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

BSc (Hons) Degree Programme in Internet and Multimedia Technologies

Code: 42477-SY; Full-time, Credit-based

Programme Booklet

(2022/23)

Department of Electronic and Information Engineering

Bachelor of Science (Honours) Degree Programme in

Internet and Multimedia Technologies

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BSc(Hons) in Internet and Multimedia Technologies (Full-Time)

Contents

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

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/bsc_imt_42477/" 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 Science (Honours) Degree in Internet and Multimedia Technologies**
Host Department	Department of Electronic and Information Engineering (EIE)
Programme Structure	Credit-based
Final Award	BSc(Hons) in Internet and Multimedia Technologies 互聯網及多媒體科技〔榮譽〕理學士
Mode of Attendance	Full-time
Normal Duration	Senior Year Intake Full-time Mode: 2 years
Total Credits for Graduation (Academic Credits + Training Credits + WIE Training Credit)	• Academic Credits: Senior Year Intake: 67 credits • Training Credits: 5 (for all intakes) • Work-Integrated Education Training Credit: 1 (for all intakes)
Professional Recognition	The programme has been granted full accreditation from the Hong Kong Institution of Engineers (HKIE) as a Computer Science Programme. Graduates of the programme will satisfy the academic requirements for Corporate membership of the HKIE.

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

2.1 Background and Rationale

Internet and multimedia technologies are among the key technologies that support the economic growth worldwide. Products with multimedia features are in great demand. With the increasing popularity of wired and wireless broadband communications, plenty of multimedia contents are being created, delivered and shared among users via the Internet. There is a need of professionals who exercise knowledge and leadership in all three areas of computer networks, multimedia and information technologies.

2.2 Aims

This Programme aims at producing graduates with:

1. a wide range of professional knowledge and skills relevant to Internet and Multimedia Technologies,
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

Programme Outcomes are the attributes of the graduates who have completed the Programme successfully. These attributes are classified into two broad categories. Category A embraces such attributes as knowledge, skills, abilities, attitudes that are related to Internet and multimedia technologies. Category B embraces all-roundedness attributes possessed by the graduates to support their further development.

Category A: Professional/Academic Knowledge and Skills

On successful completion of the Programme, students should be able to:

1. Apply knowledge of computing and mathematics appropriate to the discipline of Internet and Multimedia Technologies;
2. Apply knowledge of Internet and Multimedia Technologies to the abstraction and conceptualisation of Information and Communications Technology (ICT) models;
3. Analyse a problem in Internet and Multimedia Technologies, and identify and define the computing requirements appropriate to its solution;
4. Design, implement, and evaluate a system, process, component, or program in Internet and Multimedia Technologies to meet desired needs with appropriate consideration for public health and safety, social and environmental considerations; and
5. Use current techniques, skills, and tools necessary for practice in Internet and Multimedia Technologies with an understanding of the limitations.

Category B: Attributes for All-Roundedness

On successful completion of the Programme, students should be able to:

6. Function effectively on teams to accomplish a common goal;
7. Understand professional, ethical, legal, security and social issues and responsibilities;
8. Communicate effectively with a range of audiences;
9. Analyse the local and global impact of Internet and Multimedia Technologies on individuals, organisations, and society; and
10. Recognise the need for and engage in continuing professional development.

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
7	X		X	X
8				X
9	X		X	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			X			
2	X	X		X			
3	X	X		X			
4	X			X			
5	X						
6			X			X	
7	X					X	X
8	X	X	X	X			
9		X			X		X
10					X		

3. ENTRANCE REQUIREMENTS

3.1 Programme-specific Minimum Entrance Requirements

- An Associate Degree or Higher Diploma from a recognized institution in Information Technology, Computer Science, Engineering, Electronic Engineering, Information Engineering, Communication Engineering, Electrical Engineering, Computer Engineering or other similar disciplines.

4. PROGRAMME, SUBJECTS, AND CREDITS

4.1 Programme Specified Subjects

This Programme is a credit-based, 2-year full-time programme. The minimum number of credits required for graduation is 67 (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), plus 5 practical training credits and 1 WIE training 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 with 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.

During the first year of studies, moreover, students are required to complete a 5-week practical training at Industrial Centre. The practical training consists of two parts: Computer Training and Electronic Practice. It will be conducted during the summer.

During the 2 years of studies, students will be allowed to select 4 technical electives from a pool of subjects according to their own interest. They must complete a Computer Game Development Project or an Honours Project in their final year. In addition, students will take "non-technical" compulsory subjects on economics and management, and Cluster-Area Requirement (CAR) subjects. The objectives of taking such "non-technical" subjects are to broaden the knowledge base of students and to enhance the all-roundedness of students. Before graduation, students must obtain a minimum of 1 training credit on Work-Integrated Education (WIE), which can be in the form of industrial project or jobs as deemed appropriate.

Table 4.1 Compulsory and Elective Subjects to be Taken by BSc in IMT Students

Subject	Subject Title	Credit	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)*	-	-
-	Essential Components of General Education	0	COM
Discipline-Specific Requirement (DSR)			
AF3625	Engineering Economics	3	COM
CLC3241P	Professional Communication in Chinese	2	COM
COMP3011	Design and Analysis of Algorithms	3	ELE
COMP3512	Legal Aspects, Professionalism and Ethics of Computing	3	COM
EIE2108	Fundamentals of Internet and Multimedia Technologies	3	COM [Note 1]
EIE3101	Computer Animation	3	COM
EIE3103	Digital Signals and Systems	3	COM
EIE3109	Mobile Systems and Application Development	3	COM
EIE3320	Object-Oriented Design and Programming	3	COM
EIE3333	Data and Computer Communications	3	COM
EIE3360	Integrated Project	3	COM
EIE4100	Computer Vision and Pattern Recognition	3	ELE
EIE4102	IP Networks	3	COM
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
EIE4121	Machine Learning in Cyber-Security	3	ELE
EIE4122	Deep Learning and Deep Neural Networks	3	ELE
EIE4428	Multimedia Communications	3	ELE
EIE4430	Honours Project	6	COM (Select any 1 subject out of these 2 subjects)
SD4981	Computer Game Development Project	6	
EIE4431	Digital Video Production and Broadcasting	3	ELE
EIE4432	Web Systems and Technologies	3	COM
EIE4435	Image and Audio Processing	3	ELE
ELC3531	Professional Communication in English for Engineering Students	2	COM
ENG3003	Engineering Management	3	COM
EIE2903/IC2141	Internet and Multimedia Product Development	5	TRN
SD3985	Computer Game Development	3	COM

Note:

AF	School of Accounting and Finance
AMA	Department of Applied Mathematics
CLC	Chinese Language Centre
COM	Compulsory
COMP	Department of Computing
EIE	Department of Electronic and Information Engineering
ELC	English Language Centre
ELE	Elective
ENG	Faculty of Engineering
IC	Industrial Centre
SD	School of Design
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.
Note[1] Only for those students without background in Statistics.

Subject Code	Subject Title	Credit	Category
EIE522	Pattern Recognition: Theory and 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
EIE568	IoT - Tools and Applications	3	ELE
EIE569	Sensor Networks	3	ELE
EIE575	Vehicular Communications and Inter-Networking Technologies	3	ELE
EIE579	Advanced Telecommunication Systems	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 one 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.

4.3 Specified Progression Pattern

Year 1	
Semester 1 (15 credits)	**Semester 2 (18 credits)**
EIE3101 Computer Animation (3 credits)	EIE3333 Data and Computer Communications (3 credits)
EIE3103 Digital and Systems (3 credits)	EIE3360 Integrated Project (3 credits)
EIE3109 Mobile Systems and Application Development (3 credits)	SD3985 Computer Game Development (3 credits)
EIE3320 Object-Oriented Design and Programming (3 credits)	Technical Elective 1 (3 credits) Note 4
EIE4432 Web Systems and Technologies (3 credits)	Service-Learning (3 credits) Note 1
	CAR-English Language (3 credits) Note 1
Essential Components of General Education	
Semester 3: EIE2903/IC2141 Internet and Multimedia Product Development (5 training credits)	
Year 2	
Semester 1 (18 credits)	**Semester 2 (16 credits)**
EIE4102 IP Networks (3 credits)	AF3625 Engineering Economics (3 credits)
ENG3003 Engineering Management (3 credits)	COMP3512 Legal Aspects, Professionalism and Ethics of Computing (3 credits)
Technical Elective 2 (3 credits) Note 4	CLC3241P Professional Communication in Chinese (2 credits)
Technical Elective 3 (3 credits) Note 4	ELC3531 Professional Communication in English for Engineering Students (2 credits)
CAR M (3 credits) Note 1,2	Technical Elective 4 (3 credits) Note 4
SD4981 Computer Game Development Project / EIE4430 Honours Project (6 credits)	

Total Number of Credits: 67 Note 3

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. Students also need to fulfil the Chinese reading and writing requirements, if such requirements have not been fulfilled in previous studies.

Note 3: 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.

Note 4:

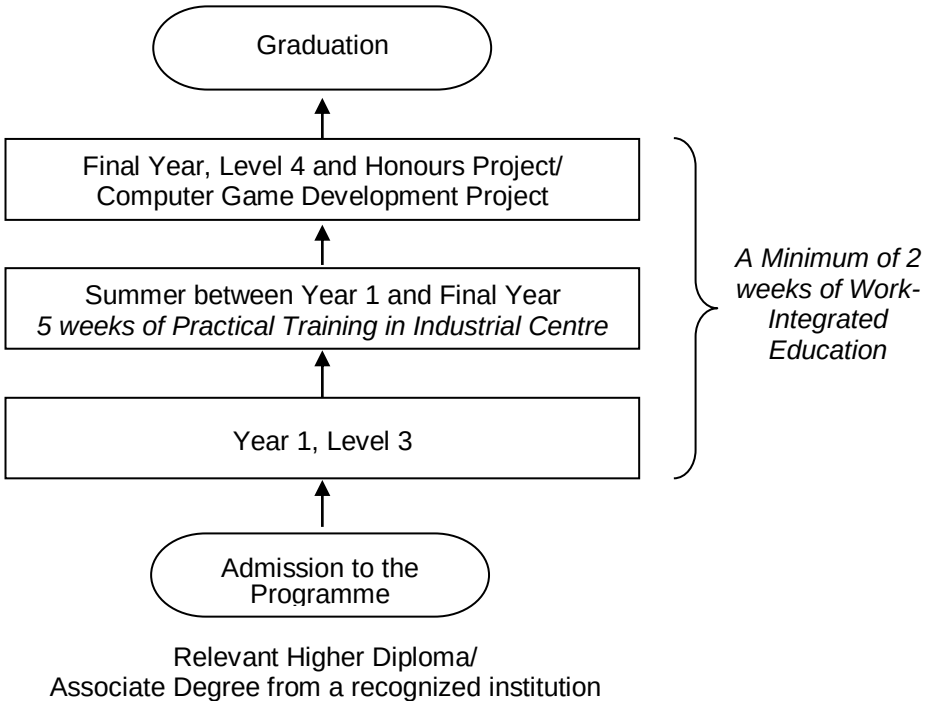
Technology stream electives:	**Science stream electives:**
EIE4104 Mobile Networking	COMP3011 Design and Analysis of Algorithms
	COMP4434 Big Data Analytics
EIE4106 Network Management and Security	EIE4100 Computer Vision and Pattern Recognition
EIE4428 Multimedia Communications	EIE4105 Multimodal Human Computer Interaction Technology
EIE4431 Digital Video Production and Broadcasting	EIE4108 Distributed Systems and Cloud Computing
EIE4435 Image and Audio Processing	EIE4121 Machine Learning for Cyber-security
	EIE4122 Deep Learning and Deep Neural Networks

5. MODE OF STUDY AND FRAMEWORK

5.1 Mode of Study

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

Under this mode, 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.



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)										
Language and Communication Requirements (LCR)										
LCR - English - ELCXXXX (2 Subjects)								**T,P**		
LCR - Chinese - CLCXXXX (1 Subject)								**T,P**		
Cluster-Area Requirements (CAR) (4 Subjects)										
CAR-English Language (Human Nature, Relations and Development with English)								**T,P**		
CAR M (Chinese History and Culture)								**T,P**		
Other Requirements										
SL - Service-Learning						**T,P**		**T,P**		
B. DISCIPLINE-SPECIFIC REQUIREMENTS (DSR)										
Compulsory - Mathematics and Sciences Subjects										
AMA1110 Basic Mathematics I – Calculus and Probability & Statistics			**T,P**		**T,P**					
AMA1120 Basic Mathematics II – Calculus and Linear Algebra			**T,P**		**T,P**					
Compulsory - Computer Science and Engineering Subjects										
EIE3101 Computer Animation				**T**	**T**					
EIE3103 Digital Signals and Systems			**T**		**P**			**T**		**T**
EIE3109 Mobile Systems and Application Development				**T**	**T**				**T,P**	
EIE3320 Object-Oriented Design and Programming	**T,M**		**T,P**	**T,P, M**	**P**					
EIE3333 Data and Computer Communications	**T**	**T**			**T,P**			**T**		
EIE3360 Integrated Project	**T,P, M**	**T,P, M**	**T,P, M**		**T,P, M**	**P,M**		**P,M**	**M**	**T,P, M**
EIE4102 IP Networks	**T**				**T,P**					**T**
EIE4432 Web Systems and Technologies		**T**			**T,P**	**P,M**				**T**
ENG2003 Information Technology			**T,P**		**T,P**				**T,P**	
SD3985 Computer Game Development			**T,P**	**T,P**		**T,P**		**T,P**		
Compulsory/ Elective - Computer Science and Engineering Subjects										
EIE4431 Digital Video Production and Broadcasting	**T,P, M**		**T**		**T,P, M**					**T**
EIE4435 Image and Audio Processing			**T,M**	**T,M**		**T**				
Compulsory - Capstone Project (Select Any 1)										
EIE4430 Honours Project	**P,M**	**P,M**	**P,M**	**P,M**	**P,M**			**P,M**	**P,M**	**P,M**
SD4981 Computer Game Development Project	**P,M**	**P,M**	**P,M**	**P,M**	**P,M**	**T,P**		**P,M**	**P,M**	**P,M**
Compulsory - Industrial Centre Training and Training through Work Experience										
EIE2903/IC2141 Internet and Multimedia Product Development			**T,P**		**T,P**	**T,P**	**T**		**T**	
Work-Integrated Education (WIE)				**P,M**		**P,M**	**P,M**	**P,M**	**P,M**	**P,M**
Compulsory - Complementary Subjects										
AF3625 Engineering Economics						**T,P**	**T,M**	**T,P**		**T,P**
CLC3241P Professional Communication in Chinese								**T,P, M**		
COMP3512 Legal Aspects, Professionalism and Ethics of Computing							**T,P, M**	**P,M**		**T,P, M**
ELC3531 Professional Communication in English for Engineering Students								**T,P, M**		
ENG3003 Engineering Management						**T**	**T,M**	**T**	**T,M**	

	Programme Outcomes									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Elective - Computer Science and Engineering Subjects (Select Any 4)										
COMP3011 Design and Analysis of Algorithms	**T,P**		**T,P**	**T,P**						**T,P**
EIE4100 Computer Vision and Pattern Recognition	**T**	**T,P**	**T**	**T**	**T**	**T**				**T**
EIE4104 Mobile Networking	**T**				**T,P**					**T**
EIE4105 Multimodal Human Computer Interaction Technology	**T,P**				**T,P**				**T,P**	
EIE4106 Network Management and Security	**T,M**	**T,P, M**	**T,M**	**T**	**T,M**			**T**		**T**
EIE4108 Distributed Systems and Cloud Computing	**T,P**		**T**	**T,P**	**P**			**T,P**	**T,P**	
EIE4121 Machine Learning for Cyber-security	**T,P**				**T,P, M**			**P,M**		
EIE4122 Deep Learning and Deep Neural Networks			**T,P, M**	**T,P, M**					**T,P ,M**	
EIE4428 Multimedia Communications	**T**	**T**	**T,P, M**							**T**

Note:

Programme Outcomes:
1. Apply knowledge of computing and mathematics appropriate to the discipline of Internet and Multimedia Technologies;
2. Apply knowledge of Internet and Multimedia Technologies to the abstraction and conceptualisation of Information and Communications Technology (ICT) models;
3. Analyse a problem in Internet and Multimedia Technologies, and identify and define the computing requirements appropriate to its solution;
4. Design, implement, and evaluate a system, process, component, or program in Internet and Multimedia Technologies to meet desired needs with appropriate consideration for public health and safety, social and environmental considerations; and
5. Use current techniques, skills, and tools necessary for practice in Internet and Multimedia Technologies with an understanding of the limitations.
6. Function effectively on teams to accomplish a common goal;
7. Understand professional, ethical, legal, security and social issues and responsibilities;
8. Communicate effectively with a range of audiences;
9. Analyse the local and global impact of Internet and Multimedia Technologies on individuals, organisations, and society; and
10. Recognise the need for and engage in continuing professional development.

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

7. HONOURS PROJECT / COMPUTER GAME DEVELOPMENT PROJECT

The Honours Project/ Computer Game Development 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/ Computer Game Development 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/ Computer Game Development Project when a student is to be awarded a high Honours classification.

One of the important features of the project is “learning by doing”. It is intended to be a platform for 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 concept to final implementation and testing, through problem identification and the selection of appropriate solutions will be practised by the students.

7.1 Project Management

7.1.1 Honours Project

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.

7.1.2 Computer Game Development Project

The Computer Game Development Project consists of lectures that introduce basic technical components in 3D game programming, including architecture of 3D game engine, and algorithms and trends in their future developments. Students are required to study a new algorithm and study its implications in 3D game design and development.

Students are also required to complete a number of tasks corresponding to those essential technical components in laboratory sessions, which serve as the basis for students to realize the project.

Students have to form a group to work on a project to design, implement and evaluate a playable game to demonstrate their understanding in the entire game production process.

7.2 Project Assessment

7.2.1 Honours Project

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.

7.2.2 Computer Game Development Project

Written assignment is given to students so that students can study new algorithms in 3D computer game and understand their implications in 3D game design and development.

Laboratories are organized to let students learn and practise basic technical components in a 3D game engine for realizing a 3D game. Each student is required to complete a predefined task according to a lab sheet for each laboratory session.

Students form groups of at most three members to work on a project. Each group creates an original playable game from its own idea, and evaluate the game with intended players. During the project period, each group is required to submit assignments corresponding to different stages of the game development process. At the end of the project, each group is required to demonstrate their game and present their work to the class.

8. PRACTICAL TRAINING

Students are required to undergo training at the University's Industrial Centre (IC). Students have to complete Practical Training (EIE2903/IC2141), which is a 5-training-credit subject. Practical Training is an important part of the Programme in which students are given hands-on training, including the use of scientific computation tool, and practice on manufacturing a multimedia electronic product through a project in the design and fabrication of a multimedia electronic product prototype. IC training is essential for students to blend knowledge into practice and promotes critical thinking, which prepares them for working in an authentic environment.

Students will be assessed and graded in the normal manner from A+ to F, which will be counted in the evaluation of the Grade Point Average (GPA). However, the grade will not be counted towards the credit requirement of the award or the evaluation of the Weighted GPA. The IC training will be graded at the end of the Summer Term of Year 1. If the assessment cannot be done in time for the grade to be reported in the particular year, the grade will be reported during Semester One of the following academic year.

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 one 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 2. 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 the Programme Requirement Document. 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 the same subject ever taken, the grade attained in the last attempt should be carried over with the credit transfer. 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 that subject, no credit transfer should be granted, despite the fact that the student may have attained a pass grade for the subject in 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 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 examinations, at the discretion of the individual subject offering Department. Where both continuous assessment and examinations 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;

(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/School 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 opt 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 BSC(HONS) IN INTERNET AND MULTIMEDIA TECHNOLOGIES PROGRAMME

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

(i) the University Graduation Requirements, as explained in Section 27.1 below.

27.1 University Graduation Requirements

(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 (ER/EW & CR/CW) 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.

27.2 Specific Graduation Requirements for the **BSc(Hons) in Internet and Multimedia Technologies** Programme

(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 (i)-(iv).
   (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) as stated in Table 4.1.

(ii) Obtain a total 5 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 number of 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 fulfill 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 and 27.6 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 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 4.3) (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, 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 who is subject to disciplinary action.

30. SYLLABI

(Please see pages 46 to 124.)

APPENDIX

(Please see pages 125 to 129.)

Subject Description Form

Subject Code	EIE2903/IC2141
Subject Title	Internet and Multimedia Product Development
Credit Value	5 Training Credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject provides to students hands-on practical training with a focus on Internet and multimedia product development. This subject also trains students on the use of scientific computing software.
Intended Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. Design simple Internet and multimedia applications for experimentation and demonstrations; 2. Build simple product prototypes using contemporary microcomputer platforms; 3. Apply troubleshooting techniques and tools in product and system development; and 4. Apply scientific computation software to solve engineering problems
Subject Synopsis/ Indicative Syllabus	1 Microcomputer Applications and Practice for Internet & Multimedia 1.1 Introduction to Microcomputer systems and development tools 1.2 Knowledge on the corresponding operating system and its operation 1.3 Basic hardware concepts and practice: Input/output ports, peripherals, system design and testing 1.4 Hands-on practice on controlling the peripherals 1.5 Hands-on practice on typical sensor applications 2 Advanced System Applications and Practice for Internet & Multimedia 2.1 Introduction to contemporary IMT systems, related devices, tools and implementation 2.2 Basic database application and practice 2.3 Introduction to web application development tools 2.4 Web application practice 2.5 Basic graphics practice and introduction to Pygame 2.6 Hands-on practice on simple game development 3 Application of Computing Tool 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; 3.2 Use of functions and popular Python packages, such as Numpy, Panda and Matplotlib; 3.3 Python script programming & debugging; logic operations & flow control; data visualization by using graphics packages; 3.4 Data manipulation and data science operations with Panda 4 Project with Internet and Multimedia Application 4.1 Project management techniques 4.2 System integration involving IOT, edge computing, web applications, data visualization, analysis and manipulation.

<table>
<tr><td>Learning Methodology</td><td>The teaching and learning methods include lectures, practical workshop tutorials, and group project.

The lectures aim at providing students with background knowledge required for understanding key concepts in programming languages, use of microcomputer development systems and tools.

The practical workshop tutorials aim at reinforcing students' knowledge and developing their ability in applying the knowledge and skills to complete specific tasks.

Group project aims at facilitating students to review the diverse topics covered in this subject and perform active learning with research, practice, questioning, and problem solving in a unified activity. In addition, students should be able to cultivate their personal quality, creativity, management skills and leadership in teamwork collaborations.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Assessment Methods</th><th rowspan="2">Weighting (%)</th><th colspan="4">Intended Learning Outcomes Assessed</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1. Assignment</td><td>45</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Report</td><td>37</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>3. Product performance</td><td>18</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:
1. Assignment is to facilitate students to apply the skills and knowledge periodically throughout the training.
2. Report writing is to facilitate students to acquire deep understanding on the topics of the training, to present those concepts clearly, and to do reflection on achievement of learning outcomes.
3. Product performance is to review the completeness and quality of the product constructed by students.</td></tr>
<tr><td>Student Study Effort Expected</td><td>Class contact:
<table>
<tr><td>▪ Mini-Lecture</td><td>16 Hours</td></tr>
<tr><td>▪ Workshop Practices</td><td>134 Hours</td></tr>
<tr><td>Total student study effort:</td><td>150 Hours</td></tr>
</table></td></tr>
<tr><td>Reading List and References</td><td>Reference Reading List:
1. Gareth Halfaceree, (2018). The Official Raspberry Pi Beginner's Guide, Raspberry Press
2. Samarth Shah, (2015). Learning Raspberry Pi, Packt Publishing
3. Andrea Chiarelli, (2018). Beginning React, Packt Publishing
4. *Padmanabhan, T. (2016). Programming with Python. Singapore: Springer.
5. McKinney, W. (2017). Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython (Second ed.). Sebastopol, CA: O'Reilly.</td></tr>
<tr><td>Last Updated</td><td>Jun 2021</td></tr>
<tr><td>Prepared by</td><td>Industrial Centre</td></tr>
</table>

Subject Description Form

Subject Code	AF3625 (for 42470 and 42477)
Subject Title	Engineering Economics
Credit Value	3
Level	3
Exclusion	AF2618
Objectives	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.
Intended Subject Learning Outcomes	**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.
Subject Synopsis/ Indicative Syllabus	Economic Environment of a Firm **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 Engineering Economics Return on investment; Accounting profit versus economic profit Fundamentals of Budgetary Planning and Control 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
Teaching/ Learning Methodology	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.

<table>
<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>
<tr><td>Student Study Effort Required</td><td>
<table>
<tr><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>Other student study effort:</td><td></td></tr>
<tr><td>• Study and self-learning</td><td>48 Hours</td></tr>
<tr><td>• Presentation preparation and written assignments</td><td>18 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>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.</td></tr>
<tr><td>Last Updated</td><td>July 2022</td></tr>
<tr><td>Prepared by</td><td>School of Accounting and Finance</td></tr>
</table>

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

<table>
<tr><td>Subject Code</td><td>COMP3011</td></tr>
<tr><td>Subject Title</td><td>Design and Analysis of Algorithms</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>3</td></tr>
<tr><td>Pre-requisite / Co-requisite / Exclusion</td><td>Pre-requisite: COMP2011 Data Structures or EIE3320 Object-Oriented Design and Programming or equivalent</td></tr>
<tr><td>Objectives</td><td>The objectives of this subject are to:
1. provide students with in-depth knowledge on algorithm design techniques; and
2. introduce and practice advanced algorithms for various data types.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
<u>Category A: Professional/academic knowledge and skills</u>
1. understand common techniques for designing algorithms;
2. acquire the skills to design efficient algorithms for solving computational problems;
3. analyse and compare the efficiency of algorithms;
4. design and implement efficient algorithms for solving computing problems in a high-level programming language (e.g., C++ or Java);
<u>Category B: Attributes for all-roundedness</u>
5. solve problems independently; and
6. think critically for improvement in solutions.</td></tr>
<tr><td>Subject Synopsis/ Indicative Syllabus</td><td>
<table>
<tr><th>Topic</th><th>Duration of Lectures</th></tr>
<tr><td>1. Analysis of algorithms
Mathematical techniques; big-O notation; efficiency analysis; recurring relations.</td><td>2</td></tr>
<tr><td>2. Advanced Algorithmic Design Techniques
Dynamic programming, divide-and-conquer, branch-and-bound, greedy algorithm.</td><td>6</td></tr>
<tr><td>3. Advanced Analysis Techniques
Introduction to randomised algorithms, probabilistic analysis, amortised analysis.</td><td>6</td></tr>
<tr><td>4. Advanced Data Structures
Cache-oblivious data structures, log-structured merge tree, locality sensitive hashing, Bloom filter.</td><td>4</td></tr>
<tr><td>5. Computational Geometry Algorithms
Spatial range searching, indexing of spatial objects, convex hull, closest pairs</td><td>4</td></tr>
<tr><td>6. NP-Complete Problems
Complexity classes, NP-completeness, reduction, approximation algorithms.</td><td>4</td></tr>
<tr><td>Total</td><td>26</td></tr>
</table>
</td></tr>
<tr><td>Teaching/ Learning Methodology</td><td>Lectures provide students the main concepts of the topic, together with comprehensive examples for easy understanding.

Tutorials and lab sessions offer an opportunity to students for practicing their algorithmic analysis, design, and implementation techniques.

Both written and programming assignments will be utilised in the course. Written assignments help students develop analysis and design skills, whereas programming assignments emphasise on implementation skills.</td></tr>
</table>

<table>
<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="6">Intended subject learning outcomes to be assessed</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>Continuous Assessment</td><td rowspan="4">60%</td><td colspan="6"></td></tr>
<tr><td>1. Assignments</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>2. Lab Exercises</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>3. Mid-Term / Tests</td><td>✓</td><td>✓</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Examination</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="6"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

All four items are relevant to the assessment of the use of algorithms advanced data structures for problem solving, as well as their efficiency analysis (for items 1, 2, 3).

In addition, programming exercises in assignments and lab sessions are used to assess implementation skills (for item 4); whereas the mid-term / tests and the examination are used to assess independent problem solving and critical thinking skills (for items 5, 6).
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td colspan="2">Class contact:</td></tr>
<tr><td>▪ Lecture</td><td>26 Hours</td></tr>
<tr><td>▪ Tutorial/Lab</td><td>13 Hours</td></tr>
<tr><td colspan="2">Other student study effort:</td></tr>
<tr><td>▪ Assignments (Written and Programming)</td><td>65 Hours</td></tr>
<tr><td>Total student study effort</td><td>104 Hours</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>
Textbook:
1. Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L. and Stein, Clifford, Introduction to Algorithms, 3rd Edition, MIT Press, 2009.

Reference Books:
1. Goodrich, M.T., and Tamassia, R., Data Structures and Algorithms in Java, 3rd Edition, John Wiley, 2005.
2. Carrano, Frank M., Data Abstraction & Problem Solving with C++: Walls & Mirrors, Addison Wesley, 2007.
3. Jon M. Kleinberg, Éva Tardos: Algorithm design. Addison-Wesley 2006, ISBN 978-0-321-37291-8.
</td></tr>
<tr><td>Last Updated</td><td>Jun 2022</td></tr>
<tr><td>Prepared by</td><td>COMP</td></tr>
</table>

Subject Description Form

Subject Code	COMP3512
Subject Title	Legal Aspects, Professionalism and Ethics of Computing
Credit Value	3
Level	3
Pre-requisite / Co-requisite / Exclusion	
Objectives	The objectives of this subject are to: 1. be fully aware of the basic set of legal, ethical and security responsibilities; 2. introduce relevant professional bodies and be able to apply codes of conduct and ethical standards as a computing/IT practitioner; and 3. be in a position to deal with ethical dilemmas and legal challenges that they can expect to face when they start work.
Intended Learning Outcomes	**Upon completion of the subject, students will be able to**: Category A: Professional/academic knowledge and skills 1. demonstrate a basic understanding of professional issues, including contemporary legislation, and ethical considerations, from the viewpoint of computing/IT professionals; 2. apply the conceptual tools provided in the course to develop analytical skills for determining what to do in ethical and legal decision-making; Category B: Attributes for all-roundedness 3. communicate effectively both verbally and in writing as a professional in computing/IT; 4. develop the basic skills to work independently to solve routine problems; and 5. think and reason critically, especially on different issues related to computing/IT professional in society.
Subject Synopsis/ Indicative Syllabus	**Topic** **1. Introduction** A brief account of the development of computing/IT industry; exploration of computing technologies whose impact is likely to grow in the near future. **2. Computer Ethics and Profession** Generic skills; typical scenarios of profession; characteristics of a profession; the system of professions; the computing profession; social issues. **3. Professional Bodies and Codes of Ethics** Role and functions of professional bodies; professional bodies for computing/IT practitioners; Impact of computing/IT professional bodies. **4. Methods and Tools for Ethical Analysis** Traditional/philosophical ethics; policy vacuum; social context; competing factors in decision making; practical approach/ analysis; sample cases. **5. Computer Crimes and Laws** Computer criminals; computer fraud; computer sabotage; computer forensics. **6. Privacy** Personal privacy; computer and privacy; relevant privacy acts. **7. Software Ownership and Intellectual Property** Ethical/legal issues of software; intellectual property; property rights; legal protection; philosophical basis; consequentialist argument. **8. Security** Fundamental concepts about security, Security at e-commerce, Security and legislation.

	9. Entrepreneurship Emerging technologies; entrepreneurship in computing profession; professional capabilities extended through virtual firms.
Teaching/ Learning Methodology	This subject emphasises both ethical and legal aspects of computing/IT professional. It is intended to provide students with knowledge and practical experience on ethical, technological and legal issues related to computing. Lectures would cover the conceptual aspects. Guest lectures with external speakers provide students with knowledge from another perspective. Laboratory and tutorial sessions focus on the exercises to gain understanding both of what being a professional in computing involves and how they can most effectively deal with the challenges they will encounter.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		1	2	3	4	5
Continuous Assessment	**100%**					
Assignment		✓	✓	✓	✓	✓
Tests		✓	✓		✓	✓
Projects		✓	✓	✓	✓	✓
Presentations		✓	✓	✓		✓
Examination	**0%**					
Total	100%					

Student Study Effort Expected

Class contact:	
▪ Lectures	39 Hours
▪ Tutorials/Lab	0 Hours
Other student study effort:	
▪ Assignments, Quizzes, Projects, and Tests	66 Hours
Total student study effort	105 Hours

Reading List and References

Reference Books:

1. Herman T. Tavani, *Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing,* 3rd Edition, Wiley, Hoboken, N.J., 2011.
2. Deborah G. Johnson and Keith W. Miller, *Computer Ethics: Analyzing Information Technology*, 4th Edition, Prentice Hall, Upper Saddle River, N.J, 2009.
3. Tobias Kollmann, Andreas Kuckertz, Christoph Stèockmann (2010) E-Entrepreneurship and ICT Ventures: Strategy, Organization and Technology, Hershey, PA: Business Science Reference. 2010.
4. Thomas N. Duening, Robert D. Hisrich, Michael A. Lechter, *Technology Entrepreneurship: Creating, Capturing, and Protecting Value*, Academic Press, Burlington, MA, 2010.
5. D. G. Johnson, *Computer Ethics*, 4th Edition, Prentice Hall, 2009.
6. M. J. Quinn, *Ethics for the Information Age*, Addison Wesley, 2013.

Last Updated	Jun 2022
Prepared by	COMP

Subject Description Form

Subject Code	EIE3101
Subject Title	Computer Animation
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	This course aims at training students to master the basic principles, knowledge, and skills about computer animation. While pure theoretical discussion is avoided, this subject addresses practical issues and provides accessible techniques for straightforward implementations.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. describe the animation production pipeline 2. develop all the written and visual materials necessary for the production of computer animations 3. manage files and workflow needed in the animation production pipeline 4. discuss and implement dynamics simulations 5. discuss a variety of animation techniques and apply them to actual animation production Category B: Attributes for all-roundedness 6. understand the creative process when designing solutions to a problem
Subject Synopsis/ Indicative Syllabus	INTRODUCTION • The Production Process of Computer Animation MODELING • Modeling Concepts • Modeling Techniques RENDERING • The Camera • Lighting • Shading and Surface Characteristics ANIMATION AND EFFECTS • Computer Animation Techniques • Dynamics Simulations
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. Tutorial, Laboratory and assignments: During tutorial/laboratory sessions, 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 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	5	6
1. Continuous Assessment (total: 100%)							
• Homework and assignments	35%	✓	✓	✓	✓	✓	✓
• Tests	50%	✓	✓	✓	✓	✓	✓
• Laboratory exercises	15%		✓	✓	✓	✓	✓
Total	100%						

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.

Tests: They assess students' achievement of the learning outcomes in a more formal manner.

Student Study Effort Expected		
	Class contact (time-tabled):	
	• Lecture/Tutorial	30 Hours
	• Laboratory	9 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 Book:

1. Kelly L. Murdock, *Autodesk 3ds Max 2017 Complete Reference Guide*, SDC Publications, 2016.
2. Rick Parent, *Autodesk 3ds Max 2017 for Beginners: A Tutorial Approach*, 17th ed., CADCIM Technologies, 2016.
3. Isaac Kerlow, *The art of 3D computer animation and effects*, 4th ed., Hoboken, N.J.: John Wiley & Sons, 2009.

Last Updated	July 2017
Prepared by	Dr Pauli Lai

Subject Description Form

Subject Code	EIE3103
Subject Title	Digital Signals and Systems
Credit Value	3
Level	3
Pre-requisite	EIE2106 Signal and System Analysis or EIE2108 Fundamentals of Internet and Multimedia Technologies
Co-requisite/ Exclusion	Nil
Objectives	1. To provide students with basic concepts and techniques for the modelling and analysis of 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 digital signals and systems. 2. Understand the modelling of linear discrete-time systems. 3. Use different techniques to analyze and design discrete-time systems. 4. Apply software tools to laboratory exercises for experimenting with theories, and to the analysis and design of discrete-time systems. 5. Appreciate the advantages and disadvantages of using the different representations and modelling approaches. Category B: Attributes for all-roundedness 6. Present ideas and findings effectively.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Fourier Representations for Discrete-time Signals Mathematical Description of Discrete-Time Signals. Discrete Fourier Series. Discrete-Time Fourier Transform. Discrete Fourier Transform. Relationship Among Various Fourier Transforms. 2. Discrete-Time Systems Time-Domain Analysis of Discrete-Time Systems. Unit pulse response. Difference Equation Representation. Convolution. 3. System Analysis Frequency Response of LTI Discrete-Time Systems. Concept of Filtering: Lowpass, Bandpass and Highpass Filters. FIR Filters and IIR Filters. Linear and Circular Convolution. FIR Filter Analysis. Filtering Examples to Different Signals. 4. z-Transform Definition and Properties of z-Transform. Inverse z-Transform: Power Series Expansion, Partial-Fraction Expansion. z-Transfer Analysis of LTI Systems. 5. Filter design FIR filter design using windows, FIR design by frequency sampling, etc. **Laboratory Experiments:** 1. Linear Time-Invariant Discrete-time Systems 2. Fourier Analysis of Discrete-time Signals 3. Convolution and Correlation 4. Application of Digital Filters

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	These are supplementary to lectures; 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	Students will make use of the software MATLAB and/or LabView to simulate 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
1. Continuous Assessment	50%						
• Laboratory sessions	14%				✓		✓
• Short quizzes	18%	✓	✓	✓		✓	
• Tests	18%	✓	✓	✓		✓	✓
2. Examination	50%	✓	✓	✓		✓	✓
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.
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	Oral examination based on the laboratory exercises will be conducted to evaluate student's 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	**References:** 1. M.J. Roberts, *Fundamentals of Signals & Systems,* McGraw-Hill, 2008. 2. James H. McClellan, Ronald W. Schafer and Mark A. Yoder, *DSP First: A Multimedia Approach,* Prentice-Hall, 1999.	
Last Updated	January 2018	
Prepared by	Dr Chris Chan	

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.

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.

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: 50%)					
• Homework and assignments	15%	✓	✓	✓	✓
• Tests	15%	✓	✓	✓	
• Laboratory exercises	20%			✓	✓
2. Examination	50%	✓	✓	✓	✓
Total	100%				

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.

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. 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	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	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	EIE3360
Subject Title	Integrated Project
Credit Value	3
Level	3
Pre-requisite	ENG2002 Computer Programming
Co-requisite/ Exclusion	Nil
Objectives	At a mid-stage of the programme, this subject plays the role of applying knowledge acquired in other subjects in an integrated manner. While the emphasis will be placed on the technical challenges that may encompass system integration, software development and troubleshooting, students will also be given opportunities to face various non-technical difficulties behind the development of multimedia/information systems.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Design effective and reliable software programs to achieve the objectives of a project. 2. Critically evaluate the different alternatives and strategies when implementing a project. 3. Apply higher-order thinking skills and knowledge from other subjects in an integrated manner to implement a project. Category B: Attributes for all-roundedness 4. Self-improvement in the context of interpersonal skills and recognising life-learning. 5. Plan, manage and evaluate the learning in pursuit of self-determined goals. 6. Present ideas and findings effectively. 7. Work in a team and collaborate effectively with others.
Subject Synopsis/ Indicative Syllabus	**Syllabus / Operation:** The project(s) shall be of software development in nature with defined milestones (or **Subtasks**). The scope will include multimedia and network system design but does not exclude the possibilities of extending into areas such as computer animation or image processing. Students need to work in groups of two or three. **Each Subtask** needs to complete in a certain period. **Functional Demonstrations** and **Progress Reports** measure the project. Upon completing the project, each group needs to have a demonstration/presentation of the completed system and submit a **Final Report**. Students are required to individually keep a **Logbook** on the work performed during the entire period. The logbooks are to be evaluated on a more frequent basis. At the end of the project, the logbooks will be collected and graded. **Lectures:** Lectures are to be conducted at the beginning of the semester. During these lectures, the instructor shall give clear explanation on the functional and technical requirements, with a schedule for submitting deliverables. Concepts specific to the project(s), which are not yet learnt by the students, are to be covered in these lectures. Concepts behind critical use of tools and equipment will also be strengthened. Copies of supplementary/reference material will be distributed, or, links to on-line material will be provided for self-paced learning.

Guided In-class Exercises/Tutorials/ /Laboratory Experiments:

The project requires the students to learn to use specific tools and/or equipment. The demonstrations and exercises will be arranged in the early weeks. Below are some examples:

1. Use of project-specific development tools, software and hardware.
2. Implementation of the basic framework of the project.
3. Software techniques to optimize the performance of the system.

Self-Paced Work:

Multiple tutorials and laboratory sessions will be scheduled to cater to self-paced work in the laboratory to ensure the students are working in a correct direction and defined milestones are given in the course of their work. Students are required to demonstrate their works at each milestone to show their progress.

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3	1. Principles and key concepts of the multimedia platform used in the project are explained to students. Uses of tools are demonstrated. 2. The goals are specified. The various problems to be encountered are explained.
Tutorial/In-class exercises	2, 3	1. Students review the basic knowledge of object-oriented programming. 2. Students will learn **basic C#** programming to build a simple application.
Laboratory	2, 3	1. Students will learn to use the provided software modules and expand them to accommodate new functionalities. 2. Students will develop a software controller to trigger the event handler. 3. Students need to present ideas and findings through the reports.
Extended self-paced laboratory work	2, 3, 4, 5, 6, 7	Students need to work in teams of two or three to construct a multimedia application. They learn to use the provided software modules and expand them to accommodate new functionalities.
Logbooks	5	Students describe the project progress through the logbooks.
Project Proposal	1, 2, 6, 7	1. Students present ideas and evaluate the different

			alternatives to compose the project proposal. 2. Students work as a team to collaborate on the project idea.
	Preliminary Project Demo	3, 4, 6, 7	Students need to illustrate the project progress through the preliminary demo.
	Final Project Demo	3, 4, 6, 7	Students demonstrate the final application and indicate the project achievement.
	Final Report	1, 5, 6, 7	Students require to present the findings, resources management, project achievement, workload distribution, and resolved problems in the final report.
	Peer Review	5, 6, 7	Students need to evaluate teammates' performance during preliminary and final project demonstrations using the teamwork performance system.

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%							
• Tutorials/in-class exercises	10%		✓	✓				
• Lab exercises/demo and reports	10%		✓	✓				
• Project proposal, final report and project presentation	25%	✓	✓			✓	✓	✓
• Preliminary demonstrations	15%			✓	✓	✓	✓	
• Final demonstrations	30%			✓	✓	✓	✓	
• Logbooks and peer review	10%					✓	✓	✓
Total	100%							

Assessment on individual student's ability and contribution will be conducted, according to the attributes detailed below.

INSIGHT	as evidenced by how well the concepts are understood
CREATIVITY	as evidenced by ingenuity and imagination
WORKMANSHIP	as evidenced by how well ideas are implemented and how problems are resolved
DRIVE	as evidenced by initiative, diligence and tenacity
COMMUNICATION	as evidenced by an ability to express ideas clearly and succinctly
MANAGEMENT	as evidenced by how time, manpower and other resources are effectively used

At the completion of each subtask, team members need to have demonstrations with the assessor. Based on the presentation and response to questions addressed to the members, the assessor will rate each member's contribution, achievement, and performance.

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

Specific Assessment Methods/Tasks	**Remark**
Lab Reports	To measure the students' understanding of the theories and concepts as well as some practical issues in their subject materials.
Preliminary and Final Demonstrations	1. Students need to think critically and creatively to come up with reasonable alternate solutions for an existing problem. 2. Each group member will have an oral examination of the approach taken to evaluate his/her contributions, technical knowledge and communication skills.
Proposal, Logbook, Reports and Peer Review	1. Each group of students is required to produce a project proposal and a final report. 2. Each group needs to explain the solutions in both proposal and the final report to describe how the limited resources are used in the project, how the team members work together to achieve the project goal, and why the reason behind choosing such solutions. 3. Logbooks **and peer review** are assessed to evaluate contributions and the quality of records on the progress.

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	12 Hours
	• Tutorial and Laboratory	12 Hours
	• Mini-project presentation / demonstrations	12 Hours
	Other student study effort:	
	• Revision	12 Hours
	• Additional laboratory work	12 Hours
	• Mini-project work / presentation / proposal and report writing	45 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Books:** *To be specified by the subject lecturer for each project.*	
Last Updated	June 2022	
Prepared by	Dr Doris Lin	

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	SD3985 (for 42477)
Subject Title	Computer Game Development
Credit Value	3
Level	3
Pre-requisite	ENG2002 Computer Programming
Co-requisite/ Exclusion	Nil
Objectives	• To provide a broad overview of fundamental elements and concepts in computer games design and development, and in their production process • To provide students with hands-on experience in designing and developing a computer game
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Design, analyze, implement and evaluate computer games 2. Appreciate computer games' designs and complexities 3. Demonstrate understanding of game production process through developing a computer game in a team starting from ideas 4. Demonstrate understanding of technical components in realizing a 2D game Category B: Attitudes of all-roundedness 5. Collaborate, organize and communicate with others in effective team work 6. Realize the interdisciplinary nature in computer games development and appreciate importance of collaboration 7. Be creative and critical to game and play design
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Game Design Overview History of computer games, types of computer games (video, console, arcade, hand-held, wireless, mobile); game genres; play mechanics; game rules; game progression; game balancing: obstacle/aid, penalties/rewards,; board game, role-playing game; interface design, information design, human-computer interaction design; integration of visual , audio, tactile and textual elements; visual design: composition, lighting and colour, graphics design; Audio design: music, sound effects; storytelling; game theory 2. Media and Tools Game arts; tools and standards of media: image and audio 3. Game Production Process Evaluating game concepts; game design documentation, storyboard, playtest; content creation, team roles, group dynamics, risk assessment; software engineering, project management; prototyping, iterative development; pre-production, production, testing 4. Game Programming Game loop; game engine architecture; event processing; state machine; physics and collision detection; networking

Teaching/ Learning Methodology

This subject will engage students by:

1. Lectures which introduce students with basic concepts in game design and essential elements in a game design document. Assignments are given to students for them to analyze essential elements in a simple game and write a game design document to describe the game.
2. Lectures which introduce basic technical components in 2D game programming, and laboratory sessions for them to implement these technical components in 2D game programming. Students are required to complete a number of tasks corresponding to these essential technical components in each lab, which serve as basis for students to realize their 2D games in their mini-project.
3. Students form a group to work on a mini-project to design and realize a playable game from ideas to demonstrate their understanding in the entire game production process.

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								
• Written assignment	10%	✓	✓					
• Laboratory	35%				✓			
• Mini-project	55%	✓	✓	✓	✓	✓	✓	✓
Total	100%							

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

Written assignments are given to students for them to analyze essential elements of a computer game and to understand format of a game design document.

Laboratories are organized to let students to learn and practice basic technical components in realizing a 2D computer game. Each student is required to complete predefined tasks according to lab sheet for a number of laboratory sessions.

Students form groups of at most three members to work on a mini-project, in which each group creates a game starting from ideas till a playable game. During the project period, each group is required to submit assignments corresponding to different stage of the game development process. At the end of the project, each group is required to demonstrate their game and present their whole project to the class.

Student Study Effort Expected

Class contact (time-tabled):	
• Lecture/Tutorial	15 Hours
• Laboratory	24 Hours
Other student study effort:	
• Mini-project	65 Hours
• Assignment	6 Hours
Total student study effort:	**110 Hours**

Reading List and References	**Reference books:** 1. R. Koster, *A Theory of fun for game design.* O'Reilly, 2nd Edition, 2013. 2. K. Salen and E. Zimmerman, *Rules of Play: Game Design Fundamental*, 2004. 3. K. Oxland, *Gameplay and Design*, Addison-Wesley, 2004. 4. Crawford, *The Art of Computer Game Design*, 1982. Available from https://www.digitpress.com/library/books/book_art_of_computer_game_ design.pdf 5. H.M. Chandler, *The Game Production Handbook*, Infinity Science Press, 3rd edition, 2014. 6. F.D. Laramee, *Game Design Perspectives*, Charles River Media, 2002. 7. D. Saffer, *Designing for Interaction: Creating Smart Applications and Clever Devices,* News Riders, 2007. 8. J.S. Lewinski, *Developer's guide to Computer Game Design*, WordWare Publishing Inc, 2000. 9. A. Rollings and D. Morris, *Game Architecture and Design*, New Riders Publishing, 2004. 10. E. Bethke, *Game Development and Production*, WordWare Publishing Inc, 2003. 11. D. Michael, *The Indie Game Development Survival Guide*, Charles River Media, 2003.
Last Updated	July 2018
Prepared by	School of Design

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

	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.

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%	✓	✓	✓		
• Laboratories/Mini-Project	14%		✓	✓	✓	✓
• Mid-Term Test	14%	✓	✓	✓	✓	
• End-of-Term Test	14%	✓	✓	✓	✓	
2. Examination	50%	✓	✓	✓	✓	
Total	100%					

Student Study Effort Expected	**Class contact (time-tabled):**	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Mini-Project	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. D.P. Agrawal and Q. Zeng, *Introduction to Wireless and Mobile Systems*, 4th ed., Cengage Learning, 2016.	
Last Updated	July 2020	
Prepared by	Dr K.T. Lo	

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	EIE4121
Subject Title	Machine Learning in Cyber-security
Credit Value	3
Level	4
Pre-requisite	Nil
Co-requisite/ Exclusion	Nil
Objectives	1. To introduce concepts about machine learning techniques in cyber-security 2. To develop skills of using recent techniques for solving practical problems in cyber-security
Intended Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand different machine learning techniques 2. Use different techniques for solving problems in cyber security Category B: Attributes for all-roundedness 3. Present ideas and findings effectively
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Machine learning techniques Introduction to machine learning; Basic concepts and classification; Supervised learning and unsupervised learning; classification; clustering; Neural Networks; Support vector machines; Dimensionality reduction; Deep learning 2. Machine learning development environments Software tools for implementing machine learning techniques; Generalization performance; Issues of over-fitting. 3. Malware Analysis Introduction to malware analysis; Types of malware analysis; static analysis, dynamic analysis; Behavioral vs code analysis; Use of machine learning techniques for malware detection such as K-Means, support vector machines, convolutional neural networks. 4. Phishing detection Introduction to phishing detection; Analysis of email/websites/message features for phishing characterization; Use of techniques such as logistic regression and decision tree for phishing detection. 5. Anomaly Detection Introduction to the anomaly definition; overview of anomaly detection techniques; static rules technique; use of machine learning techniques such as autoencoder for anomaly detection. **Laboratory Experiments:** Practical Works: 1. Introduction to machine learning framework 2. Evaluation of machine learning techniques in malware detection 3. Evaluation of machine learning techniques in phishing detection

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 machine learning techniques.
Mini-project	1, 2, 3	Students are required to study the use of machine learning techniques in cyber-security application. Students will need to submit a written report and make a presentation.

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. Continuous Assessment (total 50%)				
• Tests	18%	√	√	
• Laboratory sessions	13%		√	√
• Mini-project	19%		√	√
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	These can measure students' understanding of the theories and concepts as well as their comprehension of subject materials.
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	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	26 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	40 Hours
	Total student study effort:	**105 Hours**
Reading List and References	1. Thomas Tony, Athira P. Vijayaraghavan, Sabu Emmanuel, "Machine learning approaches in cyber security analytics", Springer, 2020. 2. Padmavathi Ganapathi and D. Shanmugapriya, "Handbook of Research on Machine and Deep Learning Application for Cyber security", IGI Global, 2020. 3. Mark Stamp, Introduction to Machine Learning with Applications in Information Security, Chapman and Hall/CRC, 2017. 4. Chiheb Chebbi, Mastering Machine Learning for Penetration Testing, Packt Publishing Ltd, 2018. 5. Monnappa K A, Learning Malware Analysis, Packt Publishing Ltd, 2018. 6. Dipanjan Sarkar, Raghav Bali and Tushar Sharma, Practical Machine Learning with Python, Apress, 2018.	
Last Updated	June 2021	
Prepared by	Bonnie Law	

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

	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
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. 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.
Assessment Methods in Alignment with Intended Subject Learning Outcomes	<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.

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	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%					

<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>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;
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 / mini-projects</td><td>each group of students are 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/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>
<tr><td>Reading List and References</td><td colspan="2">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.</td></tr>
<tr><td>Last Updated</td><td colspan="2">July 2020</td></tr>
<tr><td>Prepared by</td><td colspan="2">Dr K.T. Lo</td></tr>
</table>

Subject Description Form

Subject Code	EIE4430
Subject Title	Honours Project
Credit Value	6
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	Students will be most benefited from doing projects in order to have the chance to practise hands-on application of the knowledge the student has learned through the curriculum, while producing something useful or valuable. On this ground, the Honours Project (also called Final-Year Project or FYP in short) component in the curriculum is designed that meets the following objectives: 1. To provide the opportunity to the students to apply what they have learned in previous stages in a real-life technological problem 2. To enable the student to acquire and practise project management skills and discipline on pursuing the Honours Project 3. To enable the student to apply knowledge in internet and multimedia technologies to analyse problems and synthesize solutions while considering various practical constraints.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the background, requirements, objectives, and deliverables to be produced for the specific project 2. Apply knowledge and skills relevant to internet and multimedia technologies 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 Category B: Attributes for all-roundedness 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 collaboratively with others (team-partners, outsource company, technical support staff, etc.) 7. Realize different constraints, and to make appropriate compromise, when creatively designing the solution to a technical problem.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** The progression of the project will consist of the following stages: Project Specification 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 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 student 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 student 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

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, and knowledge and skills learned can be retained and transferred. The following elements will be important as evidence of 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 the student's achievement will be documented in the log book and reports submitted in various stages. The student will be required to give a presentation and demonstration so that he/she can communicate with other parties about the project achievement.

Student Study Effort Expected

Class contact (time-tabled):	
• Structured study	52 Hours
• Meeting with project supervisor (1 hours per week)	26 Hours
Other student study effort:	
• Project development and guided study	102 Hours
• Reports writing, preparing for presentation and demonstration	30 Hours
Total student study effort:	**210 Hours**

Reading List and References	**Reference Books:** *To be specified by the project supervisor for each project.*
Last Updated	June 2015
Prepared by	Dr Frank Leung

Subject Description Form

Subject Code	EIE4431
Subject Title	Digital Video Production and Broadcasting
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject provides a broad knowledge of digital video production and broadcasting.
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 digital video systems with emphasis on production and broadcasting. 2. Work with digital video editing tools. 3. Understand the system design principles of video broadcasting. 4. Design simple systems related to video broadcasting. 5. Facilitate for further development in advanced digital video production and broadcasting. Category B: Attributes for all-roundedness. 6. Learn independently.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction to Video Production and Broadcasting Elements of a video production and broadcasting system. Video services in Hong Kong. Video production and broadcasting standards and current development. 2. Fundamental of Video Production Production process, pre-production, production and post-production. Digital video editing. 3. Video Production Equipment Digital camera and video camera, image sensors, sensor architectures. 4. Fundamental of Digital Video Coding Digital video representation, digital video compression, intraframe coding, motion estimation and compensation. 5. Fundamental of Digital Video Broadcasting Digital video coding standards and video codecs – MPEG-2, H.264, HEVC, VP9 and AV1. Video transport layer. Transmission layer. 6. Transport Protocol for Digital Video Data encapsulation, multiplexing and de-multiplexing. Transmission protocols: packet structure: Program Association Table (PAT), Program Map Table (PMT) and Conditional Access Table (CAT), MPEG-2 Transport Stream (MPEG-2 TS), MPEG-2 Program Stream (MPEG-2 PS). Conditional access for digital TV. Real-time Transport Protocol (RTP)

7. Error Control for Digital Video
   Quality of service requirements for video communications. Error resilience and concealment techniques for digital video.

8. Digital Video Broadcasting Techniques and Standards
   Channel coding for error control in digital TV, block and convolution codes, concatenated coding in digital TV. Digital modulation, different modulation schemes – APSK, BPSK, QPSK, QAM, Coded Orthogonal Frequency Division Multiplexing.

9. Internet Protocol Television (IPTV) and Over-the-Top (OTT) TV
   IPTV versus OTT. Video streaming over the Internet. Content Delivery Network (CDN), OTT platform, OTT business operation, OTT advertising.

Laboratory Experiments:

1. Digital video editing – Basic tools and visual effects
2. Digital video editing – Layering and keying clips
3. Digital video coding for broadcasting systems

Teaching/ Learning Methodology

Teaching and Learning Method	**Intended Subject Learning Outcome**	**Remarks**
Lectures	1, 3, 4, 5, 6	fundamental principles and key concepts of the subject are delivered to students
Tutorials	1, 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	2, 6	students will make use of digital video editing 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**	**6**
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 group of students are 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 group member to evaluate his 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. Sanjoy Paul, *Digital Video Distribution in Broadband, Television, Mobile and Converged Networks: Trends, Challenges and Solutions*, Wiley, 2011

2. U. Reimers, *DVB: The Family of International Standards for Digital Video Broadcasting*, Springer, 2005.

3. Vijay K. Adhikari, Yang Guo, Fang Hao, Volker Hilt, Zhi-Li Zhang, Matteo Varvello, and Moritz Steiner, "Measurement Study of Netflix, Hulu, and a Tale of Three CDNs" IEEE Transactions on Networking, pp.1984-1997 vol. 23, no. 6, Dec. 2015

Last Updated	July 2020
Prepared by	Dr Y.L. Chan

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.

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

	Specific Assessment Methods/Tasks	**Remark**
	Tests, quiz	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, Project	oral examination based on the laboratory exercises will be conducted to evaluate student's 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	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. 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.	
Last Updated	July 2020	
Prepared by	Dr Ye Qingqing	

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.

<table>
<tr><td></td><td colspan="2"><table>
<tr><td>Laboratory sessions</td><td>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.</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/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>
<tr><td>Reading List and References</td><td colspan="2">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.</td></tr>
<tr><td>Last Updated</td><td colspan="2">January 2018</td></tr>
<tr><td>Prepared by</td><td colspan="2">Dr Chris Chan</td></tr>
</table>

Subject Description Form

Subject Code	SD4981 (for 42477)
Subject Title	Computer Game Development Project
Credit Value	6
Level	4
Pre-requisite	SD3985 Computer Game Development
Co-requisite/ Exclusion	Nil
Objectives	1. To introduce students with fundamental concepts and algorithms in developing 3D computer game. 2. To provide students with hands-on experience in designing, implementing and evaluating 3D computer game.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Professional/academic knowledge and skills 1. Identify essential building blocks in 3D computer games 2. Understand, analyze, implement and evaluate algorithms in developing 3D computer games 3. Realize trends in real-time algorithms in advanced 3D computer games 4. Explore new algorithms for future 3D computer games 5. Demonstrate understanding of game production process through developing a 3D computer game in a team starting from ideas Attitudes of all-roundedness 6. Collaborate, organize and communicate with others in effective team work 7. Realize the interdisciplinary nature in 3D computer games development and appreciate importance of collaboration 8. Be creative and critical to game and play design
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction Game production pipeline, 3D game engine, architecture and components. 2. Graphics and Rendering Graphics rendering pipeline; 3D hardware: programmable graphics pipeline, shading languages, procedural shading, lighting, effects; scene management; visibility processing, resource management; 3D modelling, skeleton, texturing and materials, animation; digital content creation tools 3. Audio 3D and multi-channel audio; modelling for effects, echo. 4. Physics Physics basic concepts; kinematics, kinetics, dynamics; Newton's laws, mass, moment of inertia, friction, force; constrained motion; particle systems; physics engine 5. Artificial intelligence Path planning; agent architecture; decision-making systems; genre-specific AI (FPS, RTS, RPG, racing and sport AI), behavioural modelling, artificial life. 6. Network Multiplayer game architecture, networking, protocols, topologies, security, database; online game systems. **Laboratory Experiment:** 3D modelling software, using different modules in game engine

<table>
<tr><td>Teaching/ Learning Methodology</td><td>

Lectures which introduce basic technical components in 3D game programming, including architecture of 3D game engine, and algorithms and trends in their future developments. Students are required to study a new algorithm and study its implications in 3D game design and development.
Students are required to complete a number of tasks corresponding to those essential technical components in laboratory sessions, which serve as basis for students to realize their 3D games in their mini-project.
Students form a group to work on a project to design, implement and evaluate a playable game from ideas to demonstrate their understanding in the entire game production process.

</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Subject Learning Outcomes</td><td>
<table>
<tr><th rowspan="2">Specific Assessment Methods/ Task</th><th rowspan="2">% Weighting</th><th colspan="8">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><th>6</th><th>7</th><th>8</th></tr>
<tr><td>Continuous Assessment</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>• Written Assignment</td><td>5%</td><td></td><td></td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>• Laboratory</td><td>15%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>• Project</td><td>80%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="8"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Written assignment is given to students for them to study new algorithms in 3D computer game and understand their implications in 3D game design and development.

Laboratories are organized to let students to learn and practice basic technical components in a 3D game engine for realizing a 3D game. Each student is required to complete a predefined task according to a lab sheet for each laboratory session. There are also advanced tasks which require them to explore associated knowledge and techniques.

Students form groups of at most three members to work on a mini-project, in which each group creates an original playable game from idea, and evaluate with intended players. During the project period, each group is required to submit assignments corresponding to different stage of the game development process. At the end of the project, each group is required to demonstrate their game and present their whole project to the class.
</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</td><td>48 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>• Project</td><td>136 Hours</td></tr>
<tr><td>• Assignment</td><td>6 Hours</td></tr>
<tr><td>Total student study effort:</td><td>220 Hours</td></tr>
</table>
</td></tr>
</table>

Reading List and References	**Reference Books:** 1. T. Moller, *Real-Time Rendering,* A.K. Peters, *3rd editio*n, 2008. 2. J.D. Foley, *Computer Graphics: Principles and Practice*, Addison-Wesley, 3rd edition, 2014. 3. Watt, *3D Games: Real-time Rendering and Software Technology*, Addison-Wesley, 2001. 4. J. Gregory. *Game Engine Architecture,* CRC Press, *2nd edition*, 2014. 5. R. Parent, *Computer Animation: Algorithms and Techniques,* Morgan Kaufmann, *3rd edition*, 2012. 6. D.H. Eberly, *Game Physics,* Elsevier, *2nd edition,* 2010 7. M. Haigh-Hutchinson, Real-time Cameras: A guide for game designers and developers. Morgan Kaufman, 2009. 8. I. Milington, J.D. Funge, Artificial Intelligence for games, Morgan Kaufmann/Elsevier, 2nd edition, 2009. 9. K.C. Finney, 3D game programming all in one, Course Technology PTR, 3rd edition, 2013. 10. J. Darby, Wizards and Warriors: Massively Multiplayer Online Game Creation, Cengage Learning, 2012. 11. B. Schwab, AI game engine programming, Course Technology, 2nd edition, 2009.
Last Updated	July 2018
Prepared by	School of Design

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 2022/23 Onward

All candidates qualifying for a 2-year Full-time Senior Year 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 (Majors and Minors), 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 Cluster Area 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