qualifications or certain results in some public examinations [e.g. HKDSE, HKALE, JEE, GSAT(Taiwan)] may be granted credit transfer/exemption for the Chinese LCR subject.

Writing Requirement in CAR Subjects

In additional to the LCR in English and Chinese explained above, all students must also, among the Cluster Areas Requirement (CAR) subjects they take (see section (e) below), pass one subject that includes the requirement for a substantial piece of writing in English and one subject with the requirement for a substantial piece of writing in Chinese.

Reading Requirement in CAR Subjects

All students must, among the CAR subjects they take, pass one subject that includes the requirement for the reading of an extensive text in English and one subject with the requirement for the reading of an extensive text in Chinese.

A list of approved CAR subjects for meeting the Writing Requirement (with a "W" designation) and for meeting the Reading Requirement (with an "R" designation) is shown at: https://www.polyu.edu.hk/ous/GURSubjects/CAR.php

Non-Chinese speakers and those students whose Chinese standards are at junior secondary level or below will by default be exempted from the DSR - Chinese and CAR - Chinese

Reading and Writing requirements. However, this group of students would still be required to take one Chinese LCR subject to fulfil their Chinese LCR.

Note: In addition to the LCR and Reading and Writing Requirements, students also have to complete 4 credits of discipline-specific language requirements (2 credits in English and 2 credits in Chinese) as specified in the curriculum requirements of their Major.

(b) Service-Learning

All students must successfully complete one 3-credit subject designated to meet the Service-Learning Requirement, in which they are required to (i) participate in substantial community service or civic engagement activities that will benefit the service users or the community at large in a meaningful way, (ii) apply the knowledge and skills acquired from their Major or other learning experiences at the University to the community service activities, and (iii) reflect on their service learning experience in order to link theory with practice for the development of a stronger sense of ethical, social and national responsibility.

These subjects may take the form of:

- An open-to-all GUR service-learning subject
- A GUR service-learning subject targeted at a particular student group (e.g. a Broad Discipline), or
- A customised DSR subject (core or elective) within the Major/Minor with all the required features and components to meet the Service-Learning Requirement.

Students who have satisfied the Service-Learning Requirement via a customised DSR subject will be required to take another 3-credit subject to make up for the total credit requirement.

A list of designated subjects for meeting the service-learning requirement is available at: https://www.polyu.edu.hk/ous/GURSubjects/SL.php

(c) Cluster Areas Requirement (CAR)

To expand students' intellectual capacity beyond their disciplinary domain and to enable them to tackle professional and global issues from a multidisciplinary perspective, students are required to successfully complete one 3-credit subject in both Cluster Areas of CAR M and CAR with English Language :

- Human Nature, Relations and Development (CAR with English Language)
- Chinese History and Culture (CAR M)

A list of CAR subjects under each of the four Cluster Areas is available at:
https://www.polyu.edu.hk/ous/GURSubjects/CAR.php

(d) Essential Components of General Education E-modules (a non-credit bearing subject)

Students will be required to take the General Education which comprises of National Education (NE), Online Tutorials in Academic Integrity (OTAI), Artificial Intelligence and Data Analytics (AIDA) and Innovation and Entrepreneurship (IE) e-modules.

This subject is graded on a Pass/Fail basis. Students are required to complete and pass all four elearning modules in order to pass this subject.

More details about this requirement is available at: https://www.polyu.edu.hk/ous/GURSubjects/ECGESYS.php