BEng (Hons) in Electrical Engineering
2022 – 2023

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

Bachelor of Engineering (Honours) in Electrical Engineering

Full-time

Programme Code : 41470-SY

PROGRAMME REQUIREMENT DOCUMENT

Department of Electrical Engineering
電機工程學系

Bachelor of Engineering (Honours) in Electrical Engineering (Senior Year)

Bachelor of Engineering (Honours) in Electrical Engineering

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This Programme Requirement Document (PRD) is subject to review and changes which the programme offering Faculty/Department can decide to make from time to time. Students will be informed of the changes as and when appropriate.

1 Preamble

The overarching aim of the University's 4-year undergraduate curriculum is to nurture and develop students with abilities/attributes that will prepare them to become preferred leaders for the professions and responsible global citizens in the 21st century.

The 4-year Bachelor of Engineering (Honours) in Electrical Engineering (BEng in EE) is a major electrical engineering degree programme in Hong Kong. It addresses the manpower demand of the electrical engineering profession, with particular emphasis on power systems, energy utilisation and related disciplines. This programme complies with the new university curriculum framework, which features a broad-based curriculum, emphasising on fundamentals, provision of opportunities for multidisciplinary studies, freshman experience, enhanced communication skills, work-integrated education, capstone project, and outcome-based education. At the same time, the programme addresses the societal need for a new generation of competent electrical engineers who can practise in their profession in Hong Kong, Mainland China, and the neighbouring regions.

2 General Information

2.1 Programme Title

Bachelor of Engineering (Honours) in Electrical Engineering
電機工程學(榮譽)工學士學位

2.2 Duration and Mode of Attendance

Mode	Normal Duration
Full-time	2 years*

* The exact study duration depends on the entry qualification of individual Associate Degree / Higher Diploma admittees.

2.3 Final Award

The award is Bachelor of Engineering (Honours) in Electrical Engineering and it carries no speciality or stream.

2.4 External Recognition

The BEng (Hons) in Electrical Engineering programme has been internally validated by the University. The programme has been granted full accreditation by The Hong Kong Institution of Engineers (HKIE).

2.5 Implementation Dates

September 2012 (Initial implementation)

2.6 Minimum Entrance Requirements

Candidates who hold a Higher Diploma or Associate Degree in a relevant discipline or equivalent qualifications will be eligible to apply for the programme.

2.7 Study Options

Minor and Secondary Major options are not available for Senior Year intake students.

2.8 Summer Training / Industrial Placement

Summer Training at the Industrial Centre (IC) and practical work experience in industry are the vital components to meet the programme outcomes. The training/industrial placement is credit-bearing and compulsory in the programme, constituting the Work-Integrated Education (WIE) activities as stipulated by the University. Details of the required credits, structure and assessment of the WIE and IC training are given in Sections 4.6 and 4.7.

2.9 Student Exchange Programme

Student exchange to overseas universities for a semester or an academic year is possible through various exchange schemes organised by the University or individual departments. Students are encouraged to participate so as to enhance their learning experience.

Block credit transfer may be given to exchange-out students. However, in order to ensure attaining pre-requisite knowledge for smooth integration of study, students will be consulted on subject selections in the visiting universities before leaving for the exchange.

2.10 Summer Term Teaching

Usually, there will be no summer term teaching on engineering subjects. Industrial Centre Training and external training will take place during the summers.

2.11 Daytime and Evening Teaching

Subjects will be offered predominantly during the daytime. Some subjects, particularly the advanced elective subjects, may be available only in the evenings or on Saturdays.

2.12 Medium of Instruction

English is the medium of instruction (the only exceptions are for a small number of programmes/subjects which have received special approval to be taught and examined in Chinese due to the nature and objectives of the programmes/subjects concerned).

In the presence of non-Cantonese-speaking students, English should be used all the time.

3 Aims and Rationale

3.1 Programme Philosophy

The programme aims to provide the students with a sound education in electrical engineering and furnish an opportunity for detailed study in a choice of related specialist areas. The programme is designed to nurture electrical engineers who will be able to practise their profession worldwide while being particularly competent to do so in the context of Hong Kong and Mainland China.

Modern engineers are often required to undertake different activities and may face promotion or placement in the course of their career development. The programme thus aims to prepare graduates for their entire working life rather than only for their first jobs. Emphasis is therefore placed on the understanding of fundamental concepts and theories which will always be applicable and valid. The teaching of technologies or modern tools which may have a shorter duration of applicability cannot be neglected either, but it is important not to emphasise training at the expense of education.

More and more industrial employers wish to recruit engineers who have a broad-based education as well as adequate professional knowledge to undertake detailed technical work in design and production. Therefore, the programme is also designed to provide training to our students who could develop a thorough understanding of electrical engineering, and acquire a broad and general appreciation of activities in other related disciplines. The students are guided to learn the interfaces between specialist engineering areas and be prepared to work in a multidisciplinary work environment which usually involves colleagues from other engineering backgrounds.

Students should aware that ‘a good engineering solution’ is one which has to fulfil economic, financial, and social criteria as well as to comply with engineering design specifications. This necessitates the inclusion of the study of economics, accounting and management with particular reference to engineering activities, as well as the inter-relations between engineering activities and society as a whole.

Language competence of students is strengthened through the English and Chinese subjects stipulated in the General University Requirements (GUR), and is further enhanced by discipline specific subjects. The teaching approach adopted in the curriculum, which involves lectures, seminars, discussions, in-class feedback, assessed presentations, demonstration of project work and written laboratory reports, aims to improve students’ verbal and written communication skills.

It is important to train and educate our students not only in cognitive ability in technical areas but also lifelong skills. Hence, students are exposed to situations where they can:

(i) develop their intellectual abilities (creative thinking, critical/independent judgement making, ability to analyse and synthesize, and to cope with real-life conditions such as indeterminacy, lack of information and time pressure); and

(ii) develop their social abilities (ethics, personal and public relations, team work, responsibility/authority, etc.).

Students are provided with training at the Industrial Centre (IC) so that they learn the applications of engineering technologies. They are also required to undertake industrial attachment, which gives them exposure to the real industrial working environment.

3.2 Programme Objectives

(i) To provide students with a broad base of knowledge in the fundamentals of electrical engineering and its current applications.

(ii) To prepare students for working life including the skills needed for lifelong learning.

(iii) To produce engineers with the understanding of their obligations to society.

3.3 Programme Outcomes

Programme outcomes refer to the intellectual abilities, knowledge, skills and attributes that a graduate from this programme should possess. To attain the aim of developing all-round students with professional competence, the programme outcome statements are encompassed in the following two categories of learning outcomes.

Category A: Professional/Academic Knowledge and Skills

Upon successful completion of the programme, students will be able to:

A1 Apply fundamental principles of mathematics, science and engineering to identify, formulate and solve practical problems in the areas of electrical engineering and related disciplines.

A2 Design and conduct experiments with appropriate techniques and tools; and interpret and analyse the data.

A3 Design a system, component or process according to given specifications and requirements in the areas of electrical engineering and related disciplines.

A4 Identify constraints, other than technical considerations, which may influence engineering problems, systems or projects.

A5 Keep abreast of developments in electrical engineering and related disciplines and be aware of the need of lifelong learning.

A6 Appreciate and understand the ethical, managerial and social responsibilities of a professional engineer.

Category B: Attributes for All-roundedness

Upon successful completion of the programme, students will be able to:

B1 Communicate effectively via graphic, numeric, verbal and written media with proficiency in both English and Chinese.

B2 Reason critically and develop alternative views or solutions.

B3 Work in multi-disciplinary teams with professional interpersonal skills.

The Programme Outcomes are in line with the Programme objectives and the mapping is shown in Table 3.3.1.

		Programme Objectives		
		(i)	(ii)	(iii)
Programme Outcomes	A1	√		
	A2	√		
	A3	√		
	A4	√	√	
	A5		√	
	A6		√	√
	B1	√		
	B2	√		
	B3		√	√

Table 3.3.1 Mapping between Programme Objectives and Programme Outcomes

The Subject Learning Outcomes are designed to be in alignment with the Programme Outcomes. The Subject Learning Outcomes are given in each subject and they can be found in the Subject Description Form (SDF) in Appendix I.

The programme and subject outcomes will be assessed in stages according to a Learning Outcomes Assessment Plan (LOAP) adopted by the Departmental Learning and Teaching Committee.

Relationship between Institutional Learning Outcomes and Intended Learning Outcomes (ILO) of the programme is shown in Table 3.3.2.

		Institutional Learning Outcomes						
		Competent Professional	Critical Thinker	Innovative Problem Solver	Effective Communicator	Lifelong Learner	Ethical Leader	Socially Responsible Global Citizen
Programme Outcomes	A1	√		√				
	A2	√	√					
	A3	√		√				
	A4	√	√					√
	A5	√				√		√
	A6	√					√	√
	B1				√			
	B2		√	√				
	B3	√			√			√

Table 3.3.2 Relationship between Institutional Learning Outcomes and Intended Learning Outcomes (ILO) of the programme

4 Curriculum

4.1 Summary of University Graduation Requirements

To be eligible for an Articulation Degree award under the 4-year full-time undergraduate curriculum, a student must:

(i) Complete successfully a minimum of 61 academic credits[1] and 11 training credits;

(i) Earn a cumulative GPA of 1.70 or above at graduation;

(ii) Complete successfully the mandatory Work-Integrated Education (WIE) component;

(iii) Satisfy the following GUR requirements:

(a) Language and Communication Requirements[2]	This is normally not required[3]
(b) Service-Learning	3 credits
(c) Cluster Areas Requirement (CAR)	6 credits [3 credits from CAR(A)[4] and 3 credits from CAR(M)]
(d) Essential Components of General[5]	Non-credit bearing
Total	***9 credits***

(iv) Satisfy the residential requirement for at least one-third of the credits required for the award; and

(v) Satisfy all requirements as defined and/or stipulated in the Programme Requirement Document and as specified by the University.

There are subjects which are designed to fulfil the credit requirement of different types of subjects. Students passing these subjects will be regarded as having fulfilled the credit requirements of the particular types of subjects concerned. Nevertheless, the subject passed will only be counted once in fulfilling the credit requirements of the award, and the students will be required to take another subject in order to meet the total credit requirement of the programme concerned.

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1 This minimum only applies to students who are admitted through the normal route.

2 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.

3 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.

4 Students are required to take a specially designed CAR(A) – English Language Subject with embedded English Reading and Writing Requirements starting from 2022/23.

5 The Essential Components of General Education includes four modules namely Academic Integrity; AI and Data Analytics; Innovation and Entrepreneurship; and National Education.

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.

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. For example, some students in an engineering programme are required to take 10 credits of underpinning subjects in Mathematics, whilst others in the programme are required to take 6 credits of underpinning subjects in Mathematics. Only 6 credits will be recognized for counting towards the regular credit requirement of the programme. The extra 4 credits taken by some students will be counted outside the regular credit requirement.

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

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 61 credits in order to be eligible for a Bachelor's degree. Exemption may be given from subjects already taken in the previous Associate Degree/Higher Diploma studies. In that case, students should take other electives (including free electives) instead to make up the total of 61 credits required. For students who are exceptionally admitted before 2017/18 on the basis of academic qualification(s) more advanced than Associate Degree/Higher Diploma[6], such as the advanced stage of a 4-year degree curriculum programme, Departments can continue to grant credit transfer as appropriate, so as to give recognition to the advanced study taken, and these students can take fewer than 61 credits for attaining the award. The proportion of these students should remain low. As from the 2017/18 intake cohort, all students admitted to an Articulation Degree or Senior Year curriculum, irrespective of the entry qualifications they held when applying for admission to the programmes, are required to complete at least 61 credits to be eligible for award.

A student is required to graduate as soon as he/she satisfies the graduation requirements as stipulated 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.

[6] 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.

4.2 General University Requirements (GUR)

(i) 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 4.2.1). 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).

English language competence level	**Practical English for University Studies (ELC1011)**	**English for University Studies (ELC1013)**	**Any LCR Proficient level elective subject in English (Table 4.2.2)**
HKDSE Level 3 or equivalent	Subject 1	Subject 2	-
HKDSE Level 4 and above or equivalent	-	Subject 1	Subject 2

Table 4.2.1 English LCR Subjects (3 credits each)

LCR Proficient level elective subjects	Advanced English for University Studies (ELC2014)
	Advanced English Reading and Writing Skills (ELC2011)
	English in Literature and Film (ELC2013)
	Persuasive Communication (ELC2012)

Table 4.2.2 Proficient level elective subjects for HKDSE Level 4 students and above (or equivalent) (3 credits each)

* 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. For the subject exempted, students must take any other subject to make up the 3 credits. For the subject granted credit transfer, student do not need to take any other subject to make up the credits.

Chinese

All undergraduate students must successfully complete one* 3-credit Chinese language subject as stipulated by the University, according to their Chinese language proficiency level (Table 4.2.3).

Cantonese will be used as the Medium of Instruction (MoI) of a certain proportion of Chinese LCR subject. Students taking the Cantonese version of the subjects will be offered a 39 hour non-credit bearing e-Learning course in Putonghua (optional)

Categories of students	Required subject
For Chinese speaking students	University Chinese (Cantonese or Putonghua version) (CLC1104C/CLC1104P)
For non-Chinese speakers or students whose Chinese standards are at junior secondary level or below	One subject from Table 4.2.4 below

Table 4.2.3 Chinese LCR Subjects (3 credits each)

Subject	Pre-requisite/exclusion
Chinese I (for non-Chinese speaking students) (CLC1151)	For non-Chinese speaking students at beginners' level
Chinese II (for non-Chinese speaking students) (CLC1152)	• For non-Chinese speaking students; and • Students who have completed Chinese I or equivalent
Chinese III (for non-Chinese speaking students) (CLC2151)	• 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) (CLC2154)	• 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) (CLC2152)	For non-Chinese speaking students at higher competence levels

Table 4.2.4 Chinese LCR Subjects for non-Chinese speakers or students whose Chinese standards are at junior secondary level or below (3 credits each)

* Students entering the University with specified attainment grades in certain public examinations can be given credit transfer or exemption for the LCR Chinese subjects. For the subject exempted, students must take any other subject to make up the 3 credits. For the subject granted credit transfer, student do not need to take any other subject to make up the credits.

Writing Requirement

In addition to the LCR in English and Chinese explained above, all students must also, among the Cluster Areas Requirement (CAR) subjects they take (see section (iii) 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

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 and the Reading Requirement is shown at: https://www.polyu.edu.hk/ous/GURSubjects/

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 Chinese LCR subject to fulfil their Chinese LCR.

For those Senior Year intake students who do not meet the equivalent standard of the Undergraduate Degree LCR (based on their previous studies in AD/HD programme and their academic performance) will be required to take degree LCR subjects on top of the normal curriculum requirement.

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

(ii) Service-Learning

All students must successfully complete one 3-credit subject designated to meet the Service-Learning Requirement, in which they are required to (a) participate in substantial community service or civic engagement activities that will benefit the service users or the community at large in a meaningful way, (b) apply the knowledge and skills acquired from their Major or other learning experiences at the University to the community service activities, and (c) 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) with 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 total credit requirement.

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

(iii) Cluster Areas Requirements (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 subjects in different Cluster Cluster Areas of CAR:

- CAR (A): Human Nature, Relations and Development
- CAR (D): Science, Technology and Environment
- CAR (M): Chinese History and Culture
- CAR (N): Cultures, Organisations, Societies and Globalisation

All Senior year intakes students must complete one specially-designed CAR (A) – English Language subject (with embedded English Reading and Writing Requirements) within the first year of study), and one CAR (M) subject, and fulfil the Chinese Reading and Writing Requirements.

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

(iv) Essential Components of General Education

To allow Senior Year intakes students to acquire the basic knowledge of the following:

- Academic Integrity
- Artificial Intelligence and Data Analytics (AIDA)
- Innovation and Entrepreneurship (IE)
- National Education

All Senior Year intakes students are required to take "Essential Components of General Education", and complete and pass the individual e-modules of the four components within the first year of study (Semesters 1 and 2). The "Online Tutorial on Academic Integrity" should be completed by Week 5 of Semester 1.

Details of the Essential Components of General Education is available at https://www.polyu.edu.hk/ous/GURSubjects/ECGESYS.php.

4.3 Discipline Specific Requirements (DSR)

A student in the 4-year BEng (Hons) in Electrical Engineering programme should complete 94 credits of discipline-specific requirements (DSR) as detailed below:

(i) Common underpinning subjects (12 credits)

The following subjects must be taken:

AMA1110	Basic Mathematics I – Calculus and Probability & Statistics (3)
AMA1120	Basic Mathematics II – Calculus and Linear algebra (3)
AP10005	Physics I (3)
AP10006	Physics II (3)
	12 credits

Table 4.3.1

(ii) Common DSR subjects (28 credits)

The following DSR subjects of the Faculty of Engineering must be taken:

AF3625	Engineering Economics (3)
AMA2111	Mathematics I (3)
AMA2112	Mathematics II (3)
CLC3241P	Professional Communication in Chinese* (2)
ELC3531	Professional Communication in English for Engineering Students (2)
ENG2001	Fundamentals of Materials Science and Engineering/Biology/Chemistry[#] (3)
ENG2002	Computer Programming (3)
ENG2003	Information Technology (3)
ENG3003	Engineering Management (3)
ENG3004	Society and the Engineer (3)
	28 credits

Table 4.3.2

* Students who are non-Chinese speakers or those whose Chinese standard are at junior secondary level or below will be exempted from the Discipline-Specific Chinese Language requirement. Students of this category can take a replacement subject of any level to make up for credit requirement.

[#] Students may choose one subject from (a) to (f) listed below:

Engineering Materials:	(a) ENG2001 Fundamentals of Materials Science and Engineering
Biology^:	(b) ABCT1101/ABCT1D04 Introductory Life Science
	(c) ABCT1303/ABCT1D03 Biotechnology and Human Health
	(d) BME11101/BME1D01 Bionic Human and the Future of Being Human
Chemistry^:	(e) ABCT1301/ABCT1D01 Chemistry and Modern Living
	(f) ABCT1314/ABCT1D14 Chemistry and Sustainable Development

^ Double fulfilment of DSR and CAR: Students choosing any one subject in the "Biology" and "Chemistry" areas, you will have the subject double-counted towards the fulfilment of both the Discipline Specific Requirement (DSR) and CAR D (Science, Technology and Environment). You are required to choose any 3-credit EE subject (from Level 1 to Level 4) to make up for the total credit requirement.

(iii) DSR subjects in Electrical Engineering discipline (54 credits)

The following DSR subjects in Electrical Engineering must be taken:

	Level 2
EE2001	Applied Electromagnetics (3)
EE2002	Circuit Analysis (3)
EE2003	Electronics (3)
EE2004	Electrical Energy Systems Fundamentals (3)
	12 credits
	Level 3
EE3001	Analogue and Digital Circuits (3)
EE3002	Electromechanical Energy Conversion (3)
EE3003	Power Electronics and Drives (3)
EE3004	Power Transmission and Distribution (3)
EE3005	Systems and Control (3)
EE3006	Analysis Methods for Engineers (3)
	18 credits
	Any two Level-3 electives
EE3007	Computer System Principles (3)
EE3008	Linear Systems and Signal Processing (3)
EE3009	Electrical Services in Buildings (3)
	6 credits
	Level 4
	Any two Level-4 electives
EE4003	Electrical Machines (3)
EE4004	Power Systems (3)
EE4007	Advanced Power Electronics (3)
	6 credits
EE4006	Individual Project (6)
EE4xxx	Advanced Elective 1 (3)
EE4xxx	Advanced Elective 2 (3)
	12 credits

Table 4.3.3

4.4 Progression Pattern for Senior Year Students

Total Credits Required for Graduation: 61 academic credits + 11 training credits

The progression pattern in Table 4.4.1 is recommended for Senior Year Students[@].

Year 1 (31 academic credits + 8 training credits)			
Semester 1 (15 credits + 2 training credits)		**Semester 2** (16 credits + 2 training credits)	
EE2001	Applied Electromagnetics (3)	AF3625	Engineering Economics (3)
EE3001	Analogue and Digital Circuits (3)	CLC3241P	Professional Communication in Chinese (2)
EE3005	Systems and Control (3)	EE3004	Power Transmission and Distribution (3)
ENG2001	Fundamentals of Materials Science and Engineering/ Chemistry/ Biology[#] (3)	EE3006	Analysis Methods for Engineers (3)
CAR A – English Language	one Cluster Area Requirement subject in CAR A - English Language (3)	ELC3531	Professional Communication in English for Engineering Students (2)
		ENG2003	Information Technology (3)
EE2101 Engineering Communication and Fundamentals (4 training credits)			
EE1Q01 Essential Components of General Education (non-credit bearing)			
Semester 3: EE2102 IC Training I (EE) (4 training credits)			
Year 2 (30 academic credits + 3 training credits)			
Semester 1 (13.5 – 16.5 credits)		**Semester 2** (13.5 – 16.5 credits)	
ENG3003	Engineering Management (3)	ENG3004	Society and the Engineer (3)
Two Level-4 electives should be taken		*Two advanced electives~ from Table 4.4.2 and One CAR subject should be in Year 4*	
EE4003	Electrical Machines (3)	Advanced Elective (EE) 1 (3)	
EE4004	Power Systems (3)	Advanced Elective (EE) 2 (3)	
EE4007	Advanced Power Electronics (3)	CAR M	one Cluster Area Requirement subject in CAR M (3)
EE4006 Individual Project (6 credits)			
Service-Learning[+] (3 credits)			
Semester 3: EE3010 Summer Practical Training (3 training credits)			

Table 4.4.1

@ The exact study pattern for senior year intakes varies from student to student depending on the number of subject approved for credit transfer.

Students may choose one subject from (a) to (f) listed below:

Engineering Materials:	(a) ENG2001 Fundamentals of Materials Science and Engineering
Biology^:	(b) ABCT1101/ABCT1D04 Introductory Life Science
	(c) ABCT1303/ABCT1D03 Biotechnology and Human Health
	(d) BME11101/BME1D01 Bionic Human and the Future of Being Human
Chemistry^:	(e) ABCT1301/ABCT1D01 Chemistry and Modern Living
	(f) ABCT1314/ABCT1D14 Chemistry and Sustainable Development

^ Double fulfilment of DSR and CAR: Students choosing any one subject in the "Biology" and "Chemistry" areas, you will have the subject double-counted towards the fulfilment of both the Discipline Specific Requirement (DSR) and CAR D (Science, Technology and Environment). You are required to choose any 3-credit EE subject (from Level 1 to Level 4) to make up for the total credit requirement.

+ Students are encouraged to take this subject at an earlier stage of study.

~ Out of the two Advanced Electives taken in Year 2, at least one should be an EE subject. The Department reserves the right NOT offering all the electives in each year.

Note 1 This is an example only which shows a possible study pattern for graduates with relevant Higher Diploma/Associate Degree from a recognized institution. The exact study pattern for senior year intakes varies from student to student depending on the number of subject approved for credit transfer.

Note 2 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.

List of Advanced Elective (EE)~ *(Students shoud seek prior approval for enrolling on Level 5 EE subjects.)*	
EE4003	Electrical Machines
EE4004	Power Systems
EE4007	Advanced Power Electronics
EE4008	Applied Digital Control
EE4012	Intelligent Buildings
EE4014	Intelligent Systems Applications in Electrical Engineering
EE4024	Industrial Computer Applications
EE502	Modern Protection Methods
EE505	Power System Control and Operation
EE509	High Voltage Engineering
EE512	Electric Vehicles
EE514	Real Time Computing
EE520	Intelligent Motion Systems
EE521	Industrial Power Electronics
EE522	Optical Fibre Systems
EE524	Open Electricity Market Operation
EE526	Power System Analysis and Dynamics
EE528	System Modelling and Optimal Control
EE530	Electrical Energy Saving Systems
EE545	Modern Generation and Grid Integration Technologies
EE546	Electric Energy Storage and New Energy Sources for Electric Vehicles
EE547	Electric Vehicle Charging Systems
EE548	Advanced Electric Vehicle technology
EE549	Modern Sensor Technologies
AF5107	Accounting for Engineers
BSE463	Design of Mechanical Systems in Buildings
CSE40462	Environmental Impact Assessment – Theory and Practice
CSE516	Urban Transport Planning – Theory and Practice
ENG4001	Project Management
ISE404	Total Quality Management
MM4522	China Business Management

Table 4.4.2

~ Out of the two Advanced Electives taken in Year 2, at least one should be an EE subject. The Department reserves the right NOT offering all the electives in each year.

4.5 Subjects Support to Programme Outcomes

Table 4.5 illustrates how the subjects support the Programme Outcomes through teaching activities, practice on the part of students, and measurements.

Subjects	Programme Outcomes								
	A1	A2	A3	A4	A5	A6	B1	B2	B3
AF3625				√	√	√	√	√	√
AF5107				√	√	√	√	√	√
AMA1110	√			√				√	
AMA1120	√			√				√	
AMA2111	√			√				√	
AMA2112	√			√				√	
AP10005	√							√	
AP10006	√							√	
BSE463	√		√	√	√			√	
CLC1104C/P					√		√		
CLC3241P					√		√		
CSE40462	√			√	√	√	√	√	
CSE516	√		√	√	√	√	√	√	
EE2001	√		√		√		√		√
EE2002	√	√		√				√	
EE2003	√	√		√				√	
EE2004	√	√		√				√	
EE2101		√	√	√		√	√		
EE2102		√	√	√		√	√		
EE3001	√	√	√	√		√	√	√	
EE3002	√	√					√		
EE3003	√	√					√		√
EE3004	√	√	√	√	√		√	√	
EE3005	√		√				√		
EE3006	√		√		√		√		√
EE3007	√	√	√				√		√
EE3008	√	√					√		
EE3009	√			√			√	√	
EE3010	√			√	√	√		√	
EE4003	√		√	√	√		√		√
EE4004	√	√					√	√	
EE4006		√	√	√	√	√	√	√	√
EE4007	√		√	√	√		√		√
EE4008	√		√				√		
EE4012	√		√				√	√	
EE4014	√	√					√	√	√
EE4024	√		√		√		√		

Subjects	Programme Outcomes								
	A1	A2	A3	A4	A5	A6	B1	B2	B3
EE502	√				√				
EE505	√	√					√	√	
EE509	√	√	√	√	√		√	√	
EE512	√		√		√		√	√	
EE514	√	√	√						
EE520	√		√				√		
EE521	√		√	√	√		√		√
EE522	√	√	√	√				√	
EE524	√			√	√		√		
EE526	√	√							
EE528	√		√		√		√		√
EE530	√		√	√	√		√	√	√
EE545			√	√		√			
EE546	√				√		√	√	
EE547	√	√	√	√	√		√	√	
EE548	√				√		√	√	
EE549	√	√			√				
ELC1011					√		√		
ELC1013					√		√		
ELC2011					√		√		
ELC2012					√		√		
ELC2013					√		√		
ELC2014					√		√		
ELC3531					√		√		
ENG2001	√			√				√	
ENG2002	√		√					√	
ENG2003	√		√	√	√			√	
ENG3003				√	√	√	√	√	
ENG3004				√	√	√	√		√
ENG4001				√		√	√	√	
ISE404			√	√		√		√	
MM4522						√	√	√	
CAR subjects					√	√	√		
Service-Learning			√	√	√	√	√		√

Table 4.5 Support of programme outcomes by individual subjects

4.6 Work-Integrated Education and Summer Practical Training

Work-Integrated Education (WIE) is defined as a structured and measurable learning experience which takes place in an organisational context relevant to a student's future profession. It aims to prepare students for the realities of workplaces, develop students' ability to learn in non-academic surroundings, allow students to assess their own strengths and weaknesses in a realistic working settings and develop students' critical thinking and problem solving capabilities.

Summer Practical Training (EE3010) normally takes place during the summer at the end of Year Three. Students are required to undertake a minimum of 6 weeks full-time or equivalent industrial training (3 training credits), of which is valid for WIE activities as recognised by the University.

WIE activities may include placement, employment or attachment relevant to the context, knowledge and skills of the Programme. The Job Board arranged by the Student Affairs Office (SAO) of the University is one of the main sources of placement opportunities for local students and students from Mainland China and overseas. The WIE activities may or may not involve any payment. Any payment by employers is completely at the employers' discretion. Typical examples of WIE activities are as follows:

- Full-time placement in a suitable organisation for 6 weeks.
- Assisting in PolyU activities that have an external collaboration or service component, such as Innovation and Technology Fund projects, Rapid Product Development Syndicate projects, Industrial Guided Applied Research and Development projects, high-level consultancy projects, collaborative research projects undertaken with external organisations, and jobs undertaken by the Industrial Centre as a service for an external organisation.
- Placement within the IAESTE (International Association for the Exchange of Students for Technical Experience) Programme, in which the student is attached to a workplace abroad during training.
- Students work on their final-year degree project, which involves an industrial partner or external client. The student need not be placed in the company, but will make frequent visits to ensure the project meets with the specifications required by the company.

In order to ensure that students have useful experience, the summer practical training must be suitably chosen and properly organised. Students are required to indicate the expected learning outcomes prior to the commencement of their placement, as well as to submit a report on the learning outcomes and achievements.

Accordingly, the following learning support activities will be coordinated.

(i) Orientation

Students should start their preparatory work by the commencement of the second semester usually at their third-year of study. An orientation will be provided for the following:

- Basic skills in undertaking practical training
- Planning and scheduling for successful completion of assessment instruments
- Information on searching national/international work-base employment, attachments etc.

(ii) Progress Monitoring

During the training period, students should maintain a training journal to record their progress. The journal may include:

- Location: Summarise where practical training took place and where the work team fits into the overall host organisation.
- Responsibilities: Describe the actual responsibilities. Explain the role in terms of the mission of the immediate work team.
- Skills and Knowledge: Describe the skills and knowledge needed to fulfill the work responsibilities. Describe how the knowledge and skill set evolved during the work experiences. Explain how these are relevant to the academic studies and future goals.
- Outcome: Describe the placement experiences and major achievements with concrete examples.

(iii) Learning Evaluation

After the completion of practical training, students are required to submit a report about their work experience. It provides an opportunity for the student to reflect upon the learning gained at the work site. The framework of the report includes:

- A summary of the report.
- Detail description of activities carried out during the placement, minimum 6 pages.
- A self-reflection: students articulate their thinking about each piece in the report, as well as on the entire report. Through this process of reflection, students draw connections between work experience and university-based learning, construct new knowledge, and become increasingly aware of themselves as learners.
- Conclusion: after reflection on their workplace experience, students set goals and directions for future learning.

4.7 Industrial Centre (IC) Training

Besides the WIE training components, students are required to undertake training at the Industrial Centre (IC), which is equivalent to 8 training credits. The training is scheduled within Year One and at the end of Year Two. Students will not pay any training fee, nor receive any stipend. IC training is however not part of WIE activities.

4.8 Language Enhancement Subjects

All students are strongly encouraged to make full use of the facilities and services provided in the ELC and CLC to improve their language proficiency throughout the programme.

5 Management and Operation

5.1 Administration

The daily operation of the programme, such as general administration of admission, registrations, student records, preparation for Board of Examiners meetings and documentations, is overseen by the Programme Leader and the administrative team of the Department. All enquiries regarding registration and general administration from students on the programme should be made to the General Office as the first contact point.

The Departmental Undergraduate Programmes Committee, in which the Head of Department and the Programme Leaders of all programmes offered by the Department are members, discusses and reviews the programme structure, syllabi content, high-level integration and future directions of the programme. The Departmental Learning and Teaching Committee advises on matters related to teaching methods and learning quality and cultivates the positive mentality toward teaching and learning among teaching staff and students. WIE/Career Liaison Officer and Student-Exchange Coordinator are appointed by the Department to provide students with advice and assistance.

5.2 Academic Advisors

While the Programme Leader is available for the operation of the programme, general enquiry and counselling, Academic Advisors are in place to offer more personal contacts and to look after students' needs.

The Academic Advisors, usually an academic staff member, is assigned to each newly admitted student and he/she will be with the students till graduation. Academic Advisors provide continuous and individual counselling and help guide the students through various difficulties, if any, which might affect their studies. A specific staff member from the General Office will work closely with the Programme Leaders and the Academic Advisors. All academic requirements and regulations related to academic programmes offered by the department as well as the GUR requirements will be provided to the students.

6 Academic Regulations on Admission, Registration and Assessment

The admission, registration and assessment arrangements described below are in accordance with the University policies and regulations for all 4-year full-time undergraduate degree programmes and articulation degree programmes.

6.1 Admission

Students in UGC-funded degree programmes will be recruited on a yearly basis.

6.2 Re-admission

Students who have been required to withdraw on grounds of academic failure or have been de-registered, and those who have discontinued their studies without completing the proper procedures for official withdrawal, shall not be considered for re-admission to the same scheme/programme/stream in the following academic year.

6.3 Transfer of study within the University

Students who have not completed their programmes of study may apply to transfer to another programme, and may be admitted, provided that the total period of registration will not exceed the normal duration of the original or new study programme, whichever is longer. Unless exceptionally approved by Academic Planning and Regulations Committee (APRC) Chairman, year one new students will only be considered for transfer to another programme offered in the same mode of study, starting from their second semester of registration.

Students who are currently on a UGC-funded programme and wish to transfer to another PolyU full-time UGC-funded programme of the same level should submit an application for transfer of study, instead of a new application in the non-JUPAS application period.

All applications for transfer of study will be considered in competition with other new applications.

6.4 Concurrent Enrolment

Students are not permitted to enrol concurrently on two full-time programmes, whether or not one of the programmes is offered by another institution.

Except for programmes which do not lead to any formal award, students are not allowed to enrol concurrently on a full-time programme and a part-time programme, or on more than one part-time programmes, including those offered by another institution, without permission from the Head(s) of Department concerned.

6.5 Normal Duration for Completion of the Programme

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.

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/Deans of Independent School. Applications for extension of study period beyond one year and up to two years will require the approval from Faculty/School Board Chairman.

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.

To enable student sportsmen to manage their participation in trainings/competitions and academic studies, the normal duration for completion of programmes for students admitted via the OSRS will automatically be extended for two years. Further extension will follow the prevailing regulations.

6.6 Validity Period of Subject Credits

The validity period of subject credits earned is eight years from the year of attainment, i.e., the year in which the subject is completed. Credits earned from previous study should remain valid at the time when the student applies for credit transfer.

6.7 Residential Requirement

In order to be considered for a PolyU award, a student must complete at least 1/3 of the normal credit requirement for the award he/she is currently enrolled, unless the professional bodies concerned stipulate otherwise. This 1/3 requirement is also applicable to Minor programme and Secondary Major. Students must take at least 6 credits from their chosen Minor programme or at least 12 credits from their chosen Secondary Major in order to satisfy the residential requirement of their chosen Minor or Secondary Major.

6.8 Subject Registration and Withdrawal

In addition to programme registration, students need to register for the subjects at specified periods prior to the commencement of the semester. An add/drop period will also be scheduled for each semester/term. Students may apply for withdrawal of their registration on a subject after the add/drop period and before the commencement of the examination 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 Applications submitted after the commencement of the examination period will not be considered. For approved applications of subject withdrawal, the tuition fee paid for the subject will be forfeited and the withdrawal status of the subject will be shown in the assessment result notification and transcript of studies, but will not be counted in the calculation of the GPA.

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.

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 broadening purpose, after they fulfil the graduation requirements and for the following semester. 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, and their enrolment will be arranged 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.

6.9 Study Load

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 Requirement Document, for each semester. Students cannot drop those subjects assigned by the department unless prior approval has been given by the department.

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 programme offering department. For such cases, students should be reminded that the study load approved should not be taken as the grounds for academic appeal.

To help improve the academic performance of students on academic probation, 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 by the students varies according to the policies of individual Departments and will be subject to the approval of the authorities concerned.

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 programme offering department; otherwise they will be classified as having unofficially withdrawn from their 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 (or maximum period of registration for students admitted in or before 2019/20).

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.

6.10 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 which are 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 meeting the award requirements. 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.

6.11 Credit Transfer

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.

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 which are 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.

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.

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 61 credits in order to be eligible for a Bachelor’s award.

Credit transfer can be applicable to credits earned by students through study 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 on their study plan and credit transferability. In order to overcome the problems associated with subject-to-subject mappings, block credit transfer rather than subject-by-subject credit transfer can be given.

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.

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

Students should 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/her current programme.

6.12 Deferment of Study

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 (or maximum period of registration for students admitted in or before 2019/20).

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.

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.

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

6.13 General Assessment Regulations

Students' progress by credit accumulation, i.e., credits earned by passing individual subjects can be accumulated and counted towards the final award.

A 'level' in a programme indicates the intellectual demand placed upon students and may characterise each subject with respect to its recommended sequencing within that programme. Upper level subjects should normally build on lower level subjects. Pre-requisite requirements, if any, must therefore be spelt out on a subject basis.

A 'subject' is defined as a discrete section of the programme which is assigned a separate assessment. A list of subjects, together with their level and weightings, shall be published in the Programme Requirement Document.

The following is the Subject Level code adopted by the University:

Level Code		***Explanation***
0	=	Pre-university level standard (and remedial subjects taken by new admittees to a 4-year degree programme, or some subjects offered to Higher Diploma students only)
1	=	Some subject intended learning outcomes are at the exit level for Associate Degree/Higher Diploma; intended to be taken during year 1 of a 4-year degree programme or year 1 of an Associate Degree/Higher Diploma programme; usually have no pre-requisite.
2	=	The majority of the subject intended learning outcomes are at the exit level for Associate Degree/Higher Diploma; intended to be taken during year 2 of a 4-year degree programme or the final year of an Associate Degree/Higher Diploma programme; some subjects at this level may have pre-requisites.
3	=	Some subject intended learning outcomes are at the exit level for Bachelor's degree while the rest at the exit level for Associate Degree/Higher Diploma; intended to be taken during year 3 of a 4-year degree programme; usually require the completion of subjects at the preceding levels as a pre-requisite.
4	=	The majority of the subject intended learning outcomes are at the exit level for Bachelor's degree while the rest at the exit level for Associate Degree/Higher Diploma; intended to be taken during the final year of a 4-year degree programme; usually require the completion of subjects at the preceding levels as a pre-requisite.
5	=	The majority of the subject intended learning outcomes are at the Master's level while the rest at the Bachelor's level.
6	=	The majority of the subject intended learning outcomes are at the Doctoral level while the rest at the Master's level.

The language of assessment for all programmes/subjects shall be English, unless approval is given for it to be otherwise.

6.14 Principles of Assessment

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 should be designed for this purpose. The assessment methods will also enable the teacher to differentiate students' different levels of performance within the subject. Assessment *for* learning is to engage students in productive learning activities through purposefully designed assessment tasks.

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

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 APRC and reported to the Senate as necessary.

6.15 Assessment Methods

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 shall be clearly stated in the Programme Requirement Document. 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) shall be specified in the Programme Requirement Document. Learning outcome should be assessed by continuous assessment and/or examination appropriately, in line with the outcome-based approach.

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.

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

At the beginning of each semester, the subject teacher should inform students of the details of the methods of assessments to be used, within the assessment framework as specified in the Programme Requirement Document.

6.16 Progression / Academic Probation / Deregistration

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), 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.

When a student has a Grade Point Average (GPA) 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 the semester, the status of "academic probation" will be lifted. The status of "academic probation" will be reflected in the assessment result notification but not in the transcript of studies.

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

(i) the student has exceeded the maximum period of registration for that programme, as specified in the Programme Requirement Document (applicable to students admitted in or before 2019/20); or

(ii) the student has reached the final year of the normal period of registration for that programme, as specified in the Programme Requirement Document, unless approval has been given for extension (applicable to students admitted in or after 2020/21); or

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

(iv) 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

(v) 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 (ii) with approval for extension, the Board of Examiners shall de-register the student from the programme without exception.

A student may be de-registered from the programme enrolled before the time frame specified at (iv) or (v) 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.

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.

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.

6.17 Retaking of Subjects

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.

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

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.[7]

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

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

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.

6.18 Absence from an assessment component

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/School Board Chairman shall decide on an appropriate time for completion of the late assessment.

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 or the subject teacher concerned, in consultation with the Programme Leader.

[7] In these 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.

6.19 Assessment to be completed

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.

6.20 Aegrotat Award

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.

A student who has been offered an aegrotat award shall have the right to opt either to 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.

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

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.

6.21 Grading

Assessment grades shall be awarded on a criterion-referenced basis. A student's overall performance in a subject shall be graded as follows from 2020/21 onwards≝:

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+

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

The grade points assigned to subject grades attained by students before 2020/21 are as follows:

Grade	***Grade Point for grades attained before 2020/21***
A+	4.5
A	4.0
B+	3.5
B	3.0
C+	2.5
C	2.0
D+	1.5
D	1.0
F	0.0

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

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

where N = number of all subjects (inclusive of failed subjects) taken by the student up to and including the latest semester/term. 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[8]

(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.

All training credits[9] will be counted in the GPA calculation but not in the WGPA calculation.

[8] Subjects taken in the University or elsewhere and with grades assigned, and for which credit transfer has been approved, will be included in the GPA calculation.

[9] "Training credits" is used as a generic term only, and also includes clinical/field credits for programmes in different study disciplines. Laboratory experiments done as a subject/an integral part of a subject to satisfy the academic requirements is not considered to be practical training.

Codes to Denote Overall Subject Assessments

Codes	Interpretation	Remarks
I^	Assessment to be completed	An incomplete grade must be converted to a regular grade normally in the following academic year at the latest.
N	Assessment is not required	—
P	Pass an ungraded subject	This code applies to an ungraded subject, such as industrial training.
U	Fail an ungraded subject	This code applies to an ungraded subject, such as industrial training.
M	Pass with Merit	The adoption or otherwise of this code to other subjects adopting a "Pass/Fail" grading system would be subject to the decision of individual Departments. The grade "Pass with Merit" can be awarded when the student's work exceeds the subject learning outcomes in the majority of regards.
L	Subject to be continued in the following semester	This code applies to subjects like “Project" which may consist of more than 1 part (denoted by the same subject code) and for which continuous assessment is deemed appropriate.
S	Absent from all assessment components	—
W	Withdrawn from subject	Dropping of subjects after the add/drop period is normally not allowed. Requests for withdrawal from subjects after the add/drop period and prior to examination will only be considered under exceptional circumstances. This code is given when a student has obtained exceptional approval from Department to withdraw from a subject after the "add/drop" period and prior to examination; otherwise, a failure grade (grade F) should be awarded.
Z	Exempted	—
T	Transfer of credit	—
#△	Disqualification of result due to academic dishonesty/non-compliance with examination regulations	This code applies to failure (i.e., F and U grades) arising from disqualification of subject result due to academic dishonesty/non-compliance with examination regulations. The code will be removed subsequently when the student leaves the University.
%+	Disqualification of result due to academic dishonesty	This code applies to failure (i.e., F and U grades) arising from disqualification of subject result due to academic dishonesty. The code will be removed subsequently when the student leaves the University.
@+	Disqualification of result due to non-compliance with examination regulations	This code applies to failure (i.e., F and U grades) arising from disqualification of subject result due to non-compliance with examination regulations. The code will be removed subsequently when the student leaves the University.

^ For cases where students fail marginally in one of the components within a subject, the BoE can defer making a final decision until the students concerned have completed the necessary remedial work to the satisfaction of the subject examiner(s). The students can be assigned an ' I ' code in this circumstance. The remedial work must not take the form of re-examination.

△ For cases before 2019/20.

+ For cases from 2019/20.

Note: Subjects with the assigned codes I, N, P, U, M, L, W, Z and T (if the subject is without grade transferred) will be omitted in the calculation of the GPA. A subject assigned code S will be taken as zero in the calculation.

6.22 Different types of GPA

GPA's 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.

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.

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 which a student will likely get if he/she makes steady progress on his/her academic studies.

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

For students taking the Major/Minor study route, a separate GPA will be calculated for their Major and Minor programmes. The Major GPA will be used to determine their award classification, which will be so reflected on the award parchment. The Minor GPA can be used as a reference for Board of Examiners to moderate the award classification for the Major.

For students taking the Major/Secondary Major study route, there is no separate “Secondary Major GPA”. The Major GPA is the weighted GPA of all subjects contributing to the Major and Secondary Major.

The calculation methods of the different types of GPA are further explained in the table below.

Types of GPA	***Purpose***	***Rules for GPA calculation***
GPA	Determine Progression/ Graduation	(1) All academic subjects taken by the student throughout his/her study, both inside and outside the programme curriculum, are included in the GPA calculation. (2) For training subjects, including WIE and Clinical/Field subjects, departments can decide whether to include them in the GPA calculation. (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) Departments can decide whether the training subjects are to 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 and 4 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.

Types of GPA	***Purpose***	***Rules for GPA calculation***
Major/Minor GPA	For reference and determination of award classification	*Major (including the Major/Secondary Major option) /Minor GPA* (1) Only subjects inside the curriculum of the Major/Minor Programmes will be taken in the Major/Minor GPA calculation. (2) Departments can decide whether the training subjects, are to be counted towards the Major/Minor GPA. (3) For retake subjects, only the last attempt will be taken in the Major/Minor GPA calculation. (4) Up to 6 credits from the Major/GUR [including Language Communication Requirements (LCR) subjects at proficiency level] can be counted towards the chosen Minor. Nevertheless, students must take at least 6 credits from their chosen Minor programme in order to satisfy the residential requirement of their chosen Minor. In addition, to be eligible for the Major and Minor awards, the total number of credits taken by the students for their Major-Minor studies must not be lower than the credit requirement of the single discipline Major programme. *Major GPA* Level weighting will be included in the calculation of Major GPA. *Minor GPA* Level weighting will <u>not</u> be included in the calculation of Minor GPA.
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 single Major: Award GPA = Weighted GPA (2) For Major/Minor programmes: Award GPA = Major GPA (3) For programmes without level weighting: Award GPA = GPA If the student has taken more subjects than required, refer to Section 6.23 below.

6.23 Guidelines for Award Classification

The Weighted GPA will be used as a guide to help determine award classifications.

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 = weighting to be assigned according to the level of the subject

N = number of all subjects counted in GPA calculation

For calculating the weighted GPA (and award GPA) to determine the Honours classification of students who satisfy the graduation requirements of Bachelor's degree awards, a University-wide standard weighting will be 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 and 4 subjects. Same as for GPA, Weighted GPA ranges from 0.00 to 4.30 from 2020/21.

Any subjects passed after the graduation requirement has been met or subjects taken on top of the prescribed credit requirements for award shall not be taken into account in the grade point calculation for award classification. 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).

For students who have completed a Major (including the Major/Secondary Major option)/Minor programme, a single classification will be awarded and their award classification will mainly be based on the "Major GPA", but it can be moderated by the Board of Examiners with reference to the "Minor GPA". For students who have completed a Major programme combined with free electives, their award classification will be determined by their "Major GPA" which includes grades obtained for the free electives, if appropriate.

"Major GPA" is derived based on all subjects of the Major programme, as well as the Secondary Major programme, if any, including those meeting the mandatory General University Requirements (GUR) and programme-specific language requirement, but not necessarily including the training credits.

"Minor GPA" is derived based on the 18 credits of specific Minor programme. "Minor GPA" is unweighted.

The "Major GPA" and the "Minor GPA" will be presented separately to the Board of Examiners for consideration. The guidelines for determining award classification are applicable to programmes with Major (including the Major/Secondary Major option)/Minor studies.

Where a student has a high GPA for his/her Major (including the Major/Secondary Major option) but a lower GPA for his/her Minor, he/she will not be 'penalised' in respect of his/her award classification, which is attached to the Major. On the other hand, if a student has a lower GPA for his/her Major (including the Major/Secondary Major option) than his/her GPA for the Minor, the Board of Examiners may consider recommending a higher award classification for the student for ratification by the APRC via the Faculty/School Board.

6.24 Classification of Awards

For Honours degree programmes, the awards will be classified as follows:

- First Class Honours
- Second Class Honours (Division 1)
- Second Class Honours (Division 2)
- Third Class Honours

The following are guidelines for Boards of 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.
2:i	The student has reached a standard of performance/attainment which is more than satisfactory but less than outstanding.
2: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.

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 when he/she has nonetheless covered the prescribed work of the programme in an adequate fashion, while failing to show sufficient evidence of the intellectual calibre expected 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.

Students who have committed academic dishonesty or non-compliance with examination regulations will be subject to the penalty of the lowering of 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.

The followings are the award GPA ranges for determining award classifications:

Honours Degrees	Award GPA
1st	3.60 – 4.30
2:i	3.00 – 3.59
2:ii	2.40 – 2.99
3rd	1.70 – 2.39

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/School 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/School Board (of Examiners), to the APRC for ratification.

6.25 Examination result announcements, transcripts, testimonials and references

At the end of each semester, where appropriate, examination results are announced online for individual students' checking. It provides information on subjects taken and grades attained, the Grade Point Average (GPA) for all subjects, and the overall result up to and including the latest semester. The announcement serves as an official notification of the student's academic performance.

A formal Transcript of Studies will be issued by the University, upon request, to any student registered on a programme offered by the University, and it will include the following information:

(i) name and student number;

(ii) title of the programme(s) on which enrolled, or from which graduated;

(iii) medium of instruction for the programme (applicable only to programmes which are delivered in Chinese and for which both Chinese and English versions are offered);

(iv) a full academic record, giving subjects taken and grades attained, and the Grade Point Average (GPA) for all subjects (this shall include any practical training undertaken, which fulfill the training credit requirement of the programme concerned);

(v) credit requirement of the student if different from the normal credit requirement of the programme;

(vi) where relevant, the final award(s) (including information on the Secondary Major and/or Minor award, if appropriate), with classification and year of award;

(vii) a statement indicating that the student has completed the Work-integrated Education (WIE) activities / Healthy Lifestyle / e-learning course in Putonghua (offered as an option with effect from the 2018/19 intake cohort), as appropriate; and

(viii) information on the partner institution, if the award is for a joint programme with another institution and leads to a joint award.

Students may request for a testimonial which is a certification of their studies at the University, but without details on subjects and subject results.

Students may also request for references direct from academic staff members concerned.

6.26 Recording of disciplinary actions in students' records

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

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 dishonesty/noncompliance with examination regulations'. The remark will be shown in the students' record as well as the assessment result notification and transcript of studies, until their leaving the University.

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

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 subject to disciplinary action.

Appendix I

Subject Description Forms

Content

Subject

Subject

Subject Description Form

Subject Code	AF3625
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 the 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.

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**
Continuous Assessment	50%			
1. In-class activities	15%	✓	✓	✓
2. Written assignments	15%	✓	✓	✓
3. Test	20%	✓	✓	✓
Final Examination	50%	✓	✓	✓
Total	100 %			

Student Study Effort Required		
	Class contact:	
	• Lecture	26 Hours
	• Tutorial	13 Hours
	Other student study effort:	
	• Study and self-learning	48 Hours
	• Presentation preparation and written assignments	18 Hours
	Total student study effort:	**105 Hours**

Reading List and References

Recommended Textbooks

1. Parkin and Bade, *Foundations of Microeconomics*, 8th ed., Pearson, 2018.
2. Sullivan, Wicks and Koelling, *Engineering Economy,* 16th ed., Pearson, 2014.

References

1. Robert H. Frank, *The Economic Naturalist: Why Economics Explain Almost Everything?,* Basic Books, 2007.

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Subject Description Form

Subject Code	AF5107
Subject Title	Accounting for Engineers
Credit Value	3
Level	5
Pre requisite/ Co-requisite/ Exclusion	Nil
Objectives	To orient students to the purpose and the subject matter of accounting. To provide students with the techniques and tools to understand and interpret accounting information. To stimulate students' interests in accounting.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Employ the accounting building blocks from the preparers' perspective. b. Understand accounting information from the users' perspective and be able to interpret them. c. Appreciate the role of quality accounting information in the decision making process.
Subject Synopsis/ Indicative Syllabus	**Understanding Accounting** Why accounting matters. Accounting and its building blocks. The recording process. The accounting information system. The financial statements. Corporate governance, internal control and cash. The application of accounting rules (GAAPs) in general and in particular to receivables and long-lived assets. **Interpretation of Accounts** The need for comparative analysis. Tools of financial statement analysis. Understanding the uses and limitations of the tools. Gaining meaningful insights from the numbers. **Managerial Accounting Concepts & Techniques** Understanding costs. Costing techniques. Tracking costs. Cost-Volume-Profit Analysis. **Financial Management** Basic concepts and funding needs. Capital Budgeting. Cashflow statement, budgeted income statement, budgeted balance sheet and cash budget **Accounting is Interesting** A case study of financial statements of a listed company.
Teaching/ Learning Methodology	A three-hour seminar will be conducted each week to initiate students to ideas, concepts and techniques of the topics, which is then reinforced by their participation in class discussion, quiz and presentation. These are designed to consolidate and develop students' understanding and analytical ability through problem solving and working on relevant cases

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
Continuous Assessment	50%			
1. Analytical Writing	15%	✓	✓	✓
2. Quizzes and class participation	15%	✓	✓	✓
3. Group Project & Presentation	20%		✓	✓
Final Examination	50%	✓	✓	✓
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: In addition to the classroom activities, students are required to do some research and self-reflection on learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Seminar	39 Hrs.
Other student study effort:	
▪ Reading books and working through assigned problems	45Hrs.
▪ Research, discussion &write-up	15Hrs.
Total student study effort	99 Hrs.

Reading List and References

1. Kimmel, Weygandt and Kieso, *Accounting, Tools for Business Decision Making*, Latest edition, John Wiley & Sons Inc.
2. Anthony, Hawkins and Merchant, *Accounting, Text and Cases*, Lasted edition, Mcgraw Hill.
3. Larson, Wild and Chiapetta, *Fundamental Accounting Principles*, latest edition, Mcgraw-Hill Irwin.
4. Williams, Haka, Bettne and Meigs, *Financial & Managerial Accounting: The Basis for Business Decisions*, latest edition, McGraw-Hill/Irwin.
5. Glautier and Underdown, *Accounting Theory and Practice*, latest edition, Prentice
6. Hall. Dyson, J. R., *Accounting for Non-Accounting Students*, latest edition, Financial Times.

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Subject Description Form

Subject Code	AMA1110	
Subject Title	Basic Mathematics I – Calculus and Probability & Statistics	
Credit Value	3	
Level	1	
Pre-requisite/ Co-requisite/ Exclusion	Exclusion	Calculus and Linear Algebra (AMA1007) Calculus for Engineers (AMA1130) Calculus (AMA1131) Foundation Mathematics for Accounting and Finance (AMA1500) Calculus (AMA1702)
Objectives	This subject aims to introduce students to the basic concepts and applications of elementary calculus and statistics. Emphasis will be on the understanding of fundamental concepts and the use of mathematical techniques in handling practical problems in science and engineering.	
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) apply analytical reasoning to solve problems in science and engineering; (b) make use of the knowledge of mathematical/statistical techniques and adapt known solutions to various situations; (c) apply mathematical modeling in problem solving; (d) demonstrate abilities of logical and analytical thinking.	
Subject Synopsis/ Indicative Syllabus	Elementary calculus: Limit and continuity, derivatives and their geometric meaning, rules of differentiation including chain rule, Leibniz's rule and L'Hopital's rule, exponential and logarithmic functions, trigonometric functions and their inverses, hyperbolic and inverse hyperbolic functions, applications of differential calculus. Elementary Probability and Statistics: Descriptive statistics, random variables, probability and probability distributions, binomial, Poisson and normal distributions, applications. Population and random samples. Sampling distributions related to sample mean, sample proportions, and sample variances. Concepts of a point estimator and a confidence interval. Point and interval estimates of a mean and the difference between two means.	
Teaching/Learning Methodology	Basic concepts and elementary techniques of differential and integral calculus and elementary statistics will be taught in lectures. These will be further enhanced in tutorials through practical problem solving.	

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1.Assignments and mid-term tests	40%	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓	✓
Total	100%				

	Continuous Assessment comprises of assignments, in-class quizzes, online quizzes and a mid-term test. An examination is held at the end of the semester. Questions used in assignments, quizzes, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering. Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: *The subject focuses on understanding of basic concepts and application of techniques in differential/integral calculus, elementary statistics. As such, an assessment method based mainly on examinations/tests/quizzes is considered appropriate. Furthermore, students are required to submit homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.*	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Homework and self-study	81 Hrs.
	Total student study effort	120 Hrs.
Reading List and References	Chung, K.C. *A Short Course in Calculus and Matrices*, McGraw Hill 2013 Hung, K.F., Kwan, Wilson, Pong, T.Y. *Foundation Mathematics & Statistics*, McGraw Hill 2013 Larson, R., Edwards, B. *Single Variable Calculus*, Brooks/Cole 2012 Walpole, R.E., Myers, R.H., Myers, S.L. Ye, K. *Probability and Statistics for Engineers and Scientists*, Prentice Hall, 2012	

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Subject Description Form

Subject Code	AMA1120
Subject Title	Basic Mathematics II –Calculus and Linear algebra
Credit Value	3
Level	1
Pre-requisite/ Co-requisite/ Exclusion	Basic Mathematics I – Calculus and Probability & Statistics (AMA1110)
Objectives	This subject aims to introduce students to the basic concepts and applications of elementary calculus and statistics. Emphasis will be on the understanding of fundamental concepts and the use of mathematical techniques in handling practical problems in science and engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) apply analytical reasoning to solve problems in science and engineering; (b) make use of the knowledge of mathematical/statistical techniques and adapt known solutions to various situations; (c) apply mathematical modeling in problem solving; (d) demonstrate abilities of logical and analytical thinking.
Subject Synopsis/ Indicative Syllabus	Elementary calculus: Mean Value Theorem with applications to optimization and curve sketching. Definite and indefinite integrals, fundamental theorem of calculus, methods of integration (integration by substitution, integration by parts, integration of rational functions using partial fractions and integration of trigonometric and hyperbolic functions), reduction formulas, applications to geometry and physics. Improper Integrals. Linear algebra: Basic properties of matrices and determinants, linear systems, Gaussian elimination, inverse of a square matrix, Cramer's rule, vectors in 2-space or in 3-space, applications to geometry.
Teaching/Learning Methodology	Basic concepts and elementary techniques of differential and integral calculus and linear algebra will be taught in lectures. These will be further enhanced in tutorials through practical problem solving.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below.

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1.Assignments and tests	40%	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓	✓
Total	100%				

Continuous Assessment comprises of assignments and tests. An examination is held at the end of the semester.

	Questions used in assignments, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering. Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: *The subject focuses on understanding of basic concepts and application of techniques in differential/integral calculus, elementary statistics and elementary linear algebra. As such, an assessment method based mainly on examinations/tests is considered appropriate. Furthermore, students are required to submit homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.*	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Homework and self-study	81 Hrs.
	Total student study effort	120 Hrs.
Reading List and References	Chung, K.C. *A Short Course in Calculus and Matrices*, McGraw Hill 2013 Hung, K.F., Kwan, Wilson, Pong, T.Y. *Foundation Mathematics & Statistics*, McGraw Hill 2013 Larson, R., Edwards, B. *Single Variable Calculus*, Brooks/Cole 2012 Larson, R. *Elementary Linear Algebra*, Brooks/Cole 2013	

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Subject Description Form

Subject Code	AMA2111	
Subject Title	Mathematics I	
Credit Value	3	
Level	2	
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite	Calculus and Linear Algebra (AMA1007) or Basic Mathematics II – Calculus and Linear Algebra (AMA1120) or Calculus for Engineers (AMA1130) or Calculus (AMA1131) or Foundation Mathematics for Accounting and Finance (AMA1500)
	Exclusion	Intermediate Calculus and Linear Algebra (AMA2007/AMA2707) Mathematics for Engineers (AMA2131/AMA2308) Engineering Mathematics (AMA2380) Applied Mathematics I (AMA2511) Mathematics for Scientists and Engineers (AMA2882) Engineering Mathematics (AMA290)
Objectives	This subject aims to introduce students to the basic principles and techniques of engineering mathematics. Emphasis will be on the understanding of fundamental concepts as well as applications of mathematical methods in solving practical problems in science and engineering.	
Intended Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. apply mathematical reasoning to analyze essential features of different problems in science and engineering; 2. extend their knowledge of mathematical and numerical techniques and adapt known solutions in various situations; 3. develop and extrapolate the mathematical concepts in synthesizing and solving new problems 4. demonstrate abilities of logical and analytical thinking; 5. search for useful information in the process of problem solving.	
Subject Synopsis/ Indicative Syllabus	1. Algebra of complex numbers Complex numbers, geometric representation, complex exponential functions, n-th roots of a complex number. 2. Linear algebra Systems of linear equations, vector spaces, inner product and orthogonality, eigenvalues and eigenvectors, applications. 3. Ordinary differential equations ODE of first and second order, linear systems, Laplace transforms, Convolution theorem, applications to mechanical vibrations and simple circuits.	

	4. Differential calculus of functions of several variables Partial derivatives, total differential, chain rule, Taylor's expansion, maxima and minima, directional derivatives, Lagrange multipliers, implicit differentiation, applications.
Teaching/Learning Methodology	The subject will be delivered mainly through lectures and tutorials. The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. Tutorials will mainly be used to develop students' problem solving ability.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below.

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		1	2	3	4	5
1.Homework, quizzes and mid-term test	40%	✓	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓	✓	✓
Total	100%					

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

Questions used in assignments, quizzes, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering.

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

The subject focuses on understanding of basic concepts and application of techniques in engineering mathematics. As such, an assessment method based mainly on examinations/tests/quizzes is considered appropriate. Furthermore, students are required to submit homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.

Student Study Effort Expected		
	Class contact:	
	• Lecture	26 Hrs
	• Tutorial	13 Hrs
	• Mid-term test and examination	
	Other student study effort	
	• Assignments and Self study	78 Hrs
	Total student study effort:	117 Hrs

Reading List and References

1. C.K. Chan, C.W. Chan and K.F. Hung, *Basic Engineering Mathematics*, McGraw-Hill, 2015.
2. Anton, H. *Elementary Linear Algebra* (11th edition). Wiley, 2014.
3. Kreyszig, E. (2011). *Advanced Engineering Mathematics*, 10th ed. Wiley.
4. James, G. (2015). *Modern Engineering Mathematics*, 5th ed. Pearson Education Limited
5. Thomas, G. B., Weir, M. D. & Hass, J. R. *Thomas' Calculus*, 14th ed. Pearson Education 2017

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Subject Description Form

Subject Code	AMA2112	
Subject Title	Mathematics II	
Credit Value	3	
Level	2	
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite	Mathematics I (AMA2111)
	Exclusion	Intermediate Calculus and Linear Algebra (AMA2007/AMA2707) Introduction to Differential Equations (AMA2008)
Objectives	This subject is a continuation of AMA2111. It aims to introduce students to the basic principles and techniques of engineering mathematics. Emphasis will be on the understanding of fundamental concepts as well as applications of mathematical methods in solving practical problems in science and engineering.	
Intended Learning Outcomes	**Upon completion of the subject, students will be able to:** 1. apply mathematical reasoning to analyze essential features of different problems in science and engineering; 2. extend their knowledge of mathematical and numerical techniques and adapt known solutions in various situations; 3. develop and extrapolate the mathematical concepts in synthesizing and solving new problems 4. demonstrate abilities of logical and analytical thinking; 5. search for useful information in the process of problem solving.	
Subject Synopsis/ Indicative Syllabus	1. <u>Multiple integrals</u> Double and triple integrals, change of variables, applications to problems in geometry and mechanics. 2. <u>Vector calculus</u> Vector and scalar fields, the del operator, line and surface integrals, the theorems of Green, Gauss and Stokes, applications to electromagnetic theory and fluid mechanics. 3. <u>Series expansion</u> Infinite series, Taylor's expansion, Fourier series expansion of a periodic function. 4. <u>Partial differential equations</u> Formulation of PDE of mathematical physics, separation of variables, initial-boundary value problems, introduction to Fourier transforms.	
Teaching/Learning Methodology	The subject will be delivered mainly through lectures and tutorials. The lectures aim to provide the students with an integrated knowledge required for the understanding and application of mathematical concepts and techniques. Tutorials will mainly be used to develop students' problem solving ability.	

Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		1	2	3	4	5
1. Assignments, quizzes and mid-term test	40%	✓	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓	✓	✓
Total	100%					

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

Questions used in assignments, quizzes, tests and examinations are used to assess students' level of understanding of the basic concepts and their ability to use mathematical techniques in solving problems in science and engineering.

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

The subject focuses on understanding of basic concepts and application of techniques in engineering mathematics. As such, an assessment method based mainly on examinations/tests/quizzes is considered appropriate. Furthermore, students are required to submit homework assignments regularly in order to allow subject lecturers to keep track of students' progress in the course.

Student Study Effort Expected	Class contact:	
	• Lecture	26 Hrs
	• Tutorial	13 Hrs
	• Mid-term test and examination	
	Other student study effort	
	• Assignments and Self study	78 Hrs
	Total student study effort:	117 Hrs
Reading List and References	1. C.K. Chan, C.W. Chan and K.F. Hung, *Basic Engineering Mathematics*, McGraw-Hill, 2015. 2. Anton, H. *Elementary Linear Algebra* (11th edition). Wiley, 2014. 3. Kreyszig, E. (2011). *Advanced Engineering Mathematics*, 10th ed. Wiley. 4. James, G. (2015). *Modern Engineering Mathematics*, 5th ed. Pearson Education Limited 5. 5. Thomas, G. B., Weir, M. D. & Hass, J. R. *Thomas' Calculus*, 14th ed. Pearson Education 2017	

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Subject Description Form

Subject Code	AP10005
Subject Title	Physics I
Credit Value	3
Level	1
Pre-requisite/ **Co-requisite/ Exclusion**	Nil
Objectives	This course provides a broad foundation in mechanics and thermal physics to those students who are going to study science, engineering, or related programmes.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. solve simple problems in single-particle mechanics using calculus and vectors; b. solve problems in mechanics of many-particle systems using calculus and vectors; c. understand simple harmonic motion and solve simple problems; d. solve problems related to acoustic standing waves; e. calculate changes in frequency received due to Doppler's effect; f. apply ideal gas laws to solve problems; g. apply the first law of thermodynamics to simple processes; and h. solve simple problems related to the cyclic processes.
Subject Synopsis/ Indicative Syllabus	**Mechanics**: calculus-based kinematics, dynamics and Newton's laws; calculus-based Newtonian mechanics, involving the application of impulse, momentum, work and energy, etc.; conservation law; gravitational force; systems of particles; collisions; rigid body rotation; angular momentum; oscillations and simple harmonic motion; pendulum; statics; longitudinal and transverse waves; travelling wave and standing wave; Doppler effect; sound waves and beats. **Thermal physics**: conduction, convection and radiation; black body radiation; ideal gas and kinetic theory; work, heat and internal energy; first law of thermodynamics; entropy and the second law of thermodynamics; Carnot cycle; heat engine and refrigerators.
Teaching/Learning Methodology	**Lecture**: Fundamentals in mechanics, waves and electromagnetism will be explained. Examples will be used to illustrate the concepts and ideas in the lecture. Students are free to request help. Homework problem sets will be given. **Student-centered Tutorial**: Students will work on a set of problems in tutorials. Students are encouraged to solve problems and to use their own knowledge to verify their solutions before seeking assistance. These problem sets provide them opportunities to apply their knowledge gained from the lecture. They also help the students to consolidate what they have learned. Furthermore, students can develop a deeper understanding of the subject in relation to daily life phenomena or experience.
	e-learning: In order to enhance the effectiveness of teaching and learning processes, electronic means and multimedia technologies would be adopted for presentations of lectures; communication between students and lecturer; delivery of handouts, homework and notices etc.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed							
		a	b	c	d	e	f	g	h
1. Continuous assessment	40%	✓	✓	✓	✓	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓	✓	✓	✓	✓	✓
Total	100%								

Continuous assessment:

The continuous assessment includes assignments, quizzes and test(s) which aim at checking the progress of students' study throughout the course, assisting them in fulfilling the learning outcomes.

Assignments in general include end-of-chapter problems, which are used to reinforce and assess the concepts and skills acquired by the students; and to let them know the level of understanding that they are expected to reach.

At least one test would be administered during the course of the subject as a means of timely checking of learning progress by referring to the intended outcomes, and as means of checking how effective the students digest and consolidate the materials taught in the class.

Examination: This is a major assessment component of the subject. It would be a closed-book examination. Complicated formulas would be given to avoid rote memory, such that the emphasis of assessment would be put on testing the understanding, analysis and problem solving ability of the students.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial	6 Hrs.
Other student study effort:	
▪ Self-study	81 Hrs.
Total student study effort:	120 Hrs.

Reading List and References

1. John W. Jewett and Raymond A. Serway, "Physics for Scientists and Engineers", 2014, 9th edition, Brooks/Cole Cengage Learning.
2. Hafez A. Radi, John O. Rasmussen, "Principles of physics: for scientists and engineers", 2013, Springer.
3. W. Bauer and G.D. Westfall, "University Physics with Modern Physics", 2011, McGraw-Hill.

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Subject Description Form

Subject Code	AP10006
Subject Title	Physics II
Credit Value	3
Level	1
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	To provide students with fundamental knowledge in physics focusing on the topics of waves and electromagnetism. This course prepares students to study science, engineering or related programmes.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. apply simple laws in optics to explain image formation; b. understand phenomena related to the wave character of light; c. solve problems in electrostatics; d. solve problems on interaction between current and magnetic field; e. apply electromagnetic induction to various phenomena; and f. solve problems in simple circuits.
Subject Synopsis/ Indicative Syllabus	**Waves and optics**: nature of light, reflection and refraction; Snell's law; image formation by mirrors and lenses; compound lens; microscope and telescope; superposition of waves; Huygen's principle; interference and diffraction; diffraction grating; Rayleigh's criterion and optical resolution; polarization. **Electromagnetism**: charge and Field; Coulomb's law and Gauss' law; electrostatic field and potential difference; capacitors and dielectric; current and resistance; Ohm's law; electromotive force, potential difference; Lorentz force; magnetic force on moving charges and current; Hall effect; Biot-Savart law and Ampere's law; Faraday's law and Lenz's law; induction; transformers; AC circuits and applications.
Teaching/Learning Methodology	**Lecture**: The fundamentals in optics and electromagnetism will be explained. Examples will be used to illustrate the concepts and ideas in the lecture. Students are free to request help. Homework problem sets will be given. **Student-centered Tutorial**: Students will work on a set of problems in tutorials. Students are encouraged to solve problems and to use their own knowledge to verify their solutions before seeking assistance. These problem sets provide them opportunities to apply their knowledge gained from the lecture. They also help the students to consolidate what they have learned. Furthermore, students can develop a deeper understanding of the subject in relation to daily life phenomena or experience. **e-learning**: In order to enhance the effectiveness of teaching and learning processes, electronic means and multimedia technologies would be adopted for presentations of lectures; communication between students and lecturer; delivery of handouts, homework and notices etc.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Continuous assessment	40%	✓	✓	✓	✓	✓	✓
2. Examination	60%	✓	✓	✓	✓	✓	✓
Total	100%						

Continuous assessment:

The continuous assessment includes assignments, quizzes and test(s) which aim at checking the progress of students' study throughout the course, assisting them in fulfilling the learning outcomes.

Assignments in general include end-of-chapter problems, which are used to reinforce and assess the concepts and skills acquired by the students; and to let them know the level of understanding that they are expected to reach.

At least one test would be administered during the course of the subject as a means of timely checking of learning progress by referring to the intended outcomes, and as means of checking how effective the students digest and consolidate the materials taught in the class.

Examination: This is a major assessment component of the subject. It would be a closed-book examination. Complicated formulas would be given to avoid rote memory, such that the emphasis of assessment would be put on testing the understanding, analysis and problem solving ability of the students.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial	6 Hrs.
	Other student study effort:	
	▪ Self-study	81 Hrs.
	Total student study effort	120 Hrs.

Reading List and References

1. John W. Jewett and Raymond A. Serway, "Physics for Scientists and Engineers", 2014, 9th edition, Brooks/Cole Cengage Learning.
2. Hafez A. Radi, John O. Rasmussen, "Principles of physics: for scientists and engineers", 2013, Springer.
3. W. Bauer and G.D. Westfall, "University Physics with Modern Physics", 2011, McGraw-Hill.

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Subject Description Form

Subject Code	BSE463
Subject Title	Design of Mechanical Systems in Buildings
Credit Value	3
Level	4
Pre-requisite Co-requisite Exclusion	ENG2001 and EE3009A
Objectives	(1) To provide students with a comprehensive understanding of air conditioning system, refrigeration and indoor environmental issues for different kinds of buildings common to Hong Kong; and (2) To provide students with a comprehensive understanding in formulating practical energy policies.
Intended Learning Outcomes	Upon successful completion of the subject, students are expected to: Professional / academic knowledge and skills (a) Be able to have basic knowledge of thermal systems in buildings. (b) Be able to undertake the thermodynamic and application analysis of vapour compression refrigeration systems. (c) Be able to select a proper method for estimating operation energy use for a given building air-conditioning system on the basis of understanding the energy analysis requirement, and the calculation principles of current major building energy analysis methods. (d) Be able to undertake the design and analysis of ventilation systems for general contaminants control on the basis of understanding the function and working principles of contaminants control, and able to undertake the ventilation measurements for evaluating the ventilation of contaminants control. Attributes for all roundedness (e) Be able to communicate to others in a clear and concise manner through written reports, drawings and oral presentation; and (f) Be able to develop the skills and abilities to undertake, independently, a major piece of investigation work in a specialist subject area.
Subject Synopsis/ Indicative Syllabus	This subject provides a basic understanding of air conditioning system, refrigeration and indoor environment issues for different kinds of buildings common to Hong Kong. The syllabus includes air conditioning fundamentals, loads estimation, fan and duct sizing, ventilation for acceptable air quality and refrigeration plant exclusively designed for non BSE students.
Teaching/Learning Methodology	Students are briefed in the first lecture for the expected subject outcomes. Teaching is conducted in the form of interactive lecture, supplemented by worked examples, case study and mini project. Handouts were distributed one week before the lecture session.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Individual assignment	15%	✓		✓			✓
2. Student-based seminar (Report + presentation)	25%	✓	✓	✓	✓	✓	
3. End-of-semester examination	60%	✓	✓	✓	✓		
Total	100%						

Students are required to demonstrate presentation and communication abilities through different types of assessments, which include written report, drawings and written assessment.

Student Study Effort Required		
	Class contact:	
	▪ Lectures	27 Hrs.
	▪ Tutorials	6 Hrs.
	▪ Seminar	3 Hrs.
	Other student study effort:	
	▪ Examination	3 Hrs.
	▪ Mini Project	11 Hrs.
	▪ Self-study	80 Hrs.
	Total student study effort	130 Hrs.

Reading List and References

Authors: Shan K Wang, Zalman Lavan & Paul Norton
Title: Air Conditioning and Refrigeration Engineering
Publisher: Boca Raton, Fla.: CRC Press, c2000
PolyU Call Number: TH7687.W363 2000

Authors: A.F.E. Wise & J.A. Swaffield
Title: Water, Sanitary and Waste Services for Buildings
Publisher: 5th Edition, Oxford; Woburn, Mass: Butterworth – Heinemann, 2012

Authors: T.D. Eastop & A. McConkey
Title: Applied Engineering Thermodynamics for Technologists
Publisher: 5th Edition, Essex, England: Longman; New York: Wiley 1993
PolyU Call Number: TJ265.E3 1993

Author: Hazim B. Awbi
Title: Ventilation of Buildings
Publisher: 2nd Edition, London; New York, N.Y.: Spon Press 2003
PolyU Call Number: TH7653.A9 2003

Author: Francis W.H. Yik
Title: Fundamentals, Design & Control of Air-conditioning Systems
Publisher: 2nd Edition, Francis W. H. Yik 2022
www.learnerthon.org/sharing/

July 2022

Subject Description Form

Subject Code	CLC1104C (Cantonese) / CLC1104P (Putonghua) [2019-20 onward] CBS1104C (Cantonese) / CBS1104P (Putonghua) [2018-19 and before] ***Remarks: Students taking the Cantonese version of CLC/CBS1104 (i.e. CLC/CBS1104C) will be offered a 39 hour non-credit bearing e-learning course in Putonghua (optional).***
Subject Title	University Chinese（大學中文）
Credit Value	3
Level	1
Pre-requisite / Co-requisite/ Exclusion	Students with HKDSE Chinese subject result at level 3 or above or equivalent
Objectives	This subject aims at enhancing the students' command of language knowledge to communicate effectively in both written and spoken Chinese, with particular reference to the stylistic variations of expression in different communicative settings. The ultimate goal of this subject is to train students to be effective communicators and life-long learners, and to equip them for the Chinese Discipline-Specific Language Requirement subject.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. consolidate the ability to identify and correct the most common errors in written texts; b. develop Chinese writing skills through the analysis and in-depth reading of selected literary masterpieces; c. master the format, organization, language and style of expression of various genres of Chinese writing; d. produce formal presentations in spoken Chinese effectively and appropriately.
Subject Synopsis/ Indicative Syllabus	1. Written communication Language, format and organization of each genre; coherence and thread of thinking in Chinese writing; style of expression of different genres; context dependent stylistic variation; development of logical and persuasive arguments. 2. Spoken communication Choice of words; articulation and flow of speaking; manner of speaking and gesture; identification of main idea and key messages; evaluation of relevancy of information in a message; skills of summarizing; agreeing / disagreeing / answering to questions politely; use of visual aids; body movement. 3. Reading strategies Intensive and critical reading; identification of authors' stances, arguments and purposes; extracting useful information from the texts; determination of the meanings of the important concept words in context; evaluation of the validity of the factual information and arguments of the texts; appreciation of different genres including literary masterpieces. 4. Language development Grammatical skills; use of clear words; use of specific sentences; choice of diction.

Teaching/Learning Methodology	The teaching/learning methodology is a combination of highly interactive seminars, self-formed study groups, seminar discussion, oral presentations and written assignments. E-learning materials for enhancing students' proficiency in both spoken and written Chinese are included in Chinese LCR teaching. Students are expected to follow teachers' guidelines and get access to the materials on the e-Learning platform for self-study on a voluntary basis.
Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
Quizzes / Exercises	20%	✓		✓	
Written Assignments	55%	✓	✓	✓	
Oral presentation	25%	✓		✓	✓
Total	100 %				

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

The quizzes and exercises are designed to assess students' basic knowledge of Chinese linguistics and how well they achieve ILOs (a) and (c). The writing assessments aim to obtain an objective measurement of students' basic competence in the use of written Chinese in accurate and appropriate grammatical structures (ref. ILOs (a), (b) and (c)). The oral assessment assesses students' ability to plan and present accurately, appropriately and effectively (ref. ILOs (a), (c) and (d)). Explanations and exercises are provided in classroom teaching.

Student Study Effort Expected	Class contact:	
	▪ Seminar	39 Hrs.
	Additional activity:	
	▪ e-Learning in Putonghua and written Chinese	9 Hrs.
	Other student study effort:	
	▪ Outside Class Practice	39 Hrs.
	▪ Self-study	39 Hrs.
	Total student study effort	126 Hrs.

Reading List and References	1. 于成鯤、陳瑞端、秦扶一、金振邦主編：《當代應用文寫作規範叢書》，上海：復旦大學出版社，2011年。 2. 任伯江：《口語傳意權能 : 人際關係策略與潛力》，香港：香港中文大學出版社，2006年。 3. 吳禮權：《演講的技巧》，香港：商務印書館，2013年。 4. 李錦昌：《商業溝通與應用文大全》，香港：商務印書館，2012年。 5. 邵敬敏：《現代漢語通論》，上海：上海教育出版社，2007年。 6. 香港城市大學語文學部編著：《中文傳意─基礎篇》。香港 : 香港城市大學出版社，2001。 7. 香港城市大學語文學部編著; 《中文傳意─寫作篇》。香港 : 香港城市大學出版社，2001。 8. 孫光萱：《中國現代散文名家名篇賞讀》，上海：上海教育出版社，2001年。 9. 梁慧敏：《正識中文》，香港：三聯書店，2010年。 10. 梁慧敏：《語文正解》，香港：三聯書店，2015年。 11. 梁慧敏：《語文通病》，香港：三聯書店，2014年。 12. 陳瑞端，《生活病語》，香港 : 中華書局，2000。 13. 陳瑞端：《生活錯別字》，香港：中華書局，2000年。 14. 賴蘭香：《傳媒中文寫作》(新修本)，香港：中華書局，2012年。

June 2022

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/ Exclusion	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.
Subject Intended 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 a. plan, organize and produce professionally acceptable project proposals and reports with appropriate text structures and language for different intended readers b. plan, organize and deliver effective project-related oral presentations with appropriate interactive strategies and language for different intended audiences c. 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 organizing 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 • Writing professional reports 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	Learning and teaching approach 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-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

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Project proposal and report in Chinese	60%	✓		✓
2. Oral presentation of project proposal and report	40%		✓	✓
Total	100%			

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.

Student Study Effort Expected		
	Class contact:	
	▪ Seminars	26 Hrs.
	Other student study effort:	
	▪ Researching, planning, writing, and preparing the project	44 Hrs.
	Total student study effort	70 Hrs.

Reading List and References

a) 司有和 (1984) ：《科技寫作簡明教程》，安徽教育出版社。

b) 葉聖陶、呂叔湘、朱德熙、 林燾 (1992)：《文章講評》 語文出版社。

c) 于成鯤主編（2003）：《現代應用文》，復旦大學出版社。

d) 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。

e) 邵敬敏主編 (2010) ：《現代漢語通論 (第二版)》，上海教育出版社。

f) 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。

g) 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。

June 2022

Subject Description Form

Subject Code	CSE40462
Subject Title	Environmental Impact Assessment – Theory and Practice
Credit Value	3
Level	4
Exclusion	CSE462 Environmental Impact Assessment – Theory and Practice
Objectives	To provide students with an overview of the principles and current
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. understand the EIA process; b. analyze major environmental issues for large development projects; c. conduct necessary monitoring and modeling tasks within an EIA cycle; d. function on multi-disciplinary teams; e. understand how the EIA process contributes to environmental protection and sustainable development; and f. to recognize the need for, and to engage in life-long learning.
Subject Synopsis/ Indicative Syllabus	**Keyword syllabus:** (i) Development of Environmental Impact Assessment Historical review: Environmental assessment development in the world and Hong Kong. (ii) Scope and Objectives of Environmental Impact Assessment Environmental considerations: land use, planning, development and management. EIA aims and objectives. (iii) Methodology and Assessment Techniques Methods for air, water, noise and ecology assessment. Other environmental issues (risk, visual, cultural and social-economical impacts). (iv) Monitoring and Baseline Studies Baseline studies, Environmental monitoring and audit, Environmental quality and regulatory requirements, Mitigation and control measures. (v) Environmental Impact Statement Role of Environmental Impact Statement, Statement scope & content.
Teaching/Learning Methodology	The subject teaching will include the following elements: (a) Lectures – to introduce the basic concepts and assessment methods; (b) Tutorials – to answer student questions in the learning processes; (c) Group discussion and presentations – to let students play different roles in the EIA process; (d) Reading materials and video presentations – to give students examples in local EIA case studies; (e) Seminars by invited speakers from relevant fields, government agencies and professional consultants; and (f) Course work.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Continuous assessments	50%	√	√	√	√	√	√
2. Final examination	50%	√	√			√	
Total	100%						

Students must attain at least grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result.

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

Written examination is evaluated by final examination.

Student Study Effort Expected

Class contact:	Average hours per week
▪ Lectures / Tutorials / Laboratory	3 Hrs.
Other student study effort:	
▪ Coursework exercise/ Attending seminar and seminar report writing	1.6 Hrs.
▪ Self Study	4.4 Hrs.
Total student study effort	9 Hrs.

Reading List and References

The following texts provide the majority of the basic materials to be covered in lectures. Students will need to study other relevant publications, including local case studies and approved EIA reports.

1. Barbara Caroll, 2002. Environmental Impact Assessment Handbook: A Practical Guide for Planners, Developers and Communities. Thomas Telford, London.
2. Canter, L.W., 1996. Environmental Impact Assessment, 2nd Ed., McGraw-Hill.
3. Christopher Wood. 2003. Environmental Impact Assessment: A Comparative Review. Prentice Hall, New Jersey.
4. Riki Therivel, Peter Morris, 2001. Methods of Environmental Impact Assessment, Spon Press, London.
5. Bram F. Noble, 2010. Introduction to Environmental Impact Assessment: a guide to principles and practice. Oxford University Press, Don Mills, Ont.
6. John Glasson, Riki Therivel, 2012. Introduction to Environmental Impact Assessment. Routledge, Abingdon.
7. Hong Kong Environmental Protection Department
   http://www.epd.gov.hk/eia/

July 2022

Subject Description Form

Subject Code	CSE516
Subject Title	Urban Transport Planning - Theory and Practice
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Recommended background knowledge: It is expected that students will have a fundamental understanding of mathematics, statistics and computers consistent with undergraduate level study in science or engineering.
Objectives	To provide a comprehensive theoretically based, yet practical approach to transport planning in urban areas. Emphasis is also placed on the application of rigorous transport models and analytical techniques in case studies.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able: a. to apply basic transport planning approaches to determine appropriate solutions for solving congestion problems, particularly in the planning stage for transport infrastructure projects; b. to design and conduct traffic surveys for assessment of the impacts due to transport improvement projects, and other travel demand management measures; c. to analyze and interpret data systemically from traffic and behavior surveys for strategic transport planning and travel demand forecasting; and d. to utilize the four-step modelling techniques for forecasting future travel demand and analyzing the effects of transport infrastructure facilities on a transport system.
Subject Synopsis/ Indicative Syllabus	**Keyword Syllabus** i) Fundamentals of Urban Transport Planning The fundamentals of land-use and transport planning; the planning process; planning studies; congestion problems and transport policy. ii) Urban Transport Technology Urban transport modes and technologies; intelligent transport systems. iii) Travel Demand and Data Collection Characteristics of travel demand; travel demand forecasting; travel surveys. iv) Travel Demand Analysis Model development; nature of modelling errors. Four step models: trip generation; trip distribution; modal split; traffic assignment. Simplified approach to small area planning. v) Generation and Evaluation of Solutions Evaluation techniques: economics, operation and environmental evaluation; multi-criteria assessment; public participation; case studies. vi) Traffic Impact Assessment TIA guidelines, methodology, and examples.
	vii) Laboratory This course will be augmented by computer modelling and case studies for input to calibrate transport planning models: Network building; trip generation; trip distribution and modal split; traffic assignment; transport system evaluation. Computer laboratory: transportation network modeling
Teaching/Learning Methodology	The underlying principles and techniques relating to traffic survey and transport planning will be dealt with in lectures. However, it is important that the students are exposed to the interdependence between theories and practice in transport planning. Students are therefore required to undertake survey design and data collection in order to understand the associated techniques in practice. Individual assignments will consist of numerical problems on transport modelling and analysis while computer laboratory sessions will be held to demonstrate the applications of transport model and to provide opportunity for students to appreciate the difference between manual calculation and computer modelling. The course project aims at developing a holistic understanding on contemporary urban transportation problems and devising solutions from both theoretical and practical perspectives. Professionals from government or industry may be invited to give lectures on current issues of transport planning in Hong Kong.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below
Reading List and References	**Textbooks** Ortúzar, J. de D. and Willumsen, L.G., Modelling Transport, 4th Ed., John Wiley & Sons (2011). **Reference Books** Hensher, David A. and Button, Kenneth J., Handbook of Transport Modelling, Elsevier Lam, W.H.K. and Bell, M.G.H., Advanced Modeling for Transit Operations and Service Planning, Pergamon, Elsevier Science Ltd., Oxford (2003). Sheffi, Yosef, Urban Transportation Networks, Prentice-Hall (1985).

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Continuous Assessment	60%	√	√	√	√
2. Written Examination	40%	√	√	√	√
Total	100%				

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

Continuous assessment will be based on written assignment(s) and lab reports.

Students must attain at least Grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result.

July 2022

Subject Description Form

Subject Code	EE2001 / EE2001A / EE2001B
Subject Title	Applied Electromagnetics
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To introduce to students the physical laws that govern the electromagnetic phenomena commonly encountered in electrical engineering systems. 2. To familiarise students with the techniques for solving problems in electromagnetics. 3. To provide students the foundation of electromagnetic field theory required for pursuing the EE programme.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand that electromagnetism is based on Maxwell's equations. Interpret the physical meaning and phenomena behind Maxwell's equations. Know the meanings of physical quantities of electromagnetism and their basic relationships. b. Be able to analyse electromagnetic phenomena related to electrical engineering systems by selecting the most appropriate laws/theorems/solution techniques. c. Have hands-on experience in electromagnetic measurements.
Subject Synopsis/ Indicative Syllabus	1. ***Static fields*****:** Electrostatics: Electric fields, Coulomb's law, Gauss's law, potential, capacitance and energy storage. Magnetostatics: Biot-Savart law, magnetic fields, Ampere's circuital law. Force on a current-carrying conductor, Lorentz force. 2. ***Time-varying fields*****:** Faraday's Law and Lenz's Law; self-inductance, mutual inductance and stored energy. 3. ***Mathematical preliminaries*****:** Vectors analysis and coordinate systems. The operators grad, div and curl. Concept of line, surface and volume integrals. Stokes's and divergence theorems. 4. ***Maxwell's equations and EM waves*****:** Maxwell's equations in integral form as a restatement of fundamentals. Differential form. The continuity equation. The displacement current. The wave equation, plane polarized wave, velocity of propagation and energy flows. 5. ***Material media*****:** Dielectric material: dipole, polarisation, permittivity and capacitors. Ferromagnetism: magnetisation curve, permeability, hysteresis and saturation. Boundary conditions. Magnetic circuits: magneto-motive force, reluctance and permeance. 6. ***Solution of static field problems*****:** Hand-mapping, numerical and computer-based methods. Estimation of conductance, inductance, capacitance and field quantities from field plots. **Laboratory Experiments:** Field plotting using resistance and impedance networks. Field plotting using the Electrolytic tank. Field plotting using the resistive paper.

Teaching/ Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on analysis and practical applications are given through experiments and using software, in which the students are expected to solve problems with critical and analytical thinking. Experiments are designed to supplement the lecturing materials so that the students are encouraged to take extra readings and to look for relevant information. Software is used to help the students to understand the physical meanings of mathematical equations.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lectures	✓	✓	
Tutorials	✓	✓	
Experiments	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Examination	60%	✓	✓	
2. Class Test	18%	✓	✓	
3. Assignment	12%	✓	✓	
4. Laboratory performance & report	10%	✓	✓	✓
Total	100%			

It is a fundamental subject of electromagnetics. The outcomes on physical concepts and analysis are assessed by the usual means of examination, assignment and test whilst those on analytical skills and problem-solving techniques, as well as technical reporting and teamwork, are evaluated by experiments, software application and the reports.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	33 Hrs.
	▪ Laboratory	6 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	9 Hrs.
	▪ Self-study	52 Hrs.
	Total student study effort	100 Hrs.

Reading List and References

Reference books:

1. W.H. Hayt and J.A. Buck, Engineering Electromagnetics, 8th Edition, Boston: McGraw Hill, 2012.
2. Nannapaneni Naraynan Rao, Elements of Engineering Electromagnetics, 6th Edition, Pearson Education International, 2006.
3. Fawwaz T. Ulaby and Umberto Ravaioli, Fundamentals of Applied Electromagnetics, 7th Edition, Pearson Education International, 2015.
4. Fawwaz T. Ulaby, Electromagnetics for Engineers, Pearson Education International, 2005.
5. Karl E. Lonngren, etc., Fundamentals of Electromagnetics with Matlab, 2nd Edition, Scitech Publishing, Inc., 2007.

June 2022

Subject Description Form

Subject Code	EE2002 / EE2002A / EE2002B
Subject Title	Circuit Analysis
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AP10006
Objectives	1. Introduce fundamental circuit theory. 2. Develop ability for solving problems involving electric circuits. 3. Develop skills for experimentation on electric circuits.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire a good understanding of fundamental circuit theory. b. Solve simple problems in electric circuits. c. Use suitable instrumentation to carry out experimental investigations to validate the theoretical investigations.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Capacitance, Inductance and First Order Transients Constitutive relations of capacitor and inductor. Energy stored in capacitor and inductor. Introduction to time-varying circuits. Simple RC and LC circuits. Important concept of independent state variables. First-order differential equation (with simple solution of exponential form). First order transient analysis. Time-domain solution and transient behaviour of first order circuits. 2. Steady-state Analysis of AC Circuits Phasors (rotating vectors). Steady-state analysis of circuits driven by single fixed frequency sinusoidal sources. Impedance and admittance. Analysis approach 1: phasor diagrams for simple RLC circuits. Analysis approach 2: systematic complex number analysis, i.e., same treatment as DC circuits but with complex numbers representing phase and magnitude of AC voltages and currents. Three-phase start connection. Three-phase delta connection. Line and phase voltage, line and phase current for three-phase circuits. Theorem of conservation of complex power. 3. Power in AC Circuits Average and rms values. Complex, real, reactive, and apparent powers. Lagging, leading power and unity power factor. Effects of poor power factor. Power factor correction. Theorem of conservation of complex power. 4. Mutual Inductance and Transformer Basic coupled inductance equation. Concept of ideal transformer (assuming sinusoidal voltages and currents). Dot convention. Transformer matching for maximum power transfer. Physical transformer as ideal transformer with leakage and magnetizing inductances. Applications in galvanic isolation and voltage/current level conversion. 5. Electrical Measurement Measurement uncertainties. Resistance measurement: Four-probe measurement and Wheatstone Bridge. Capacitance and inductance measurement using AC Bridges. Power Measurement. Measuring three-phase power by two-wattmeter method. **Laboratory Experiments:** 1. Basic Instrumentation 2. Kirchhoff's laws and the maximum power transfer theorem 3. RC and RL circuits
Teaching/ Learning Methodology	Lectures, supplemented with interactive questions and answers, and short quizzes — a, b — In lectures, students are introduced to the *knowledge* of the subject, and *comprehension* is strengthened with interactive Q&A and short quizzes. Tutorials, where problems are discussed and are given to students for them to solve — a, b — In tutorials, students *apply* what they have learnt in solving the problems given by the tutor. Laboratory sessions, where students will perform experimental verifications. They will have to record results and write reports on the experiments. — b, c — Students *acquire* hands-on experience in using electronic equipment and *apply* what they have learnt in lectures/tutorials to experimentally validate the theoretical investigations. Assignment — a, b — Through working assignment, students will develop a firm understanding and *comprehension* of the *knowledge* taught.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below

Specific assessment methods/task	% Weighting	Intended Subject Learning Outcomes to be Assessed		
		a	b	c
1. Continuous Assessment (Total 40%)				
▪ Assignment	16%	✓	✓	
▪ Laboratory works and reports	18%	✓	✓	✓
▪ Mid-semester test/Short quizzes	16%	✓	✓	
2. Examination	50%	✓	✓	
Total	100%			

	Specific assessment methods/task	Remark
	Assignment	Assignments are given to students to assess their competence level of *knowledge* and *comprehension*. The criteria (i.e. *what* to be demonstrated) and level (i.e. the *extent*) of achievement will be graded. Feedback about their performance will be given promptly to students to help them improvement their learning.
	Laboratory works and reports	Students will be required to perform three experiments and submit reports on the experiments. This is to evaluate the students' problem solving techniques, ability to apply what they have learnt, and organization skills.
	Mid-semester test/ Short Quizzes	There will be a mid-semester/short quizzes test to evaluate students' achievement of all the learning outcomes and give feedback to them for prompt improvement.
	Examination	There will be an examination to assess students' achievement of all the learning outcomes. These are mainly summative in nature.

Student Study Effort Expected	Class contact:	
	▪ Lecture	22 Hrs.
	▪ Tutorial	8 Hrs.
	▪ Laboratory	9 Hrs.
	Other student study effort:	
	▪ Revision and Assignments	43 Hrs.
	▪ Report Writing	18 Hrs.
	Total student study effort	100 Hrs.

Reading List and References

Textbook:

1. C.K. Alexander and M.N.O. Sadiku, Fundamentals of Electric Circuits, 6th Edition, New York: McGraw-Hill, 2017.

References:

1. G. Rizzoni and James Kearns, Principles and Applications of Electrical Engineering, 6th Edition, New York: McGraw-Hill, 2016.
2. W.H. Hayt, J.E. Kemmerly and S.M. Durbin, Engineering Circuit Analysis, 9th ed., New York: McGraw-Hill, 2018.
3. A.H. Robbins and W.C. Miller, *Circuit Analysis: Theory and Practice*, Thomson Learning, 5th ed., 2013.

Subject Description Form

Subject Code	EE2003 / EE2003A / EE2003B
Subject Title	Electronics
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE2003: EE2002 Pre-requisite for EE2003A: EE2002A Pre-requisite for EE2003B: EE2002B
Objectives	1. To introduce the principles and techniques used in the operations and analysis of fundamental classes of semiconductor-based electronic devices and circuits, including diodes and diode circuits, bipolar junction transistors (BJTs) and BJT amplifiers, metal-oxide-semiconductor field-effect transistors (MOSFETs) and MOSFET amplifiers as well as operational amplifiers (op-amps) and op-amp circuits. 2. To introduce the principles and techniques used in the implementation of frequency domain analysis on first-order ac circuits with sinusoidal driving sources.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Describe the operating principles of the fundamental classes of semiconductor-based electronic devices and circuits. b. Apply the appropriate techniques to analyze the fundamental classes of semiconductor-based electronic devices and circuits. c. Implement the frequency domain analysis on first-order ac circuits with sinusoidal driving sources. d. Conduct relevant laboratory experiments and report the findings with appropriate techniques and tools.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Diodes and Diode Circuits Semiconductor materials and properties. Properties of p-n junctions. Structure, operation and characteristics of p-n junction diodes. Ideal and practical p-n junction diodes. Analysis of basic diode circuits. Analysis of specific diode circuits: rectifiers, peak detectors, clippers, clampers, etc. Load line concept and analysis. 2. BJTs and BJT Amplifiers Structures, operations and characteristics of n-p-n and p-n-p BJTs. DC analysis, load line and design techniques of BJT circuits. DC biasing schemes. Basic configurations, operations and characteristics of BJT amplifiers. AC analysis, load line and design techniques. Small-signal equivalent circuits and parameters. Small-signal voltage gain, current gain, input resistance and output resistance. Loading effect. 3. MOSFETs and MOSFET Amplifiers Structures, operations and characteristics of n-channel and p-channel MOSFETs. DC analysis, load line and design techniques of MOSFET circuits. DC biasing schemes. Basic configurations, operations and characteristics of MOSFET amplifiers. AC analysis, load line and design techniques. Small-signal equivalent circuits and parameters. Small-signal voltage gain, current gain, input resistance and output resistance. Loading effect. 4. Op-Amps and Op-Amp Circuits Transistor-level diagram and basic operation of op-amps. Ideal and practical op-amp equivalent circuits and characteristics. Golden rules. Basic op-amp circuits: inverting, non-inverting, summing, difference, integrating and differentiating amplifiers. Specific op-amp circuits: voltage follower, current-to-voltage converter, voltage-to-current converter, instrumentation amplifier etc. Design applications. 5. Frequency Domain Analysis Power, voltage and current gains on linear and logarithmic scales. Concepts of "bel" and "decibel". Concepts of time t, angular frequency $j\omega$ and complex angular frequency s domains. Transfer functions in $j\omega$ and s domains. Introduction to Bode plot. Derivation of transfer functions of first-order ac circuits with sinusoidal driving sources. Implementation of Bode magnitude and phase plots. Concepts of pole and zero, corner/cutoff frequency as well as bandwidth. **Laboratory Experiments:** 1. EE2003-E01: Basic Diode Circuits. 2. EE2003-E02: BJT Circuits (PSIM simulation). 3. EE2003-E03: Op-Amp Circuits.
Teaching/ Learning Methodology	Assignments — a, b, c — Through assignments, students learn to *apply* the appropriate techniques to solve problems and *get familiarized* with the concepts they have learnt. Lectures, supplemented with interactive questions and answers — a, b, c — In lectures, students are introduced to the *knowledge* of the subject, and *comprehension* is strengthened with interactive Q&A. Tutorials, where problems are discussed and are given to students for them to solve — a, b, c — In tutorials, students *apply* what they have learnt in solving the problems given by the tutor. Laboratory sessions, where students will perform experimental verifications. They will have to record results and write a report on one of the experiments. — a, b, d — Students *acquire* hands-on experience in using electronic equipment and *apply* what they have learnt in lectures/tutorials to experimentally validate the theoretical investigations.
Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed			
		a	b	c	d
1. Assignments	16%	✓	✓	✓	
2. Mid-semester test/ Quizzes	16%	✓	✓	✓	
3. Laboratory works and reports	18%	✓	✓	✓	✓
4. Examination	50%	✓	✓	✓	
Total	100%				

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

Specific assessment methods/tasks	Remark
Assignments	Students will be given multiple assignments to evaluate their ability to apply the appropriate techniques for analysis of semiconductor-based electronic devices and circuits.
Laboratory works and reports	Students will be required to perform three experiments and submit a report on the experiments. Assessment will be based on their ability to apply what they have learnt, report organization skills, and problem-solving techniques.
Mid-semester test/ Quizzes	There will be test(s) to evaluate students' achievement of all the learning outcomes and give feedback to them for prompt improvement.
End-of-semester Examination	There will be an end-of-semester examination to assess students' achievement of all the learning outcomes. These are mainly summative in nature.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture	25 Hrs.
	▪ Tutorial	10 Hrs.
	▪ Laboratory	10 Hrs.
	Other student study effort:	
	▪ Self-study and assignments	45 Hrs.
	▪ Laboratory logbook & report writings	10 Hrs.
	Total student study effort	100 Hrs.

Reading List and References

Textbook:

1. Donald A. Neamen, *Microelectronics: Circuit Analysis and Design*, 4th ed., Boston: McGraw-Hill, 2010.

References:

1. Adel S. Sedra, Kenneth C. Smith, Tony C. Carusone, and Vincent Gaudet, *Microelectronic Circuits*, 8th international edition, NY: Oxford University Press, 2021
2. G. Rizzoni and James Kearns, *Principles and Applications of Electrical Engineering*, 6th ed., New York: McGraw-Hill, 2016.
3. W.H. Hayt, J.E. Kemmerly and S.M. Durbin, *Engineering Circuit Analysis,* 9th ed., New York: McGraw-Hill, 2018.
4. A.H. Robbins and W.C. Miller, *Circuit Analysis: Theory and Practice*, Thomson Learning, 5th ed., 2013.

Subject Description Form

Subject Code	EE2004 / EE2004A
Subject Title	Electrical Energy Systems Fundamentals
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE2004: EE2002 Pre-requisite for EE2004A: EE2002A
Objectives	1. To provide an overview of the supply, utilization, and control of electrical energy. 2. To introduce energy issues, and assist students in placing these topics and technologies in perspective.
Intended Learning Outcomes	Upon completion of the subject, students will be able: a. To master the fundamental knowledge on electrical energy systems. b. To identify, analyze, and solve technical problems using mathematics and engineering techniques. c. To be aware of equipment characteristics in modern electrical power systems. d. To be able to conduct laboratory work in teams and present the findings.
Subject Synopsis/ Indicative Syllabus	1. ***Nature of electrical energy system***: Power system definition, layout and basic components, transmission and distribution structure, role of transformers. The interconnected power system. HVDC transmission. Layout of a substation, distribution structure, overhead lines and cables, circuit breaking, protection concepts, line protection. 2. ***Generation & energy***: Principles of energy conversion, power plant and busbar layout, types of generators and turbines. Concept of generation control and operating chart. Pumped storage and wind turbine. Renewable and non-renewable sources. Sustainable development. 3. ***Basic principles:*** Concept of phasor, representation and properties of phasor. Inductive and capacitive circuit. Real and reactive power. Single and three phase systems. Per-phase analysis. Per unit system and calculation. Power factor correction. 4. ***Transformers***: Construction and operating principles. Equivalent circuits. Tests on transformers. Voltage regulation and power efficiency. Parallel operation. Three-phase transformers and phase grouping. Autotransformers and instrument transformers. 5. ***Line & cables***: Overhead line construction including transposition and bundling. Primary (RLCG) and general (ABCD) parameter calculations. Line equations and performance calculations. Corona loss and interference. Cable types and construction. Electrical stress and thermal characteristics. 6. ***Tariffs:*** Concept and structure of electricity market. Concepts of tariff design. Tariff structures. Conventional and new tariffs in different utilities. Two-part tariff, introduction to deregulation and load management concepts. **Laboratory Experiment:** Experiments on single phase transformer. Experiments on three-phase transformer. **Case study:** Intermittent energy resources and major issues with their integration into power grids Application of voltage source converter technology in power systems Smart grids and the coordination of behind-the-meter technologies (EV, PV, storage) Autonomous energy grids and their applicability in Hong Kong Offshore wind power generation, overall global potential vs. global energy demand Battery energy storage systems and their applications in power systems
Teaching/Learning Methodology	Lectures are the primary means of conveying the basic concepts and knowledge, teaching students the skills in identifying, analyzing, and solving technical problems, and providing students feedback in relation to their learning. Laboratory experiments and case studies are designed, as supplement to the lecturing materials, for students to gain practical experiences and be aware of equipment characteristics and environment issues on the modern electrical power system.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Case studies	✓	✓	✓	
Experiments			✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	
2. Class tests	18%	✓	✓	✓	
3. Lab performance and report	10%			✓	✓
4. Case studies	12%	✓	✓	✓	
Total	100%				

The outcomes on concepts, design and applications are assessed by examinations and tests whilst those on analytical skills, problem solving techniques and practical considerations of electrical energy systems, as well as team work and technical report writing abilities are evaluated by lab performance and reports, and assignment / case study reports.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Laboratory preparation / Report	9 Hrs.
▪ Case study / Self-study	52 Hrs.
Total student study effort	100 Hrs.

Reading List and References

Textbooks:

1. J. Grainger, W. D. Stevenson, Power System Analysis, McGraw-Hill, Latest edition
2. B. M. Weedy, B. J. Cory, N. Jenkins, J. B. Ekanayake, G. Strbac, Electric Power Systems, Wiley, 5th Edition, Wiley, 2012
3. M. E. El-Hawary, Electrical Energy Systems, 2nd Edition, CRC Press, 2018

Reference books:

1. H. Saadat, Power System Analysis, 3nd Edition, PSA Publishing LLC, 2011
2. A. R. Bergen, V. Vittal, Power System Analysis, 2nd Edition, Pearson, 2000
3. J.D. Glover, M. S. Sarma, T.J. Overbye, Power System Analysis and Design, 6th Edition, Cengage Learning, 2016
4. D.P. Kothari, I.J. Nagrath, Modern Power System Analysis, McGraw-Hill, 4th Edition, 2011

July 2022

Subject Description Form

Subject Code	EE2101 / EE2101B / IC2105
Subject Title	Engineering Communication and Fundamentals
Credit Value	4 Training Credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject offers a wide spectrum of fundamental engineering practices that are essential for a professional engineer. This subject includes Engineering Drawing and CAD, Industrial Safety and Electronic Product Safety Test and Practice, Basic Mechatronic Practice and Basic Scientific Computing that aims at providing fundamental and necessary technical skills to all year 1 student interested in engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Describe the principles and conventional representation of engineering drawings according to engineering standards and be able to use it as a medium in technical communication and documentation with CAD application, modelling and practice in engineering applications; b. Interpret basic occupational health and industrial safety requirements for engineering practice; c. Explain common electronic product safety tests; d. Develop a simple mechatronic system to solve an engineering problem; and e. Apply scientific computing software for basic computation, data visualisation and programming in science and engineering;
Subject Synopsis/ Indicative Syllabus	1. (TM8059) Engineering Drawing and CAD 1.1 Fundamentals of Engineering Drawing: Principles of engineering drawing, dimensioning and tolerances; types of drawings, such as part drawing and assembly drawing; conventional representation of common machine elements and parts; wiring diagram and wiring table for electrical installation; system block diagram for the electrical system; architectural wiring diagram. 1.2 Introduction to CAD Features of the 2D CAD system; 2D drawings techniques, such as basic object construction, annotation, dimensioning; setup of 2D plotting; general concepts on 3D computer modelling; parametric feature-based solid modelling; construction and detailing of solid features; concepts of assembly modelling; virtual validation and simulation, generation of 2D drawings from 3D parts and assemblies; data exchange; techniques for export files for different processes (e.g. 3D printing, laser machining, VR) 2. (TM2009) Industrial Safety 2.1. Safety Management: Overview, essential elements of safety management, safety training, accident management, and emergency procedures. 2.2. Safety Law: F&IU Ordinance and principal regulations, OSH Ordinance and principal regulations. 2.3. Occupational Hygiene and Environmental Safety: Noise hazard and control; dust hazard and control; ergonomics of manual handling. 2.4. Safety Technology: Mechanical lifting, fire prevention, dangerous substances and chemical safety, machinery hazards and guarding, electrical safety, first aid, job safety analysis, fault tree analysis, and personal protective equipment. 3. (TM1116) Electronic Product Safety Test and Practice 3.1 Use of basic electronic test instruments, current and voltage measurements, waveform measurement, power supply and signalsources; 3.2 Electronic product safety standards; electronic product test methods, such as high voltage isolation test, insulation resistance test, continuity test, leakagecurrent measurement, electrostatic discharge (ESD) Test etc. 4. (TM0510) Basic Mechatronic Practice 4.1. Definitions of mechatronics; mechatronic system design approach; key elements of a mechatronic system, such as sensor and actuator, mechanical drives, digital control, signal conditioning,and human-machine interfaces. 4.2. Introduction of design and operation of typical mechatronic systems, such as robotic arms, elevator systems, mobile robots, manufacturing and logistic system; 4.3. Design of mechatronic system using programmable controllers and development software such as PLC and Microcontroller system; use of simulation software packages to support system prototyping. **One of the following as decided by hosting programme** 5. (TM3014) Basic Scientific Computing with MATLAB 5.1. Overview of the scientific computing with MATLAB; interactive calculations, variables, vectors, matrices and string; mathematical operations, polynomial operation, data analysis and curve fitting; file I/O functions; basic 2D and 3D plots. 5.2. M-file programming & debugging; scripts, functions, logic operations, flow control; introduction to the graphical user interface. 6. (TM3300) Basic Scientific Computing with Python 6.1. Overview of the scientific computer with Python. Basic data structures and data operations; script programming and debugging; logic operations, flow control and graphical userinterfaces. 6.2. Use of functions and common Python packages for data manipulation and processing. 6.3. Data visualization by using graphics packages;
Teaching/ Learning Methodology	The teaching and learning methods include lectures, workshop tutorials, and practical works. The lectures are aimed at providing students with an overall and concrete background knowledge required for understanding key issues in engineering communication, the use of standard engineering components and systems, and the importance of industrial safety. The workshop tutorials are aimed at enhancing students' in-depth knowledge and ability in applying the knowledge and skills to complete specific tasks. The practical works aim at facilitating students to review the diverse topics covered in this course and perform active learning with research, practice, questioning, and problem-solving in a unified activity.

Assessment Methods in Alignment with Intended Learning Outcomes

Assessment Methods	% weighting	Intended Learning Outcomes Assessed				
		a	b	c	d	e
Continuous Assessment						
1. Assignments/ Project	Refer to individual Module Description Form	✓	✓	✓	✓	✓
2. Test			✓		✓	✓
3. Report/ Logbook				✓	✓	
Total	100%					

Assessment Methods	Remarks
1. Assignment / Project	Assignment are designed for students to reflect and apply the knowledge periodically throughout the training.
2. Test	Test is designed for students to review their understanding on specific topics.
3. Report / Logbook	Report / Logbook is designed to facilitate students acquiring a deep understanding of the topics of the training and to present those concepts clearly.

Student Study Effort Expected

Class Contact	**TM8059**	**TM2009**	**TM1116**	**TM0510**	**TM3014 or TM3300**
• Mini-lecture	11 Hrs.	7 Hrs.	2 Hrs.	6 Hrs.	6 Hrs.
• In-class Assignment/ Hands-on Practice	40 Hrs.	8 Hrs.	4 Hrs.	21 Hrs.	15 Hrs.
Other Study Effort					
Nil					
Total Study Effort			**120 Hrs.**		

Reading List and References

Reference Software List:

1. AutoCAD from Autodesk Inc.
2. SolidWorks from Dassault Systèmes Solidworks Corp.
3. MATLAB from The Mathworks Inc.
4. Python from Python Software Foundation

Reference Standards and Handbooks:

1. BS EN ISO 128 – Technical product documentation. General principles of representation
2. Cecil H. Jensen, et al, Engineering Drawing and Design, McGraw-Hill,2008
3. IEEE Standard 315 / ANSI Y32.2 / CSA Z99 Graphic Symbols forElectrical and Electronics Diagrams.
4. IEC 61082 Preparation of Documents used in Electrotechnology.

Reference Books:

Training material, manual and articles published by Industrial Centre.

Subject Description Form

Subject Code	EE2102 / EE2102A / IC2112
Subject Title	IC Training I (EE)
Credit Value	4 Training Credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide trainees with simulated working environments and training of industrial practices in Electrical Engineering. 2. This subject covers a wide range of fundamental electrical engineering application technology that including electrical installation practice, lighting and electrical system design, LV switchboard and power monitoring, integral building system and basic electronic practice.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. identify relevant engineering theories and principles and to apply them in hands-on training exercises to determine system feasibility; b. compare and contrast conceptual design, develop actual work sequences and methods for various electrical installations; c. recognize the engineering standards, regulations and practices to undertake the design, construction, testing and commissioning electrical distribution system in buildings. ; d. apply intelligent building control technology effectively and evaluate new building automation/intelligent control schemes; and e. apply their knowledge and skills for system analysis.
Subject Synopsis/ Indicative Syllabus	(TM0367) Lighting and Electrical System Design Interior lighting design and calculation; daylight illumination consideration; lumens and reflectors; T5, T8 and T11 lamps; energy conservation. Introduction of low-voltage power distribution system and code of practices of electrical design in Hong Kong; examine architectural drawings; design lighting and electrical services; prepare layout drawings and schematics. (TM0389) Low-voltage Switchboard and Power Monitoring, AC Control and PLC Specifications, standards and requirements of LV switchboard; IDMTL and electronic protection relays; schematic diagram, testing, commissioning and maintenance. Power monitoring and analysis, noise and harmonics; active filters and real- time capacitor bank. Introduction of programmable controller systems, sensors, actuators, drives, timers, counters, ladder logic programming and testing. (TM0380) Integrated Building Systems Proprietary and open systems (BMS, EIB and DALI); sensors and actuators; wiring circuit, scenes control; system design, programming and commissioning; intelligent building system integration.
	(TM0373) Electrical Installation and Basic Electronic Practice Wiring for conventional low voltage installations and intelligent building control systems (EIB and DALI); final lighting and power circuits, control gears and protective devices; inspection, testing. Identification of electronic circuit components, soldering and de-soldering, Dry film process, Etching process.
Teaching/ Learning Methodology	The teaching and learning methods include lectures, workshop tutorials, and practical works to convey general principles, techniques and related technologies to students. Their learning knowledge will be strengthened through the practical exercises and case studies in a problem-based format for the development of system integration skills, and to effectively apply those on real world environments.
Assessment Methods in Alignment with Intended Learning Outcomes	

Assessment Methods	% weighting	Intended Learning Outcomes Assessed				
TM0367 Lighting and Electrical System Design		a	b	c	d	e
1. Assignments	40%	✓	✓	✓		✓
2. Test	30%	✓	✓			
3. Training Report	30%	✓	✓	✓		✓
Total	100%					

Assessment Methods	% weighting	Intended Learning Outcomes Assessed				
TM0389 Low-Voltage Switchboard and Power Monitoring, AC Control and PLC		a	b	c	d	e
1. Assignment	40%	✓	✓	✓	✓	✓
2. Test	30%	✓	✓			
3. Training Report	30%	✓	✓	✓	✓	✓
Total	100%					

Assessment Methods	% weighting	Intended Learning Outcomes Assessed				
TM0383 Integrated Building Systems		a	b	c	d	e
1. Assignment	40%	✓			✓	✓
2. Test	30%	✓				
3. Training Report	30%	✓			✓	✓
Total	100%					

<table>
<tr><td></td><td>
<table>
<tr><td>Assessment Methods</td><td rowspan="2">% weighting</td><td colspan="5">Intended Learning Outcomes Assessed</td></tr>
<tr><td>TM0373 Electrical Installation and Basic Electronic Practice</td><td>a</td><td>b</td><td>c</td><td>d</td><td>e</td></tr>
<tr><td>1. Assignment</td><td>40%</td><td>✓</td><td>✓</td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>2. Test</td><td>30%</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>3. Training Report</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="5"></td></tr>
</table>
The assignment is designed to facilitate students to reflect and apply the knowledge periodically throughout the training.

Test is designed to facilitate students to review the breadth and depth of their understanding on specific topics.

Training Report is designed to facilitate students to acquire deep understanding on the topics of the training and to present those concepts clearly.
</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td colspan="2">Class Contact</td></tr>
<tr><td>▪ Lecture / Tutorial / Demonstration</td><td>32 Hrs.</td></tr>
<tr><td>▪ Workshop Practice</td><td>86 Hrs.</td></tr>
<tr><td>▪ Test</td><td>2 Hrs.</td></tr>
<tr><td>Other Study Effort</td><td>0 Hr.</td></tr>
<tr><td>Total Study Effort</td><td>120 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td>1. Training material, manual and articles published by the Industrial Centre.
2. EMSD, Code of Practice for the Electricity (Wiring) regulations, 2020 Edition
3. IET wiring regulation, 18th Edition.
4. EMSD, Code of Practice for Energy Efficiency of Building Services Installation 2021</td></tr>
</table>

July 2022

Subject Description Form

Subject Code	EE3001 / EE3001A
Subject Title	Analogue and Digital Circuits
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE3001: EE2002 and EE2003 Pre-requisite for EE3001A: EE2002A and EE2003A
Objectives	1. To familiarise students with the characteristics and operation of analogue and digital circuits for analysis and design purposes. 2. To enable students to understand the common techniques used in circuit design for combinational and sequential logic circuits. 3. To provide an appreciation of advantages and limitations of different classes of power amplifiers. 4. To enable students to analyse the operation principles of different A/D and D/A approaches and match their properties to serve the purposes of different applications. 5. To enable students to appreciate the limitations of circuit design.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Design basic digital combinational and sequential circuits. b. Given the requirements of an application, justify the use of suitable A/D or D/A converters and elaborate on the advantages and limitations of the selection. c. Compare the characteristics and operation of different classes of power amplifiers. d. Analyse operation of digital circuits and diagnose faults with basic equipment in the laboratory.
Subject Synopsis/ Indicative Syllabus	**Digital Circuits** 1. ***Digital system fundamentals*:** Boolean algebra, number systems and codes used in digital systems logic gates and their characteristics, truth tables. 2. ***Analysis and synthesis of combinational circuits*:** Simplification techniques, Don't care terms, Karnaugh maps. Implementation of large scale circuits. Static and dynamic hazards. 3. ***Digital integrated circuits*:** Digital IC families: TTL, CMOS, structure of basic logic gates, input and output V-I characteristics; transfer characteristics, switching thresholds, noise margins, power dissipation of logic gate, propagation delay, rise time, fall time. ***Sequential circuits*:** Typical structure, operation, design and applications of flip-flops. Design and analysis of synchronous sequential circuits; states and state variable: structures of registers, counters and memory units. Design of asynchronous circuits, state machines, flow tables, stable and unstable states. **Analogue Circuits** 4. ***Large-signal transistor circuits*:** Classification of power amplifiers; analysis of efficiency, power dissipation and distortion of class A, B, AB and C amplifiers. 5. ***Signal conversion*:** Voltage comparator. Sample & hold circuits. A/D and D/A converters: Weighted-resistor D/A converter; R-2R Ladder D/A converter; Parallel-comparator A/D converter; Dual slope A/D converter; Successive-approximation A/D converter; **Laboratory Experiments:** 1. EE3001-E01: Design of 2-bit Seven Segment Decoder and Ripple Counter. 2. EE3001-E02: Analog-to-Digital (ADC) and Digital-to-Analog (DAC) Converter.

Teaching/Learning Methodology	The main teaching methods used to convey the basic concepts and fundamental theories are lectures and tutorials. The assignments and laboratory sessions are used to help the students to have an in-depth understanding of the fundamentals of analogue and digital circuits and apply the fundamental theory and knowledge learned to practice.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Assignments	✓	✓	✓	
Lectures	✓	✓	✓	
Tutorials	✓	✓	✓	
Experiments	✓		✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	
2. Quizzes/Mid-term test(s)	18%	✓	✓	✓	
3. Assignments	12%	✓	✓	✓	
5. Lab Reports	10%	✓	✓		✓
Total	100%				

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

It is a fundamental circuit design subject. The outcomes on concepts, design and applications are assessed by the usual means of examination and test whilst those on analytical skills, problem-solving techniques and practical considerations of circuit design, as well as technical reporting, are evaluated by experiments, and the reports.

Student Study Effort Expected	
Class contact:	
▪ Lecture/Tutorial	30 Hrs.
▪ Laboratory	9 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	10 Hrs.
▪ Self-study and assignments	51 Hrs.
Total student study effort	100 Hrs.

Reading List and References

Textbooks:

1. Thomas L. Floyd, "Digital fundamentals", 11th Edition, Prentice Hall, 2015
2. Donald A. Neamen, "Microelectronics: Circuit Analysis and Design", 4th Edition, Boston: McGraw-Hill, 2010.

Reference books:

3. M.M. Mano, "Digital Design: With an Introduction to the Verilog HDL", 6th Edition, Prentice Hall, 2017
4. J.F. Wakerly, "Digital Design: Principles and Practices, 5th Edition, Pearson, 2018

July 2022

Subject Description Form

Subject Code	EE3002 / EE3002A / EE3002B
Subject Title	Electromechanical Energy Conversion
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE3002: EE2002 Pre-requisite for EE3002A: EE2002A Pre-requisite for EE3002B: EE2002B
Objectives	1. To provide students a general knowledge on common types of electric machines. 2. To provide students the basic techniques of steady-state electric machine analysis.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Explain the construction, operating principles, performance characteristics, control and applications of major types of rotating electric machines. b. Analyse the steady-state performance of electric machines using appropriate equivalent circuit models. c. Operate practical electric machines and to conduct relevant tests and experiments. d. Present results of electric machine studies in the form of tables, graphs, and written reports.
Subject Synopsis/ Indicative Syllabus	1. ***Introduction*:** Principles of motors and generators. Materials for electric machines. Types of electric machines and applications. Losses and efficiency. 2. ***Machine rating*:** Temperature rise and cooling methods. Heating and cooling curves. Thermal ratings. Machine nameplate. 3. ***Windings*:** Phase and commutator windings. Winding factors. E.M.F. equation. Harmonics. Production of rotating magnetic field. 4. ***D.C. machines*:** Construction. E.M.F equation. Armature reaction and commutation. Characteristics of shunt, series and compound machines. Testing. Speed control. Universal motor. Brushless d.c. motor. 5. ***Synchronous machines*:** Construction. Synchronous impedance. Voltage regulation. Synchronising. Performance on infinite busbars. Power/load angle relationship. Stability. Synchronous motor. 6. ***Induction machines*:** Squirrel cage and wound-rotor types. Equivalent circuit. Torque-slip relationship. Starting, braking and generating. Testing. Speed control. Single-phase induction motors. **Laboratory Experiments:** Load test, efficiency and speed control of a d.c. motor. Performance evaluation of a three-phase cage induction motor. Synchronous generator synchronization.

Teaching/Learning Methodology	Delivery of the subject is mainly through formal lectures and complemented by tutorials. Excel programmes are used to clarify concepts of electric machines learnt and for conducting 'what-if' analysis. Laboratory work provides students hands-on experience in operation and control of practical machines, while report-writing enables students to practise written and graphic presentation skills.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Tutorials	✓	✓		
Laboratory work		✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	✓
2. Mid-term Test	20%	✓	✓	✓	
3. Laboratory work and reports	15%		✓	✓	✓
4. Assignment	5%	✓	✓		
Total	100%				

It is a fundamental subject on electric machines and transformers. The outcomes on concepts, operating principles and applications are assessed by the usual means of assignment, tests, and examination. The outcomes on practical operation of electric machines and technical communication are evaluated by laboratory work and reports.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	33 Hrs.
	▪ Laboratory	6 Hrs.
	Other student study effort:	
	▪ Revision, self-study, and assignment	43 Hrs.
	▪ Write-up of laboratory reports	18 Hrs.
	Total student study effort	100 Hrs.

Reading List and References

Reference books:

1. M.S. Sarma And M.K.Pathak, "Electric Machines", Cengage Learning, 2012.
2. S.A. Nasar, Schaum's Outline of Theory and Problems of Electric Machines and Electromechanics, 2nd Edition, McGraw-Hill, 1998

June 2022

Subject Description Form

Subject Code	EE3003 / EE3003A / EE3003B
Subject Title	Power Electronics and Drives
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To understand the characteristics and operation of power electronics devices. 2. To expose the students to the conversion and utilization of large amount of electrical power using latest power semiconductor devices and modern control techniques. 3. To ensure the students develop an understanding of various drive systems.
Subject Intended Learning Outcomes	Upon completion of the subject, students will: a. Be able to explain major semiconductor devices that can be used as switches, and their electrical characteristics which include basic idealised models as well as extension to some important non-ideal characteristics both verbally and in written form. b. Be able to explain the processes of efficient energy conversion through the use of power semiconductor switches. c. Be able to apply the concepts of switching power conversion to analyse a variety of circuits including: i. DC to DC conversion ii. AC to DC conversion iii. DC to AC conversion d. Be able to present the results of study and experiments in the form of a technical report.
Subject Synopsis/ Indicative Syllabus	1. ***Power electronics fundamentals*:** Power conversion, energy balance principle, review of fundamentals. 2. ***Power semiconductor devices*:** Diodes**,** power transistor, MOSFET, SCR, GTO, IGBT, switching characteristics. 3. ***DC-DC converters*:** Buck, Boost and Buck-Boost DC-DC converters, duty cycle controller, switched mode power supply. 4. ***AC-DC rectifiers*:** Uncontrolled and controlled single-phase and three-phase rectifiers, terminal characteristics, supply and load interactions. 5. ***DC/AC inverters*:** Basic single-phase bridge inverters, voltage and frequency control, harmonic reduction. 6. ***Electric drive systems*:** Introduction to electric drives system, applications for conservation of energy, DC electric drives. **Laboratory Experiment:** 1. DC-DC converters 2. OrCAD simulation of power electronic circuits

Teaching/Learning Methodology	Lectures, tutorials, and assignments are effective teaching methods: 1. To provide an overview or outline of the subject. 2. To introduce new concepts and knowledge to the students. 3. To explain difficult ideas and concepts of the subject. 4. To motivate and stimulate students interest. 5. To provide students feedback in relation to their learning. 6. To encourage students responsibility for their learning by extra reference books reading and computer-based circuit simulations. Laboratory works is an essential ingredient of this subject: 1. To supplement the lecturing materials. 2. To add real experience for the students. 3. To provide deep understanding of the subject. 4. To enable students to organise principle and challenge ideas.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Assignments	✓	✓	✓	
Lectures	✓	✓	✓	
Tutorials	✓	✓	✓	
Laboratory works				✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	55%	✓	✓	✓	
2. Midterm tests/Quizzes	18%	✓	✓	✓	
3. Laboratory performance & reports	12%				✓
4. Assignments	15 %	✓	✓	✓	
Total	100%				

The understanding on theoretical principle and practical considerations, analytical skills and problem solving technique will be evaluated. Examination, class tests, assignments, laboratory sections and reports are an integrated approach to validly assess students' performance with respect to the intended subject learning outcomes.

Student Study Effort Expected	
Class contact:	
▪ Lecture/Tutorial	33 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	12 Hrs.
▪ Self-study and assignments	48 Hrs.
Total student study effort	99 Hrs.

Reading List and References	**Textbooks:** 1. Power Electronics, a First Course - Ned Mohan, Wiley, 2012 2. Muhammad H. Rashid, Power Electronics: Circuits, Devices and Applications, 3rd Edition, Prentice Hall, 2004 **Reference books:** 1. Robert W. Erickson, Fundamentals of Power Electronics, Springer, 3rd edition, 2020 2. Bimal K. Bose, Power Electronics and Variable Frequency Drives: Technology and Applications, IEEE Press, 1997 3. Philip T. Krein, Elements of Power Electronics, Oxford University Press, 1998 4. R. Krishnan, Electric Motor Drives: Modeling, Analysis, and Control, Prentice-Hall, 2001 5. Ned. Mohan, Electric Drives: An Integrative Approach, Minnesota Power Electronics Research & Education, 2003

July 2022

Subject Description Form

Subject Code	EE3004 / EE3004A
Subject Title	Power Transmission and Distribution
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE3004: EE2004 Pre-requisite for EE3004A: EE2004A
Objectives	To introduce students to the fundamental knowledge which is essential for electrical power engineers. It leads to a deeper insight into the design, planning, operation, equipment characteristics and environmental impacts of modern electrical power systems.
Subject Intended Learning Outcomes	Upon completion of the subject, students will: a. Have acquired the fundamental knowledge and analytical techniques on electrical power systems. b. Be able to identify, analyze, and solve technical problems in power system design, planning, and operation, making use of mathematics and engineering techniques. c. Be able to work in teams when conducting laboratory investigations.
Subject Synopsis/ Indicative Syllabus	1. ***Reactive power and voltage control*****:** Voltage drop and power loss calculation. Voltage control using tap-changing and booster transformer, regulator, series and shunt compensation. Reactive power flow. Power factor improvement. 2. ***Surges*****:** Travelling wave, surge impedance and standing voltage. Lightning and switching surges. Surge mitigation, reflection and refraction. Use of lattice diagram. Protection against overvoltage. 3. ***Fault analysis*****:** Use of per unit notation. Balanced 3-phase fault calculation. Fault current limiting concepts. Unbalanced fault calculation by symmetrical components method including line-to-ground, line-to-line, and double-line-to-ground faults. Sequence current and voltage measurements. 4. ***Switchgear and protection*****:** Construction and application of different types of switching devices. Arc extinction and transient recovery voltages. AC and DC current interruption, current chopping. Role and component of protection systems. Coordination, selection and zoning of protection. Overcurrent relays. Differential and distance protection schemes. **Laboratory Experiment(depending on equipment availability etc):** • Voltage regulation and reactive power compensation for short and medium length transmission lines. • Static and electromechanical current measuring relays. • Studies of surges on transmission lines. • Symmetric and Asymmetric fault using interactive package "Powerworld". • Symmetrical components. • Effects of different earthing methods in distribution system. • Grading of overcurrent relays.

Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on system analysis, design and practical applications are given through experiments, in which students are expected to solve the power system design, planning, and operation problems with practical constraints and to attain pragmatic solutions with critical and analytical thinking. Experiments are designed to supplement the lecturing materials so that students are encouraged to take extra readings and to look for relevant information.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lectures	✓	✓	
Tutorials	✓	✓	
Experiments			✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Examination	62%	✓	✓	
2. Class tests	18%	✓	✓	
3. Lab performance and report	10%		✓	✓
4. Assignments	10%	✓	✓	
Total	100%			

The outcomes on concepts, design and applications are assessed by the usual means of examination, tests and assignments. Experiments and written reports assess those on analytical skills, problem-solving techniques and practical considerations of power system design, as well as technical reporting and teamwork.

Student Study Effort Expected	
Class contact:	
▪ Lecture/Tutorial	33 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	9 Hrs.
▪ Self-study	52 Hrs.
Total student study effort	100 Hrs.

Reading List and References

Textbooks:

1. C.R. Bayliss and B.J. Hardy, Transmission and Distribution Electrical Engineering, Oxford, 4th Edition, 2012
2. W.D. Stevenson, Elements of Power System Analysis, McGraw Hill, 4th Edition, 1982
3. B.M. Weedy, Electric Power Systems, Wiley, 5th Edition, 2012

Reference Books:

1. L. Grigsby, Electric Power Generation, Transmission and Distribution, Electric Power Engineering Handbook, 3rd Edition, CRC Press, 2012
2. A.R. Bergen and V. Vittal, Power System Analysis, Prentice Hall, 2nd Edition, 2000
3. T. Gönen, Modern Power System Analysis, 2nd Edition, CRC Press, 2013

June 2022

Subject Description Form

Subject Code	EE3005 / EE3005A / EE3005B
Subject Title	Systems and Control
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AMA2111
Objectives	1. To introduce the principles and techniques used in the analysis and design of control systems. 2. To provide the foundation for the later subjects in the areas of power systems, drives and control.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Analyse the stability, transient response and steady-state response of continuous time systems. b. Design compensators and controllers for control systems. c. Model systems using block diagram and signal flow graph and evaluate the properties of the overall systems. d. Write technical reports and present the findings.
Subject Synopsis/ Indicative Syllabus	1. ***Introduction to control system analysis*****:** Open-loop control systems, Closed-loop control systems, Effects of feedback, Examples of control systems. 2. ***Mathematical modelling of dynamic systems*****:** Electrical and electro-mechanical system components, Transducers and actuators, Laplace transform, Transfer functions. Differential equation, State space, Transfer functions, Block diagram, Signal flow graphs, Mason's formula 3. ***Time domain analysis of linear systems*****:** First-order systems, Second-order systems, Transient response, Steady-state response, Routh-Hurwitz stability criterion. Root-locus analysis 4. ***Frequency domain analysis of linear systems*****:** Frequency response, Bode Diagrams, Gain margin and phase margin, Polar plots, Nyquist stability criterion, Nichols plots. 5. ***Compensators and PID controllers:*** Compensators, PID controllers, Controller tuning. Ziegler-Nichols tuning, Model-based tuning, internal mode control. Sensitivities and Design Tradeoffs 6. ***Common Challenges*****:** Fuzzy control, neural network control, AI control. **Laboratory Experiment:** PID control Fuzzy controller

Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiments are designed to supplement the lecturing materials. The students are encouraged to take extra readings and to look for relevant information.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Tutorials	✓	✓	✓	
Experiments	✓	✓		✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	
2. Class test	15%	✓	✓	✓	
3. Laboratory reports	15%	✓	✓		✓
4. Assignment	10%	✓	✓	✓	
Total	100%				

The outcomes on analysis and design are assessed by the usual means of examination and tests whilst those on technical reporting and presentation are evaluated by the experiments and reports.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	33 Hrs.
	▪ Laboratory	6 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study, revision and assignment	49 Hrs.
	Total student study effort	100 Hrs.

Reading List and References

Reference books:

1. M.F. Golnaraghi and B.C. Kuo, Automatic Control Systems, 10th Edition, Prentice-Hall, 2017
2. R.C. Dorf and R.H. Bishop, Modern Control Systems, 14th Edition, Pearson, 2022
3. M. Gopal, Control Systems: Principles and Design, 4th Edition, McGraw-Hill, 2012

July 2022

Subject Description Form

Subject Code	EE3006 / EE3006A
Subject Title	Analysis Methods for Engineers
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AMA2111
Objectives	1. To familiarize students with the essential numerical techniques and operations research methods which are applicable in most engineering problems. 2. To enable students to analyze the advantages and limitations of the commonly adopted numerical techniques and operations research methods. 3. To prepare students for tackling practical engineering problems, with a combination of strong theoretical background and sound analysis methods.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Match the numerical methods and operations research techniques with the corresponding mathematical theories and compare their advantages and limitations. b. Given an engineering problem, justify the application of an appropriate technique, formulate the solution process and evaluate the results. c. Analyze essential features of different engineering problems in engineering. d. Apply computer software to implement iterative numerical algorithms. e. Write technical reports and present the findings in logical and organised manner.
Subject Synopsis/ Indicative Syllabus	1. ***Basics*:** Error propagation, numerical stability, solutions by iterations, Newton's method, finite difference and interpolation, Lagrange interpolation; solution of non-linear simultaneous equation; numerical differentiation and integration. 2. ***Differential equations*:** Numerical solutions of ordinary differential equations, Euler and Runge-Kutta methods, convergence and stability; finite difference methods for partial differential equations, boundary value problems. 3. ***Operations research*:** Linear programming, simple Simplex algorithms, sensitivity analysis, shortest path and maximum flow problems, integer programming, combinatorial optimisation problems, applications in power systems and transportation. 4. ***Optimisation***: Direct search and simple gradient methods; optimisation with constraints. 5. ***Probability and statistics:*** Random variables, probability distributions, sample distributions and means, Central Limit Theorem, significance and hypothesis testing, stochastic processes. **Laboratory Experiments:** • Numerical analysis and algorithm implementation through Matlab • Numerical evaluation of partial differential equations of voltage or heat distribution in electrical systems

Teaching/Learning Methodology	Basic concepts and theories are taught in lectures and tutorials. When conducting the experiments, the students are expected to solve practical problems with critical and analytical thinking. Interactive assignments and on-the-spot discussions are conducted in both lectures and laboratory sessions. Experiments are designed so that the students should use the references in the instruction sheets to look for the supplementary information.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	✓	✓	✓	✓	
Tutorials	✓	✓	✓	✓	
Experiments				✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	60%	✓	✓	✓		
2. Tests	18%	✓	✓	✓		
3. Assignments	12%	✓	✓	✓	✓	
4. Laboratory performance & reports	10%				✓	✓
Total	100%					

The outcomes on concepts, design and applications are assessed by the usual means of examination and tests. The outcomes on analytical skills, problem-solving techniques, technical reporting and teamwork, are evaluated by experiments and the reports.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	33 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	12 Hrs.
▪ Self-study and assignments	49 Hrs.
Total student study effort	100 Hrs.

Reading List and References

Reference books:

1. J.H. Mathews, Numerical methods using MATLAB, Pearson Prentice Hall, 2004
2. S.C. Chapra, Applied numerical methods with MATLAB for engineers and scientists, McGraw Hill, 2008
3. F.S. Hillier, Introduction to operations research, McGraw Hill, 2005
4. A.V. Balakrishnan, Introduction to random processes in engineering, John Wiley & Sons, 2005
5. R.E. Walpole, R.H. Myers, S.L. Myers and K.Y. Ye, Probabilities and Statistics for Engineers and Scientists, Prentice Hall, 2002

July 2022

Subject Description Form

Subject Code	EE3007 / EE3007A
Subject Title	Computer System Principles
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ENG2002
Objectives	1. To enable students to establish a broad knowledge of the organization of a computer system and internal architecture of a microprocessor 2. To enable students to understand software development for embedded systems 3. To enable students to utilize a microprocessor or microcontroller to solve engineering problems.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Given specifications of an application, design the software and hardware to carry out the necessary operations based on a microprocessor or a microcontroller. b. Understand advanced features of the latest microprocessors and understand functions of basic computer peripherals. c. Understand the basic assembly language programming d. Think logically and be able to analyze data as well as present results in writing.
Subject Synopsis/ Indicative Syllabus	**Computer Systems Hardware and Operations** 1. ***Microprocessor operations and its internal architecture*:** Operations of various registers, buses and data path, operations of ALU, arithmetic hardware, and general pipeline architecture. 2. ***Memory organization*:** Characteristics of memory technologies. Memory hierarchies and memory decoding mechanism. 3. ***Input and output systems*:** Direct I/O system and memory mapped I/O, interrupt and polling mechanisms. Protocols for serial data communications. 4. ***Introduction to embedded computing systems*:** System organization and design of input/output system. Programming software for embedded systems. 5. ***Introduction to assembly language programming*** **Laboratory Experiment:** Install and setup of an operating system for an embedded system Perform basic input/output operations of an embedded system by Python programming. Control of different types of devices using a credit card size computer.
Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design, practical applications and programming are given through experiments, in which the students are expected to solve design problems with real-life constraints and to attain feasible solutions with critical and analytical thinking. Interactive laboratory sessions are introduced to encourage better preparation and hence understanding of the experiments. On-the-spot assessments are conducted in the laboratory to provide additional incentives for student's learning. Experiments are designed to supplement the lecturing materials, especially in Python programming, so that the students are encouraged to take extra readings and to look for relevant information.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Tutorials	✓	✓	✓	
Experiments	✓		✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	✓
2. Mid-term quiz	15%	✓		✓	
3. Laboratory performance & report	15%	✓			✓
4. Online assignments and in-class activities	10%	✓		✓	✓
Total	100%				

It is a fundamental computer architecture subject. The outcomes on concepts, design and applications are assessed by the usual means of examination and test whilst those on analytical skills, problem-solving techniques and practical considerations of programming, as well as technical reporting are evaluated via experiments, and the report.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	30 Hrs.
▪ Laboratory	9 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	11 Hrs.
▪ Self-study	50 Hrs.
Total student study effort	100 Hrs.

Reading List and References

Textbooks:

1. C. Hamacher, Z. Vranesic, S. Zaky, and N. Manjikian, Computer Organization and Embedded Systems, 6th Edition, McGraw-Hill, 2012
2. J.L. Hennessy and D.A. Patterson, Computer Architecture: A Quantitative Approach, 6th Edition, Elsevier, 2019
3. A. Tanenbaum, T. Austin, Structured Computer Organization, Pearson India, 6th Edition, 2016.

Reference books and online materials

1. A.K. Ray, Advanced Microprocessors & Peripherals, McGraw-Hill, 2006
2. A.B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd ed., O'Reilly, 2015
3. S. Monk, Programming the Raspberry Pi Getting Started with Python, McGraw Hill, 2016
4. https://www.raspberrypi.org/documentation/usage/python/

July 2022

Subject Description Form

Subject Code	EE3008 / EE3008A / EE3008B
Subject Title	Linear Systems and Signal Processing
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Exclusion of EE3008B: EE3011B
Objectives	To provide an introduction to the fundamentals of linear systems, frequency domain analysis with applications to telecommunication systems.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the fundamentals of signals and linear systems. b. Understand and analyze problems in different disciplines of engineering (with an emphasis on communication systems) under the framework of signals and linear systems c. Understand the characteristics, operating principles, performance metrics and limitations of some typical telecommunication systems.
Subject Synopsis/ Indicative Syllabus	1. ***Signal representation and analysis:*** Mathematical representation of a signal; time-domain representation. Classification of signal and systems; Special functions. Linear and Time-Invariant Systems; Convolution; 2. ***Fourier series and Fourier Transforms:*** Complex exponentials; Frequency domain representation of signals; Fourier Series; Fourier transform; Fourier Transform pairs; Fourier Transform properties; Parsavel's theorem; Transfer functions; filters. Applications to music, electromagnetic radiation and imaging; 3. ***Sinusoidal carrier modulation:*** Amplitude and frequency modulation; Operating principle; Double side-band suppressed carrier, single side-band; Frequency division multiplexing; generation and detection circuitry; Modulation system performance comparison. 4. ***Pulse modulation:*** Sampling theorem. Pulse amplitude modulation. Time division multiplexing. Pulse code modulation: quantization, encoding. Quantization noise. Differential pulse code modulation. Delta modulation. Pulse amplitude modulation; Pulse width modulation; 5. ***Digital communications:*** Digital transmission. Intersymbol interference; Eye diagram. Digital carrier modulation; Pulse shaping; modulation format and spectral efficiency; probability and random variables; bit error ratio (BER) characterization and system performance. 6. ***Introduction to copper-wire, wireless and optical fiber communications:*** channel characterization; Electromagnetic radiation in wireless systems; multi-path interference; Light sources in optical communication systems. Light transmission in optical fibers. Light detection. Communication networks; Current research trends and challenges. **Laboratory Experiments:** 1) Transfer function characterization of copper wires 2) Matlab Exercise

Teaching/Learning Methodology	The main teaching methods used to convey the basic concepts and fundamental theories are lectures and tutorials. The laboratory sessions are used to help the students to have an in-depth understanding of the fundamentals of telecommunication systems and apply the theory learned to practice.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lectures	✓	✓	
Tutorials	✓	✓	
Experiments	✓		✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Examination	50%	✓	✓	
2. Class tests	25%	✓	✓	
3. Laboratory	10%	✓		✓
4. Homeworks or in-class quizzes	15%	✓	✓	
Total	100%			

The outcomes on understanding the fundamentals of telecommunication systems and their characteristics are mainly assessed by examination, test and exercises, whilst the capability of applying theory to practice is evaluated through the laboratory work.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	33 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	6 Hrs.
▪ Self-study	54 Hrs.
Total student study effort	99 Hrs.

Reading List and References

Reference books:

1. A.V. Oppenheim and A. S. Willsky, "Signals and systems," 2nd Edition, Prentice Hall, 2014.
2. B.P. Lathi and Zhi Ding, Modern Digital and Analogue Communication Systems, 4th Edition, Oxford University Express, 2009.
3. J.M. Senior, Optical Fiber Communications: Principle and Practice, 3rd Edition, Prentice Hall, 2009
4. J. G. Proakis and M. Salehi, "Digital Communications," 5th Edition, McGraw-Hill, 2007.

June 2022

Subject Description Form

Subject Code	EE3009 / EE3009A
Subject Title	Electrical Services in Buildings
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE3009: EE2002 Pre-requisite for EE3009A: EE2002A
Objectives	1. To enable students to understand the major design features, operating characteristics and functions of electrical and electronic equipment used in building services. 2. To enable students to implement technical data, regulations, standards and guidance notes prepared by statutory bodies in the design of reliable, safe and efficient electrical power distribution, lightning protection, vertical transportation, lighting and fire fighting systems in buildings.
Subject Intended Learning Outcomes	Upon completion of the subject, students will: a. Be able to plan efficient, safe and high quality distribution systems for domestic, commercial and industrial buildings. b. Be proficient to assess the suitability of different vertical transportation systems and fire fighting systems for buildings. c. Be able to design and evaluate the effectiveness of lightning protection systems. d. Be able to integrate the lighting requirements and operating characteristics of light sources to the design of interior lighting and exterior lighting. e. Be able to search for information in solving technical problems.
Subject Synopsis/ Indicative Syllabus	1. ***Power distribution in buildings*:** System planning. Incoming supply arrangement for domestic, commercial and industrial installations. Economics of HV/LV distributions. Tariffs, maximum demand, load factors and diversity. Earthing systems. Applications of standby generator sets and uninterruptible power supplies. 2. ***Requirements for safe design*:** Overview of Supply Rules and Regulations. Electric shock, overcurrent and earth fault protection. Fuse, MCB, MCCB, ACB design and selection criteria. Co-ordination of protection systems. Cable and wiring systems design. 3. ***Interference and power quality*:** Installation requirements, grouping, interference, noise suppression and power supply in communication systems. Electromagnetic compatibility. Harmonics and voltage dips issues. 4. ***Lightning protection systems*:** Lightning phenomena. Estimation of exposure risk. Requirements for system components. Standards for protection of structures against lightning. 5. ***Vertical transportation systems*:** Lift. Hoist and escalator drives. Safety requirements and drive characteristics. Grade of service and round trip time. 6. ***Lighting*:** Characteristics of light sources. Classification of luminaries. Lighting control. Interior lighting design. Glare index calculation. Color rendering. Utilization of daylight. Exterior lighting design. 7. ***Fire Fighting Systems*:** Outline, regulations, requirements and components of fire fighting systems. Fire sprinkler systems. Heat and smoke detector systems. Fire-fighting gases.

	Case Study: 1. Distribution systems design for typical buildings in Hong Kong 2. Applications of overcurrent and earth fault protection 3. Co-ordination of various types of protective devices 4. Electrical power quality issues in building services 5. Lightning protection systems design 6. Interior lighting and exterior lighting designs 7. Fire protection for domestic, commercial and industrial buildings
Teaching/Learning Methodology	In lectures and tutorials, materials that emphasize practical problem-solving methods are balanced with materials that emphasize fundamental understanding. Students are expected to take initiative to learn through the process of engagement and participation in lectures and tutorial sessions. Practical designs used in industry, where appropriate, are discussed interactively in class. Mini-Projects are used to enhance students learning experiences and practical applications. They provide students with the opportunity to develop independent design/planning and technical report writing skills pertinent to the field of electrical services in buildings.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	✓	✓	✓	✓	
Tutorials	✓	✓	✓	✓	
Mini-projects	✓	✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	60%	✓	✓	✓	✓	
2. Mid-term Test	18%	✓	✓	✓	✓	
3. In-class Quiz	4%	✓	✓	✓	✓	
4. Mini-project & report	18%	✓	✓	✓	✓	✓
Total	100%					

The subject outcomes on planning, design, effectiveness evaluation of electrical services in buildings are assessed by means of examination, quizzes and tests. The outcomes on engineering skills, applications, problem solving techniques, as well as technical writing, are evaluated by mini-project and reports.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	39 Hrs.
	Other student study effort:	
	▪ Mini-project discussion/report	20 Hrs.
	▪ Self-study	41 Hrs.
	Total student study effort	100 Hrs.

Reading List and References

Textbooks and Reference books:

1. R. Barrie, Design of Electrical Services for Buildings, Routledge, 4th edition, 2005
2. G. Stokes, J. Bradley, A Practical Guide to the Wiring Regulations: 17th Edition IEE Wiring Regulations (BS 7671:2008), Wiley-Blackwell, 4th edition, 2009
3. G.C. Barney, Elevator Traffic Handbook: Theory and Practice, Routledge, 2nd edition, 2016
4. The SLL Lighting Handbook, The Society of Light and Lighting, Chartered Institution of Building Services Engineers, 2018
5. F. Hall, Building Services Handbook, Routledge, 9th edition, 2017

June 2022

Subject Description Form

Subject Code	EE3010 / EE3010A / EE3010B
Subject Title	Summer Practical Training
Credit Value	3 training credits (not counted towards GPA)
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To give students an exposure to the industrial/engineering working environments before they complete their program of study. 2. To explore and extend their understanding of engineering study in a broader perspective. 3. To enrich students' all-round and global learning experience.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Develop and deliver a report for presenting learning experiences and outcomes. b. Demonstrate the awareness of the practical contexts in engineering. c. Appreciate the work of others in an industrial or engineering sector. d. Demonstrate good working practices to show a developing maturity and sense of responsibility.
Subject Synopsis/ Indicative Syllabus	**INDICATIVE CONTENT** In order to ensure that students have useful experience, the summer practical training must be suitably chosen and properly organized. Students are expected to carry out a minimum of 6 weeks full-time (or equivalent) industrial training. Students are required to indicate the expected learning outcomes prior to the commencement of their placement, as well as to submit a report on the learning outcomes and achievements. Accordingly, the following learning support activities will be coordinated. **(I) Orientation** Students should start their preparatory work by the commencement of the second semester **usually at their third-year of study**. An orientation will be provided for the following: ◆ Basic skills in undertaking practical training ◆ Planning and scheduling for successful completion of assessment instruments ◆ Information on searching national/international work-base employment, attachments etc. **(II) Progress Monitoring** During the training period, students should maintain a training journal to record their progress. The journal may include: ◆ **Location**: Summarize where practical training took place and where the work team fits into the overall host organization. ◆ **Responsibilities**: Describe the actual responsibilities. Explain the role in terms of the mission of the immediate work team. ◆ **Skills and Knowledge**: Describe the skills and knowledge needed to fulfill the work responsibilities. Describe how the knowledge and skill set evolved during the work experiences. Explain how these are relevant to the academic studies and future goals. ◆ **Outcome**: Describe the placement experiences and major achievements with concrete examples.

	(III) Learning Evaluation After the completion of practical training, students are required to submit a report about the work experience. It provides an opportunity for the student to reflect upon the learning gained at the work site. The framework of the report includes: ◆ A summary of the report. ◆ Detail description of activities carried out during the placement, minimum 6 pages. ◆ A self-reflection: students articulate their thinking about each piece in the report, as well as on the entire report. Through this process of reflection, students draw connections between work experience and university-based learning, construct new knowledge, and become increasingly aware of themselves as learners. ◆ Conclusion: after reflection on their workplace experience, students set goals and directions for future learning. ◆ **Examples of valid industrial placement** ◆ Full-time placement in a suitable organization for 6 weeks. ◆ Assisting in PolyU activities that have an external collaboration or service component such as, Innovation and Technology Fund projects, IGARD projects, high-level consultancy projects, collaborative research projects that were undertaken with external organizations, jobs undertaken by the Industrial Centre as a service for an external organization. ◆ Placement within the IAESTE (International Association for the Exchange of Students for Technical Experience) Programme in which the student is attached to a workplace abroad during the training. ◆ The student works on his/her final-year degree project which involves an industrial partner or external client. The student need not be placed in the company but make frequent visits to ensure that the project will meet the specifications required by the company/client.
Teaching/Learning Methodology	Through on-the-job work placements, students learn to connect classroom theory with practical workplace applications, prepare themselves for the realities of workplaces and develop their generic skills in a real working environment. In addition to the orientation, students consult with teaching staff on a one-to-one basis. Teaching/Learning Methodology — Outcomes: a / b / c / d Industrial placement: ✓ / ✓ / ✓ / ✓
Assessment Methods in Alignment with Intended Learning Outcomes	Specific assessment methods/tasks — % Weighting — Intended subject learning outcomes to be assessed (a / b / c / d) 1. Placement Report — 100% — ✓ / ✓ / ✓ / ✓ 2. Placement Questionnaire (Compulsory item) — 0% — / ✓ / ✓ / ✓ The outcomes on this subject are assessed by means of student learning report as well as questionnaire to industrial supervisors.
Student Study Effort Expected	Class contact: N/A Other student study effort: Industrial Placement: 6 weeks ▪ Total student study effort: 6 weeks
Reading List and References	Information available in the CAPS website https://www.polyu.edu.hk/sao/careers-and-placement-section/career-development/

July 2022

Subject Description Form

Subject Code	EE4003 / EE4003A
Subject Title	Electrical Machines
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE4003: EE3002 Pre-requisite for EE4003A: EE3002A
Objectives	1. After completing an elementary subject on electromechanical energy conversion, the students are exposed to more challenging topics such as electrical machine design methods, transient and unbalanced operations of electrical machines in this course. 2. This course is designed to ensure the students developing an in-depth understanding of various drive systems in industry. 3. To give the knowledge of various electrical machines such as power electronic driven AC motors.
Subject Intended Learning Outcomes	Upon completion of the subject, students will: a. Have acquired a good understanding of the basic design methods of electric machines. b. Have had experience in synchronous machines including load characteristics, oscillations equations, and displacement stability. c. Be able to analyse the unbalanced and dynamic operation, and condition monitoring for single and 3-phase induction machines. d. Be able to understand the drives for induction machines and their harmonics analysis for drives. Be aware of various switched-mode driven machines. e. Be capable to understand the control method for induction machines including closed loop and vector control.
Subject Synopsis/ Indicative Syllabus	1. ***Appreciation of machine design*:** Appreciation of basic technological factors. Main dimensions. Electric loading and magnetic loading. Magnetic circuit. Magnetomotive force produced in windings. 2. ***Reactances of AC machines and transformation*:** Inductance parameters. Winding Transformation. Circuit equations, conversion process. Electromagnetic torque, equation of motion. 3. ***Synchronous machines*:** Load characteristics of isolated generator. Linearized equations of small oscillations. Natural frequency. 4. ***Induction machines*:** Basic circuit model of induction motor. Performance analysis of single- and three-phase induction machines. Unbalanced operation. Dynamic Operation. Temperature-rise tests. 5. ***Drives for induction machines*:** Induction motor drives fed from PWM inverters. 6. ***Control of machines*:** Open loop and closed loop control. Concept of vector control, torque control. **Laboratory/Mini-project Experiments:** The students are required to team up to work on laboratory session or mini-project. The mini-project is problem-based learning type and they are required to research for information, and do the design and analysis on the topics selected.

Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on analysis, control, design and practical applications are given through mini-projects, in which the students are expected to solve design and control problems with real-life constraints and to attain pragmatic solutions with critical and analytical thinking. The mini-projects are designed to supplement the lecturing materials so that the students are encouraged to take extra readings and to look for relevant information.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	✓	✓	✓	✓	✓
Tutorials	✓	✓	✓	✓	✓
Mini-projects	✓	✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	60%	✓	✓	✓	✓	✓
2. Class test	24%	✓	✓			
3. Mini-project & report	16%	✓	✓	✓	✓	✓
Total	100%					

This subject discusses the specific topics of electrical machines. The outcomes on concepts, design and applications are assessed by usual means of examination and test whilst those on analytical skills, problem-solving techniques and practical considerations of electrical machine design, analysis and control, as well as technical reporting and teamwork, are evaluated by mini-project and the reports.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	36 Hrs.
	▪ Laboratory/Mini-project	3 Hrs.
	Other student study effort:	
	▪ Mini-project/report	15 Hrs.
	▪ Self-study	48 Hrs.
	Total student study effort	102 Hrs.

Reading List and References

Reference books:

1. B.K. Bose, Power Electronics and AC Drives, Prentice-Hall, 2002
2. P. Vas, Vector control of AC machines, Clarendon Press: Oxford University Press, 1990
3. D.W. Novotny and T.A. Lipo, Vector control and dynamics of AC drives, Oxford University Press, 1996
4. D. Hanselman, Brushless Permanent Magnet Motor Design, The Writers' Collective, 2003
5. Haitham Abu-Rub, Atif Iqbal, Jaroslaw Guzinski, High performance control of AC drives with MATLAB/Simulink models, Wiley, 2012

June 2022

Subject Description Form

Subject Code	EE4004 / EE4004A / EE4004B
Subject Title	Power Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE4004: EE3004 Pre-requisite for EE4004A: EE3004A Pre-requisite for EE4004B: EE3004B
Objectives	1. To provide students with a sound knowledge of modern power systems that is essential for the understanding of the operation and control of power systems. 2. To provide a continuation of study of power systems in level 3 subject EE3004A/B "Power Transmission and Distribution" and lead to more advanced topics of power systems study in final year electives.
Subject Intended Learning Outcomes	Upon completion of the subject, students will: a. Have acquired in-depth understanding of power system analysis, stability and operation. b. Have acquired skills in identification, formulation and solution of power system analysis, operation and control problems. c. Have acquired ability to evaluate the design and operational performance of basic power systems. d. Have acquired skills in presentation and interpretation of experimental results and communication with others in a team environment.
Subject Synopsis/ Indicative Syllabus	1. ***Power flow analysis*****:** Load flow concepts and formulation. Solution methods, including Gauss-Seidel, Newton-Raphson and Fast Decoupled Methods. Applications of load flow study to system operation. 2. ***Economic operation*****:** Generation costs. Equal incremental cost. B coefficients. Penalty factor. Multi-area coordination. Unit commitment. AGC and coordination. 3. ***Power system control*****:** Generator control systems. Speed governor systems. Load sharing. Load frequency control. Interconnected area system control. Voltage control loop. Automatic voltage regulator. AVR models and response. 4. ***Power system stability*****:** Steady state and transient stability. Equal area criterion. Time domain solution of swing curves. Multi-machine stability. Stability improvement. Excitation and governor control effects. Dynamic equivalents. 5. ***Power system operation*****:** Power system control functions. Security concepts. Scheduling and coordination. Supervisory control and data acquisition. Computer control, communication and monitoring systems. Man-machine interface. Load forecasting. Energy management systems. **Laboratory Experiment:** Power system load flow and security operation simulation. Transient stability assessment of power system.

Teaching/Learning Methodology	Lectures are the primary means of conveying the basic concepts and theories. Experiences on system analysis, design and practical applications are given through experiments and mini-projects, in which students are required to solve the power system planning, operation and control problems with practical constraints and to attain pragmatic solutions with critical and analytical thinking. Experiments and mini-projects are designed to supplement the lecturing materials and encourage students to take extra readings and practice specialty software tools for power system planning, operation and control.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Mini-projects	✓	✓	✓	✓
Experiments			✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	
2. Class tests	18%	✓	✓	✓	
3. Lab performance and report	10%			✓	✓
4. Mini-project and report	12%	✓	✓	✓	✓
Total	100%				

This comprises an examination, class tests, written assignment in the form of laboratory report and mini-project report. Examination and tests assess the technical competence of students in power system analysis methods and methods of power system operation and control whilst written reports assess the students' ability to apply the theories learned in class to practical experiments, to interpret the experimental results obtained and to communicate in written form.

Student Study Effort Expected	
Class contact:	
▪ Lecture	33 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Laboratory preparation / report	9 Hrs.
▪ Mini-project / self-study	52 Hrs.
Total student study effort	100 Hrs.

Reading List and References

Reference Books:

1. J. Grainger, W. D. Stevenson, Power System Analysis, McGraw-Hill, 1994
2. B. M. Weedy, B. J. Cory, N. Jenkins, J. B. Ekanayake, G. Strbac, Electric Power Systems, 5th Edition, Wiley, 2012
3. H. Saadat, Power System Analysis, 3nd Edition, McGraw Hill, 2010
4. A. J. Wood, B. F. Wollenberg, G. B. Sheble, Power Generation, Operation and Control, 3rd Edition, Wiley, 2014
5. A. Gomez-Exposito, A. J. Conejo, C. Canizares, Electric Energy Systems: Analysis and Operation , CRC Press, 2009

July 2022

Subject Description Form

Subject Code	EE4006 / EE4006A / EE4006B
Subject Title	Individual Project
Credit Value	6
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: The student should have completed most of the subjects required in previous years of the programme before taking this subject.
Objectives	To provide an opportunity for students: 1. to apply specialized professional engineering knowledge independently in the creative design, implementation, managing and evaluation of an engineering project, and 2. to identify key engineering problems, to solve them and to communicate the findings in an oral and written report format.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able: a. To apply specialized knowledge independently. b. To identify key engineering problems, to solve them and to communicate what is achieved orally and in a written report. c. To develop a project which is creative, rich in intellectual content and sufficiently challenging. d. To monitor the progress of a project from concept to final implementation and testing, through problem definition and the selection of alternative solutions. e. To synthesize and apply their knowledge and analytical skills gained in various engineering domains. f. To build self confidence, demonstrate independence, and develop professionalism by successfully completing the project in a competent manner.
Subject Synopsis/ Indicative Syllabus	**Choice of Project** Projects are proposed by staff or by an industrial partner. Projects may also be jointly proposed by student and staff. Industrial experience, research and consultancy activities are fertile ground for ideas. **Project Plan** At the beginning of the project, students are required to submit a clear project proposal. The plan should not be too long but should cover such items as: – an abstract – problem statement and objectives – brief literature research – initial problem identification – preliminary suggestion on methodology – preliminary time schedule and milestones of the project – cost estimate and references **Interim Progress Report and Presentation** At about the midpoint of the project, students should have executed their projects for a few months and they need to submit an Interim Progress Report and carry out a presentation to summarize their progress. This gives the supervisor and an assessor a formal opportunity than at discussions to indicate his/her assessment of student's progress and to eliminate discrepancies if necessary.
	Final Project Report A good project schedule includes adequate time for preparing a report of an appropriate standard. The final report should be submitted in Week 10 of the Second Semester. This will be given to the Assessment Panel (see Assessment below) for understanding of the student's work and for assessment purpose. To ensure that the project report is prepared properly and with appropriate standard, students must first submit a draft of the report to the supervisor for comments before its final submission. At the end of the project, each project is assessed by an Assessment Panel with three members, including two examiners and the project Supervisor. The Project Supervisor will provide information on students' progress, initiative and ability to work independently. The Supervisor will also be in a position to contribute views on the student's technical achievement. All members of the Assessment Panel will grade the project report. Other assessors will also mark the presentation that includes the following activities:: – listening to the student's presentation (can be a video clip), – examining the student during the poster presentation, and – evaluate the project's outcome based on the demonstration (can be a video clip). **Assessment** In assessing the project, the assessors will typically consider the following aspects: a. Intellectual achievement; b. In-depth understanding of the topic and other related topics; c. Quantity and quality of work done, including design and construction of equipment, experimentation, mathematical models, program writing, verification; d. Presentation including the written report, presentation and response to questions. Examiners will ensure that all aspects of the project are thoroughly considered before arriving at the grade to be awarded to the project. In arriving at their decision, the examiners should bear in mind their experiences in respect of the achievements of other projects in the Department in the current and previous years. **Method of Assessment: 100% continuous assessment** **(I) Formal Project Proposal** Students are required to submit a formal project proposal. **This will contribute to 5% of the final grade.** The contents of the proposal should include: A. An abstract and objectives of the project B. Proposed specifications of the product C. Summary of the literature search D. Proposed approach/methodology to be used E. Some brief descriptions on the theory of the approach/methodology F. Schedule and milestones of the project G. References **Assessment Criteria** *1. Literature research.* *2. Project plan* *3. Problem definition and methodology.* *4. Writing quality.* **(II) The Interim Progress Report** Students are required to submit an interim progress report at about the middle of project duration. **This will contribute to 10% of the final grade.** The contents of the progress report should include: A. A summary and objectives of the project. B. A brief outline of the theory. C. Work that has been carried out up to the date. D. The system design and the block diagram of the system, plus some brief descriptions on the theory. E. Difficulties encountered and the measures taken to solve them. F. Proposed timetable / schedule for the rest of the work up to the end of the project.

G. Difficulties expected in the coming period.
H. References

Assessment Criteria

1. Abstract and introduction
2. Methodology
3. Preliminary results
4. *Project management and overall presentation of the report*

(III) Mid-term progress presentation

Student is required to present the progress to an assessor after the submission of the Interim Progress Report. **The presentation will contribute to 10% of the final grade.**

Assessment Criteria

1. Technical concept/knowledge/application
2. Up-to-date progress and preliminary results
3. Response to questions
4. Presentation skill and language competence.

(IV) The Final Report

The final project report should contain all works carried out by the student in the project. The length of the main body of the final report should be **at least 45 pages** in standard report format. Students are advised to form a framework for the report first, and then proceed to the formation of the titles of the chapters. The titles and structure of the sections within each chapter are then decided. Continuing the process, each section may be further expanded into appropriate sub-sections, divisions and sub-divisions etc., until a complete framework is formed. **The final report will contribute to 40% of the final grade.**

The content of the final report includes:

A. An abstract of the project.
B. Objectives of the project (especially any change from the original aims).
C. The motivation behind the project and a brief outline of the project work.
D. A summary of work done or developed in the project.
E. The system design and the block diagram of the system, plus some brief descriptions on the theory.
F. Results and discussion
G. Difficulties encountered and the measures taken to solve them.
H. The achievement of the project, the conclusions from the work and suggestions for further work.
I. A list of the references referred to the source of information in the report. This is compulsory.
J. Materials which are closely related to the contents of the report, and which are themselves self-contained, may be included in the report as appendixes.

Assessment Criteria

1. Abstract and introduction
2. Literature review and background
3. Methodology and technical skills
4. Results, discussions and conclusion
5. Overall presentation and organization of the report

(V) The Presentation and Demonstration

The student should keep the presentation concise and interesting through good use of visual aids and multimedia, logic flow of ideas, and appropriate control of the pace. Show good mastering of topics and avoid undue pauses. The student should be able to elaborate on technical details in answering questions during the poster presentation. Good pronunciation and intonation are desirable. Be courteous during the presentation. Hardware must be neatly built and laid out and there is good engineering sense in hardware implementation. Circuits and software should function properly, and experiments should be able to support fulfillment of project objectives.

The student should show good mastering of topics during the question session of the Poster presentation by providing satisfactory answers to questions.

The presentation and demonstration will contribute to 25% of the final grade.

Assessment Criteria

1. Technical concept/knowledge/application
2. Intellectual level, response to questions
3. Demonstration and engineering accomplishment
4. Presentation skill and language competence.

(VI) Continuous Assessment

The supervisor of the project will assess the student's overall performance based on the following items. **This will contribute to 10% of the final grade.**

1. Motivation and perseverance
2. Originality and innovation of the project
3. Execution and problem solving skills
4. Communication
5. Self-discipline and time management
6. Milestone reports

Note 1: Each student has to submit/carry out all five components (I to V) before he/she is considered to have completed the FYP.

Note 2: The final grade for the FYP will be calculated by taking the weighted average of the grades from the above six components.

Teaching/Learning Methodology

As the nature of the subject implies, there will not be formal lecture in the subject, other than a few hours of briefings on general information, some procedures in project administration and some techniques on information/components searching. Students learn the technical contents by a substantial number of individual discussions with their project supervisors and a large number of hours of self-learning. The planning of the project will be conducted under the direction of the supervisor. Through the execution of the project plan with guidance from the supervisor, the student should be able to achieve the learning outcomes.

Teaching/Learning Methodology	Outcomes					
	a	b	c	d	e	f
Discussion with the project Supervisor	✓		✓			
Writing of the project proposal	✓	✓	✓		✓	
Writing of the interim report	✓	✓	✓	✓	✓	
Writing of the final report	✓	✓	✓	✓	✓	✓
Presentation and demonstration		✓				✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Formal project proposal	5%		✓	✓			
2. Interim progress report	10%		✓	✓	✓		
3. Mid-term presentation	10%		✓		✓		✓
4. Final report	40%	✓	✓	✓	✓	✓	✓
5. Presentation and demonstration	25%	✓	✓				✓
6. Continuous assessment	10%	✓			✓		✓
Total	100%						

	Assessment criteria for each of the above assessment methods are as listed in one of above sections.	
Student Study Effort Expected	Class contact:	
	▪ Briefings	3 Hrs.
	▪ Individual discussions with supervisor	36 Hrs.
	Other student study effort:	
	▪ Information search, self study, execution of the project, report writing, preparation of presentation	161 Hrs.
	Total student study effort	200 Hrs.
Reading List and References	To be advised by supervisor	

July 2022

Subject Description Form

Subject Code	EE4007 / EE4007A / EE4007B
Subject Title	Advanced Power Electronics
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE4007: EE3003 Pre-requisite for EE4007A: EE3003A Pre-requisite for EE4007B: EE3003B
Objectives	1. To provide the students with the knowledge of advanced power electronic conversion. 2. To ensure the students having an in-depth understanding of the design and control of various power electronics converters. 3. To give the knowledge of AC switched-mode conversion. 4. To provide a concept of impact of power electronics on power quality.
Subject Intended Learning Outcomes	Upon completion of the subject, students will: a. Have acquired a good understanding of basic switched-mode DC/DC topologies, operation, performance and modelling. b. Have acquired a basic understanding of resonant converters and its method of loss reduction. c. Be able to apply switched-mode techniques to inverters (DC/AC converters). d. Be able to perform study on power electronics circuit simulation. e. Be aware of impacts of electromagnetic interference (EMI) and reduction of EMI using power electronics techniques. f. Be able to present results of study in the form of computer simulation, design equations and basic models, working independently and in teams when conducting power electronics circuit design.
Subject Synopsis/ Indicative Syllabus	1. ***Pulse-width-modulated DC/DC Converters*****:** Basic topologies and higher order converters, transformer-isolated topologies, snubber circuits, continuous and discontinuous conduction modes of operation, ripple analysis. 2. ***Resonant-mode DC/DC Converters*****:** Classification, zero-current switching and zero-voltage switching techniques, quasi-resonant converters, resonant transition converters. 3. ***Switched-mode Inverters*****:** Single-phase and three-phase voltage-source inverters, AC/AC conversion, resonant inverters. 4. ***Modelling and* Control of *Power Converters:*** Small-signal modelling, traditional PID control method, modern control techniques, analogue and digital circuit simulation for power electronics, simulation techniques. 5. ***Electromagnetic Interference*****:** Generation of EMI, power factor, switched-mode EMI filter, International Standards, reduction of EMI. **Laboratory Experiments** Conduct computer simulations on DC-DC converter and DC-AC inverters.

Teaching/Learning Methodology	Lectures and tutorials are effective teaching methods: 1. To provide an overview or outline of recent development of power electronics. 2. To introduce new concepts and knowledge in advantage power electronic converter design, soft switching techniques, control methods and electromagnetic interference (EMI) aspects. 3. To explain difficult ideas and concepts. 4. To provide students feedback in relation to their learning. 5. To encourage students' responsibility for their learning by extra reference books reading and computer-based circuit simulations. Laboratory works is an essential ingredient of this subject: 1. To supplement the lecturing materials. 2. To provide power converter design experience for the students. 3. To provide deep understanding of various power converter design aspects. 4. To enable students to organise principles and challenge ideas.

Teaching/Learning methodology	Outcomes					
	a	b	c	d	e	f
Lectures	✓	✓	✓		✓	
Tutorials	✓	✓	✓		✓	
Experiments	✓	✓	✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Examination	60%	✓	✓	✓		✓	
2. Tests	15%	✓	✓	✓		✓	
3. Laboratory reports	15%	✓	✓	✓	✓	✓	✓
4. Assignments	10%	✓	✓	✓		✓	
Total	100%						

The understanding on theoretical principle and practical considerations, analytical skills and problem solving techniques will be evaluated. Examination, class tests, laboratory sections and reports are an integrated approach to validly assess students' performance with respect to the intended subject learning outcomes.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	33 Hrs.
	▪ Laboratory	6 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report/assignment	12 Hrs.
	▪ Self-study	49 Hrs.
	Total student study effort	100 Hrs.

Reading List and References

Textbooks:

1. Ned. Mohan, Power Electronics: Converters, Applications & Design, Wiley, 2007
2. K.W.E.Cheng, Classical Switched Mode and Resonant Power Converters, The Hong Kong Polytechnic University, 2002
3. G. M. Masters, Renewable and efficient electric power systems, John Wiley & Sons, 2004.

Reference books:

1. N. Mohan, Power Electronics: A First Course, John Wiley & Sons, 2012.
2. A.M. Trzynadlowski, Introduction to Modern Power Electronics, Third Edition, John Wiley & Sons, 2015.

June 2022

Subject Description Form

Subject Code	EE4008 / EE4008A / EE4008B
Subject Title	Applied Digital Control
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE4008: EE3005 Pre-requisite for EE4008A: EE3005A
Objectives	1. To facilitate a working knowledge of principles of reduced-order modelling, digital control algorithms, system identification, and adaptive control. 2. To enable students designing industrial control systems for applications in different engineering areas.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the concepts of reduced-order modelling, deadbeat control algorithm, system identification and adaptive control. b. Understand the notions of offline and online system identification. c. Design conventional and adaptive controllers based on user specifications. d. Use CAD package for design and simulation.
Subject Synopsis/ Indicative Syllabus	1. ***Process control*****:** Process modelling, Performance Specification, Industrial controller, Ziegler & Nichols tuning, Advanced process control, Reduced order modelling. 2. ***Direct digital control algorithms*****:** PID algorithm, Cascade control, Dead-time compensation, Internal model control. 3. ***Computer control methods*****:** Hierarchical control configurations, Distributed approach, Programmable logic controllers (PLC). 4. ***System identification*****:** Discrete-time and continuous-time systems, identification by correlation, principle of least squares, Recursive least squares. 5. ***Self-tuning control*****:** Introduction to adaptive control, Self-tuning controller. **Laboratory Experiment:** There will be two laboratory experiments on the topics of reduced order modeling, digital control design and system identification by least-squares technique. **Case study:** Individual assignment related to above methods. Students will write a report and present their finding to the class.

Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiments and case study are designed to supplement the lecturing materials. The students are encouraged to take extra readings and to look for relevant information.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Tutorials	✓	✓	✓	
Experiments and case study			✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	
2. Class test	20%	✓	✓	✓	
3. Project report	10%				
4. Case Study	10%				
Total	100%				

The outcomes on concepts, analysis and design are assessed by the usual means of examination and tests.

Student Study Effort Expected	
Class contact:	
▪ Lecture/Tutorial	33 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	12 Hrs.
▪ Case study preparation/report	14 Hrs.
▪ Self-study	35 Hrs.
Total student study effort	100 Hrs.

Reading List and References

Reference books:

1. D.E. Seborg, Process Dynamics and Control, Hoboken, N.J.: Wiley, 2011
2. C.A. Smith, Automated Continuous Process Control, New York, John Wiley & Sons, 2002
3. J.R. Leigh, Applied Digital Control: Theory, Design, and Implementation, New York, Prentice-Hall, 1992
4. P.E. Wellstead and W. Zarrop, Self-tuning Systems: Control and Signal Processing, Wiley, 1991
5. R. Isermann, Adaptive Control Systems, New York, Prentice Hall, 1992

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Subject Description Form

Subject Code	EE4012 / EE4012A
Subject Title	Intelligent Buildings
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite for EE4012: EE3009 Pre-requisite for EE4012A: EE3009A
Objectives	1. To enable students to establish a broad knowledge on the concepts of intelligent buildings. 2. To enable students to understand that intelligence of a building can be achieved by integration and optimization of building structure, services systems, information technology, management and valued-added services. 3. To enable students to understand basic features of an intelligent building and the required services system to support these features. 4. To enable students to understand the operation principle and characteristics of various service systems/technologies of an intelligent buildings; such as the building automation system, intelligent vertical transportation systems, communications, structured cabling and etc. 5. To enable student to understand the impacts these services systems/ technologies on the building and people.
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Identify benefits, impacts and driving forces of intelligent buildings, and its subsystems; understand the concepts of Building Information Modelling. b. Describe design philosophy at system level, system configurations, system sub-modules of vertical modern vertical transportation systems and building automation systems, including the out-stations, etc. c. Describe general design concept and principles of communication systems in intelligent building, such as voice communication system, video communication systems, LAN, wireless LAN, data networks, office automation systems, etc. d. Describe the general principle, concepts and system configurations of structure cabling, including the features, characteristics and applications of different categories of cables. e. Given a technical topic related to the subject, carry out literature search and present the findings in a technical report.
Subject Synopsis/ Indicative Syllabus	1. ***Intelligent building characteristics*:** Features and benefits of intelligent buildings. The anatomy of intelligent buildings. Environmental aspect. The marketplace and other driving forces behind the emergence of intelligent buildings. (4 hours) 2. ***Building automation systems & controls*:** Philosophy, system configuration, system modules, distributed systems and on-line measurements. Fire protection, security and energy management. Control objectives. Sensors, controllers and actuators. Control system schematics, system design, and internal elements of outstations. Microprocessor based controllers & digital controls. Examples of sub-systems such as: Digital Addressable Lighting Interface (DALI) (10 hours)
	3. ***Modern intelligent vertical transportation systems:*** Sky lobby, double-deck lifts, twin lifts, advanced call registration systems, large scale monitoring systems, applications of artificial intelligence in supervisory control, energy saving measures related to lift systems/escalator systems, other modern vertical transportation systems, such as: gondola systems, materials handling systems, etc. (6 hours) 4. ***Communication and security systems*:** Voice communication systems, local area network, wireless LAN, Digital TV, CCTV, digital CCTV, teleconferencing, and CABD. SMATV. Data networking. Public address/sound reinforcement systems. Digital public address system. Modern security systems (10 hours) 5. ***Structured cabling systems*:** Characteristics and benefits. Standards, configurations and physical media. EMI/EMC issues, grounding problems. System design. Different Categories of cables. (3 hours) 6. ***Building information Modelling (BIM)***: Concept of BIM, its features and benefits. Levels and Dimensions of BIM, Its applications in (Mechanical & Electrical Plants) MEP of buildings. Case studies. (3 hours) 7. ***Integrating the technologies and systems*:** The impact of information technology on buildings and people. Interaction and integration between building structure, systems, services, management, control and information technology. (3 hours) **Case study:** International Financial Centre II, International Commerce Centre, Central Plaza and similar buildings.
Teaching/Learning Methodology	Lectures and tutorials are effective teaching methods: 1. To provide an overview or outline of the subject. 2. To introduce new concepts and knowledge to the students. 3. To explain difficult ideas and concepts of the subject. 4. To motivate and stimulate students' interest. 5. To provide students feedback in relation to their learning. Mini-project works/Assignments are essential ingredients of this subject: 1. To supplement the lecturing materials. 2. To add real experience for the students. 3. To provide deep understanding of the subject. 4. To enable students to organize principle and challenge ideas.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	✓	✓	✓	✓	
Tutorials	✓	✓	✓	✓	
Mini-project					✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	60%	✓	✓	✓	✓	
2. Class tests	18%		✓	✓	✓	
3. Assignments	11%	✓				✓
4. Mini-project	11%	✓				✓
Total	100%					

	The understanding on theoretical principle and practical considerations, analytical skills and problem solving technique will be evaluated. Examination, class tests and mini-project report are an integrated approach to validly assess students' performance with respect to the intended subject learning outcomes.	
Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	39 Hrs.
	Other student study effort:	
	▪ Mini-project/Assignments	20 Hrs.
	▪ Self-study	41 Hrs.
	Total student study effort	100 Hrs.
Reading List and References	**Reference books:** 1. M Dastbaz, CA Gorse and A Moncastor, Building Information Modelling, Building Performance, Design and Smart Construction, Springer, 2017 2. Clements-Croome, Derek, Intelligent Buildings: An introduction, Routledge, 2014 3. Shengwei Wang, Intelligent Buildings and Building Automation, Spon Press, 2010 4. Jim Sinopoli, Smart Building Systems for Architectures, Owners and Builders, Elsevier, 2010 5. P. Manolescue, Integrating Security into Intelligent Buildings, Cheltenharn, 2003 6. A. Dobbelsteen, Smart Building in a Changing Climate, Techne Press, 2009 7. D. Clements-Croome, Intelligent Buildings: An Introduction, Routledge, 2014 8. A. Oliviero, Cabling [electronic resource]: The Complete Guide to Copper and Fiber-ooptic Networking, John Wiley & Sons, 2014 9. W.T. Grondzik, & A.G. Kwok, Mechanical and Electrical Equipment for Buildings, Wiley, 2015	

June 2022

Subject Description Form

Subject Code	EE4014 / EE4014A / EE4014B
Subject Title	Intelligent Systems Applications in Electrical Engineering
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To introduce students to the fundamentals of intelligent systems and their applications in Electrical Engineering.
Subject Intended Learning Outcomes	Upon completion of the subject, students will: a. Have acquired a good understanding of the fundamental concepts, characteristics, methodologies and usefulness of intelligent systems. b. Be able to understand and design various intelligent system techniques such as neural networks, supervised learning, unsupervised learning, and evolutionary computation. c. Be able to integrate the intelligent system approaches in real-life problems. d. Have acquired skills in presentation and interpretation of mini-project results and communicate in written form.
Subject Synopsis/ Indicative Syllabus	1. ***Artificial neural network*****:** Concepts. Neuron and perceptron. Multi-layer neural network. Supervised learning. Forward and backward propagation. Training of neural networks. Recurrent and convolutional neural network. 2. ***Unsupervised learning*****:** Concepts. K-means. Agglomerative nesting. Competitive learning and self-organizing map. 3. ***Evolutionary computation*****:** Concepts. Genetic algorithm. Particle swarm optimization. 4. ***Applications of intelligent systems***. **Mini-project:** Apply the introduced intelligent system techniques to solve an engineering problem.
Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on system analysis, design and practical applications are given through mini-projects, in which the students are expected to solve the engineering problems using intelligent techniques with critical and analytical thinking. Mini-projects are designed to supplement the lecturing materials so that the students are encouraged to take extra readings and to look for relevant information.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Tutorials	✓	✓	✓	
Mini-projects	✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	
2. Class Test	15%	✓	✓		
3. Mini-project	15%	✓	✓	✓	✓
4. Exercises	10%	✓	✓		
Total	100%				

The outcomes on concepts, design and applications are assessed by the usual means of examination, test and exercises. Mini-projects and written report assess those on analytical skills, problem-solving techniques and practical considerations of intelligent system applications, as well as technical reporting, teamwork and presentation skills.

Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	33 Hrs.
	▪ Mini-project presentation	6 Hrs.
	Other student study effort:	
	▪ Mini-project preparation/report	16 Hrs.
	▪ Self-study	50 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. K.Y. Lee and M.A. El-Sharkawi, Modern Heuristic Optimization Techniques: Theory and Applications to Power Systems, Wiley-IEEE Press, 2008
2. M. Negnevitsky, Artificial Intelligence - A Guide to Intelligent Systems, Addison-Wesley, 2011
3. S. Samarasinghe, Neural Networks for Applied Sciences and Engineering: from Fundamentals to Complex Pattern Recognition. Auerbach Publications, 2016
4. A. Eiben and J. Smith, Introduction to Evolutionary Computing (Natural Computing Series), Springer, 2015
5. S. Haykin, Neural Networks and Learning Machines, Prentice Hall, 2009
6. T. Mitchell, Machine Learning, McGraw-Hill, 1997

July 2022

Subject Description Form

Subject Code	EE4024 / EE4011A / EE4011B
Subject Title	Industrial Computer Applications
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	Introduce the applications of advanced computing techniques in solving industrial problems. The topics include: embedded system; applications of computer vision; Internet of Things (IoT) applications and introduction to Big Data
Subject Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Apply advanced computing techniques to solve industrial problems b. Understand the importance of computing systems in industrial applications. c. Think logically and be able to analyze data as well as present results in writing.
Subject Synopsis/ Indicative Syllabus	1. ***Embedded Computer control*****:** Modelling of the computer process control system, practical approaches to digital control implementation, microprocessor based control systems. 2. ***Big Data*****:** Big Data fundamentals, the Hadoop frame work, web scraping. 3. ***Computer vision*****:** Digital image fundamentals, image representation, image enhancement, image segmentation, application of image processing in industrial automation. 4. ***IoT and Mobile applications*****:** IoT design and implementation. Introduction to server-side and client-side applications and MQTT platform. **Mini-project:** Apply one of the above computing topics to solve an engineering problem
Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and practical applications are given through mini-project, in which the students are expected to solve design problems with real-life constraints and to attain pragmatic solutions with critical and analytical thinking.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lectures	✓	✓	
Tutorials	✓	✓	
Mini-project	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Examination	60%	✓	✓	✓
2. In-class Test	15%	✓	✓	✓
3. Mini-project	15%	✓	✓	✓
4. Exercise	10%	✓	✓	
Total	100%			

One end-of-semester written examination; one mid-semester test; a mini-project on an industrial computing based application with a study report covering the investigation of the intriguing computing application for feasibility lookout, failure explanation, rooms for future enhancement and improvements.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	33 Hrs.
	▪ Laboratory (mini-project)	6 Hrs.
	Other student study effort:	
	▪ Mini-project report and preparation	16 Hrs.
	▪ Self-study	45 Hrs.
	Total student study effort	100 Hrs.

Reading List and References

Reference books and online materials:

1. T. Cox, et al., Getting Started with Python for the Internet of Things, Maker Media, Inc, 2019.
2. E. White, Making Embedded Systems: Design Patterns for Great Software, O'Reilly, 2011.
3. A.V. Deshmukh, Microcontrollers: Theory and Applications, Tata McGraw-Hill, 2006
4. M. Beyeler, Machine Learning for OpencCV: Intelligent image processing with Python, Packt Publishing, 2017.
5. Y. L. Prasad, Big Data Analytics Made Easy, Notion Press, 2016
6. T. White, Hadoop: The Definitive Guide, 3rd Ed, O'Reilly, 2012

July 2022

Subject Description Form

Subject Code	EE502
Subject Title	Modern Protection Methods
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Student should have some prior knowledge in Power Transmission and Distribution
Objectives	1. To introduce the concept of modern power system protection to students. 2. To integrate theory and practical knowledge of power system protection. 3. To understand the design philosophy and working principle of power system protection. 4. To master the analytical techniques. 5. To apply protective relaying in power systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Master the concept and philosophy on power system protection. b. Apply and adapt applications of mathematics, engineering skills in the analysis, comparison, interpretation of various protection schemes in power systems. c. Integrate and justify techniques to be used in the planning and operation of power system protection. d. Solve technical problems for power system protection. e. Present technical results in the form of a technical report.
Subject Synopsis/ Indicative Syllabus	1. ***Overview of protection system and its development*****:** General considerations. Components of protection. Structure of protective relays. Unit protection and non-unit protection. Trend of protection development. 2. ***Fault and transient in power systems*****:** Fault transient behaviour in power systems. Computer simulations of the transient behaviour in power systems. 3. ***Current and voltage transducers*****:** Sources of errors. Requirements of transducers for measurement and protection. Their features and characteristics under steady state and transient conditions. 4. ***Protection systems for distribution networks*****:** Protection criteria for distribution systems. Features of directional and non-directional protection schemes for distribution systems. 5. ***Protection systems for transmission networks*****:** Distance protection system and characteristics. Differential line protection. Phase comparison line protection. Use of line carrier and communication for protection systems. 6. ***Busbar, transformer and generator protection systems*****:** High impedance and low impedance differential protection schemes. Protection schemes for busbar, transformer, and generator. 7. ***Digital protection relaying technique*****:** Features of digital protection relay. Digital relay architecture. Digital relaying algorithms. Adaptive and intelligent relays. Recent development.

Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Knowledge on system analysis, design and practical applications are given through case studies, in which students are expected to integrate and justify modern techniques to be used in the planning and operation of power system protection with critical and analytical thinking. Mini-projects and experiments are designed to supplement the lecturing materials so that students are encouraged to take extra readings and to look for relevant information.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	√	√		√	
Tutorials	√	√		√	
Mini-projects and experiments		√	√		√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	60%	√	√	√	√	
2. Class Tests	18%	√	√	√	√	
3. Mini-project and report	12%		√	√		√
4. Laboratory and report	10%		√	√		√
Total	100%					

The examination and tests assess the technical competence of students in power system protection analysis methods and methods of protection design, planning, and operation. Mini-projects, experiments and written reports assess those on analytical skills, problem-solving techniques and practical considerations of protection design, as well as technical reporting.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	33 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	12 Hrs.
▪ Mini-projects/Self-study	54 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. L. Hewitson, M. Brown and R. Balakrishnan, Practical Power System Protection, Newnes, 2005
2. Network Protection and Automation Guide, Alstom Grid, 2011
3. S.H. Horowitz and A.G. Phadke, Power System Relaying, Wiley, 2014
4. J.L. Blackburn and J. Domin, Protective Relaying: Principles and Applications, CRC Press, 2014
5. A.T. Johns and S.K. Salman, Digital Protection for Power Systems, IEE Power Series, 1995
6. Advancements in Microprocessor Based Protection and Communication – IEEE Tutorial Course, Publication No. 97TP120-0, 1997
7. Power System Protection, Vol. 1, 2, & 3, The Electricity Training Association, 1995

June 2022

Subject Description Form

Subject Code	EE505
Subject Title	Power System Control and Operation
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To introduce the concept of modern power system control & operation to students; 2. To integrate theory and practical knowledge of power system control & operation; 3. To understand the working principle of power system control and operation; 4. To apply the theory in power system control & operation; and 5. To understand the industrial practice and tools used in power system control and operations
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Ability to analyse power system security control & operation; b. Ability to analyse interconnected power system interchange and economic operation. c. Ability to analyse power system computer control and applications; d. Understand the functionalities and able to use to appropriate level of competence of selected specialty software for power system control and operation purpose; e. To be aware of new technologies development trends and environmental impacts of modern power system control and operation techniques; and f. Ability to write technical reports and present the findings through individual effort as well as team work
Subject Synopsis/ Indicative Syllabus	1. ***Power system operational security and dispatch*:** Power system security concepts. Contingency analysis. Static and dynamic security. States of operation. Prevention of blackouts. Power system state estimation concepts. Application of state estimation. 2. ***Unit commitment and economic dispatch*:** Priority lists. Methodologies for large system economic dispatch and unit commitment. Programming methods. 3. ***Frequency and voltage control*:** Frequency and voltage control concepts. Control loops and analysis. Automatic generation control (AGC) concepts, methodology and implementation. 4. ***Interconnected systems operation*:** System interconnection merits and problems. Economic interchange and control. Multi-area operation. 5. ***Energy management and real-time control*:** Energy management systems. Software systems. Computer hardware resources and configurations. Data management. Communication and distributed computing. Load forecasting. Contingency and security assessment. System restoration and emergency control concepts. **Case Study:** 1. Local system control centre arrangement. 2. Case study of past system blackout in overseas countries. 3. AGC and voltage control case studies. 4. Power system developments in HK and China as well as overseas countries. 5. Applications of computer technology in power system control and monitoring

Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on real world cases and associated analysis are given through case studies, in which the students are expected to power system control and operation problems with real-life constraints and to attain pragmatic solutions with critical and analytical thinking. Guest lecture / industrial seminars will be given to provide hands-on experience and knowledge on this subject from industry practice. Mini-project is designed to supplement the lecturing materials so that the students are encouraged to take extra readings and practice specialty software tools for power system operation and control.

Teaching/Learning Methodology	Outcomes					
	a	b	c	d	e	f
Lectures	√	√	√	√		
Tutorials	√	√	√	√		
Report	√	√	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Exam	60%	√	√	√		√	
2. Class test	18%	√	√	√		√	
3. Mini-project & report	12%	√	√	√	√	√	√
4. Essay Assignment	10%	√				√	√
Total	100%						

The assessment methods include an examination, a class test, and written assignment in the form of mini-project report. The examination and class test assess the technical competence of students in power system analysis methods and methods of power system operation and control. The written reports assess the students' ability to apply the theories learned in class to practical project, and to communicate in written form.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	39 Hrs.
	Other student study effort:	
	▪ Mini-project and report	15 Hrs.
	▪ Essay assignment/Self-study	51 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. W.D. Stevenson, Elements of Power System Analysis, McGraw Hill
2. Wood & Wollenberg, Power Generation, Operation and Control, J. Wiley.
3. Weedy and Cory, Electric Power Systems, 4th Edition, Wiley
4. Grainger & Stevenson, Power System Analysis, McGraw Hill
5. H. Saadat, Power System Analysis, McGraw Hill
6. Antonio Gomez-Exposito, Antonio J. Conejo, and Claudio Canizares, Electric Energy Systems: Analysis and Operation, CRC Press, 2009

August 2022

Subject Description Form

Subject Code	EE509
Subject Title	High Voltage Engineering
Credit Value	3
Level	5
Pre-requisite / Co-requisite / Exclusion	Nil
Collaboration Institute	HK Electric Institute
Objectives	To provide students with the knowledge and skills to understand the physical insights and analysis techniques of high voltage engineering, including the causes and manner of insulation failures as well as the challenges and problems encountered in the practice of high voltage equipment.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Describe the insulation breakdown mechanisms for identifying the failure phenomena of different insulation systems. b. Understand the principles and practices of high voltage equipment for realizing the pragmatic design and applications of high voltage equipment in the industry.
Subject Synopsis / Indicative Syllabus	1. ***Introduction to Electrical Insulation*:** Electric fields; Dielectric breakdown; Electrical insulating materials; Industrial applications of electrical insulating materials. 2. ***Breakdown of Gaseous Insulation*:** Ionization processes; Townsend breakdown mechanism; Experimental determination of Townsend's ionization coefficients; Breakdown in electronegative gases; Streamer breakdown mechanism; Paschen's law; Corona discharges; Breakdown in non-uniform fields; Post-breakdown phenomena and applications; Vacuum insulation and breakdown. 3. ***Breakdown of Liquid Insulation*:** Breakdown in pure liquids and commercial liquids; Purification and breakdown test; Power law for commercial liquids. 4. ***Breakdown of Solid Insulation*:** Breakdown due to treeing, surface flashover, and surface tracking; Breakdown in composite insulation. 5. ***Partial Discharges & In-house Demonstration*:** Classification of partial discharges by origin; Principle of partial discharge measurements; Demonstration of state-of-the-art measuring equipment. 6. ***High Voltage Equipment for Power System Networks*:** Hierarchy of power system networks; Introduction to high voltage equipment and their general specifications. 7. ***Transmission Gas Insulated Switchgears*:** Design and busbar topologies; Layout and internal construction; Environmental, health, and safety precautions in handling SF_6 gas; Type and routine tests; Inspection before installation; Commissioning test and precautions; Typical incidents around the world. 8. ***High Voltage Cables*:** Basic high voltage cable technology; Dielectric properties; Types and constructions; Type, routine, and diagnostic tests; Health index; Water tree formation; Accessory design, operations, and maintenance considerations; Reliability reviews and failure analysis; Faulty joint dissections and lessons learned. 9. ***Visit HK Electric*:** Introduction to transmission and distribution facilities; Demonstration of transmission gas insulated switchgears and relevant high voltage test equipment used in the power industry.
Teaching / Learning Methodology	Lectures are the primary means of conveying the knowledge and skills to understand the physical insights and analysis techniques of high voltage engineering. In-house Demonstration and Visit HK Electric are the complementary means of providing real-life experience on the pragmatic design and applications of high voltage engineering in the industry. Students are expected to solve design problems with real-life constraints and to attain pragmatic solutions with critical and analytical thinking.

Teaching/Learning Methodology	Outcomes	
	a	b
Lectures	✓	✓
In-house Demonstration	✓	
Visit HK Electric		✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended learning outcomes to be assessed	
		a	b
1. Examination	60%	✓	✓
2. Continuous Assessment	40%	✓	✓
Assignments (Insulation breakdown)		✓	
Assignments (High voltage equipment)			✓
Log (In-house demonstration)		✓	
Log (Visit HK Electric)			✓
Total	100%		

The assessment methods include: Examination (60%) and Continuous Assessment (40%), both in alignment with intended learning outcomes a and b. Examination (60%) is in form of a three-hour, closed-book, end-of-subject written examination. Continuous Assessment (40%) consists of assignments (32%) and logs (8%) which, in turn, are after-class exercises for lectures on Insulation Breakdown (16%) and High Voltage Equipment (16%) and records of practical learning for In-house Demonstration (4%) and Visit HK Electric (4%), respectively.

Student Study Effort Expected

Class contact:	
▪ Lecture/In-house Demonstration/Visit to HK Electric	39 Hrs.
Other student study effort:	
▪ Assignments	16 Hrs.
▪ Self-study	50 Hrs.
Total student study effort	105 Hrs.

Reading List and References	**Textbooks:** NIL (Refer to Lecture Notes). **Reference books:** 1. M. S. Naidu and V. Kamaraju, High-Voltage Engineering, 5th Edition, Tata McGraw-Hill, 2013. 2. F. A. M. Rizk and G. N. Trinh, High Voltage Engineering, 1st Edition, Routledge, 2017. 2. V. Y. Ushakov, Insulation of High-Voltage Equipment, Springer Verlag, 2004. 3. E. Kuffel, W. S. Zaengl and J. Kuffel, High Voltage Engineering: Fundamentals, 2nd Edition, TBS, 2000. 4. C. L. Wadhwa, High Voltage Engineering, 3rd Edition, New Age Science, 2010. 5. A. Ravindra and M. Wolfgang, High Voltage and Electrical Insulation Engineering, Wiley: IEEE Press, 2011. 6. F. H. Kreuger, Partial Discharge Detection in High-Voltage Equipment, Butterworth-Heinemann, 1990. 7. IET Digital Library, Lightning Protection, Edited by C. Vernon, Institution of Engineering and Technology, 2010.

July 2022

Subject Description Form

Subject Code	EE512
Subject Title	Electric Vehicles
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	
Objectives	1. To acquire a broad knowledge on modern electric vehicles (EVs). 2. To understand the development of EVs from technological, environmental, and societal perspectives.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the importance of EVs for environment, energy sustainability and climate change. b. Understand various underpinning technologies for modern EVs, including electric motor drives, energy storage, batteries, charging methods, infrastructure and auxiliary systems. c. Explain the emerging technologies such as hybrid electric vehicles (HEVs), fuel cell electric vehicles (FEV) and energy storage methods.
Subject Synopsis/ Indicative Syllabus	1. ***Introduction to electric vehicles (EVs)*:** Historical perspective. EV advantages and impacts. EV market and promotion: infrastructure needs, legislation and regulation, standardization. 2. ***Electric vehicle (EV) design options*:** EV configurations: fixed vs. variable gearing, single- vs. multiple-motor drive, in-wheel drives. EV parameters, driving cycles and performance specifications. Choice of system voltage levels: electrical safety and protection. 3. ***Vehicle dynamics and motor drives*:** Road load: Vehicle kinetics; Effect of velocity, Acceleration and grade. EV drivetrain and components. EV motor drive systems: DC drives, Induction motor drives, Permanent-magnet synchronous motor drives, Switched reluctance motor drives. Control strategies. 4. ***Batteries*:** Battery parameters. Types and characteristics of EV batteries. Battery testing and maintenance; Charging schemes. Battery Management System. Open-circuit voltage and ampere-hour estimation. Battery load levelling Energy Storage. 5. ***Auxiliaries*:** On-board and off-board battery chargers. Energy management units. Battery state-of-charge indicators. Temperature control units. Power steering. 6. ***Emerging EV technologies*:** Hybrid electric vehicles (HEVs): types, operating modes, torque coordination and control, generator/motor requirements. Fuel cell electric vehicles (FEVs): fuel cell characteristics, hydrogen storage systems, reformers. Alternative sources of power: super- and ultra-capacitors, flywheels.

Teaching/Learning Methodology	Delivery of the subject is mainly through formal lectures, complemented by tutorials and worked examples. Self-learning on the part of students is strongly encouraged and extensive use of web resources will be made. A term paper and a related presentation enable students to develop skills in literature survey and writing. Oral presentation sessions develop students' skills in spoken communication and peer evaluation.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lectures	✓	✓	✓
Tutorials	✓	✓	✓
Assignment and oral presentation	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Examination	60%	✓	✓	✓
2. Test	25%	✓	✓	✓
3. Assignment (Term Paper/Homework)	10%	✓	✓	✓
4. Oral presentation	5%	✓	✓	✓
Total	100%			

It is an advanced elective on electric vehicles. The outcomes on electric vehicle technology and its impacts are assessed by the usual means of test and examination, and partly by the term paper. The outcomes on technical communication and presentation skills are evaluated by the term paper and a related oral presentation.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	30 Hrs.
	▪ Presentation/Tests	9 Hrs.
	Other student study effort:	
	▪ Self-study and revision	48 Hrs.
	▪ Report – Case Study	18 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. K. T. Chau, Electric Vehicle Machines and Drives: Design, Analysis and Application, Wiley, 2015.
2. K.T.Chau, Energy Systems for Electric and Hybrid Vehicle, IET, Aug 2016
3. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, New York: CRC Press, 2nd edition, 2010.
4. Per Enge, Nick Enge, Stephen Zoepf, Electric Vehicle Engineering, McGraw Hill, 1st Edition, 2020.

July 2022

Subject Description Form

Subject Code	EE514
Subject Title	Real Time Computing
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To understand the properties of real time operating systems and associated hardware. 2. To apply real time system technologies and concepts in engineering applications. 3. To demonstrate and realize advantages in real time system underlying in today advanced technological evolvements.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand important issues in real time computing systems, and their relations in engineering applications. b. Identify and understand the complications in a real time computing system. The mechanism of overcoming these obstacles is explored. c. Communicate effectively with concerned topics during discussions and presentations. d. Equip student the ability to analyse related issues and identify the proper solution in a real-time computing design.
Subject Synopsis/ Indicative Syllabus	1. ***Real time computing systems concepts*:** Characteristics of Real Time Computing. Properties and Speed Requirements of Real Time Systems. Synchronous Real Time Systems: Polled, Main Polled Loop with Interrupts, Cyclic Schedulers. Multi-Processors Real Time Systems: Multi-Processor Structures, Process Dispatch Latency, Inter CPU Communication, Hierarchical Approach to Real Time Systems. 2. ***Real time systems design issues*:** Time Handling: Representation of Time, Time constraints, Time Service and Synchronization, Real Time System Life Cycle: Requirement Specification. 3. ***Real time system applications*:** System supervision in process operation. Implementation of IT to resolve the real-time system operation issues. **Mini-Project:** Implementation of a real-time computing system based on the Real-time OS
Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and practical applications are given through a mini-project, in which the students are expected to understand design problems with real-life constraints and to attain pragmatic solutions.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Tutorials	✓	✓	✓	
Mini-project	✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	50%	✓	✓	✓	
2. Test	15%	✓	✓	✓	
3. Assignments	10%	✓	✓		
4. Mini project	25%	✓	✓	✓	✓
Total	100%				

The outcomes on concepts, design and applications of real-time systems are assessed by the usual means of examination and test whilst those on analytical skills, problem-solving techniques and practical considerations, as well as technical reporting and teamwork, are evaluated by a mini-project.

Student Study Effort Expected

Class contact:	
▪ Lecture/Seminar	33 Hrs.
▪ Mini-project presentation demonstration	6 Hrs.
Other student study effort:	
▪ Mini-project	25 Hrs.
▪ Self-study	41 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books/materials:

1. Hermann Kopetz, Real-Time Systems: Design Principles for Distributed Embedded Applications, 2nd Ed., Springer, 2013
2. C.M.Krishna, K.G.Shin, Real-Time systems, McGraw-Hill, 2015
3. J.A. Stankovic and K. Ramamritham, Advances in Real-Time Systems, IEEE Computer & Society Press, 1993
4. Selected papers from Proceedings of Real-time Systems Symnposium (IEEE)
5. Chris Moyer, Building Applications in the Cloud, Pearson Education, 2011
6. Jim Cooling, Software Engineering for Real-time System, Packt Publishing Ltd., 2019

July 2022

Subject Description Form

Subject Code	EE520
Subject Title	Intelligent Motion Systems
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To describe an in depth knowledge on the design and operation of intelligent motion systems. 2. To relate and compare numerous application examples, which ranges from CD players and hard disc drives to robots and component insertion machines. 3. To enable the students to have the ability to design motion control systems for industry and domestic purposes.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Contrast and compare different motion control system configurations, and select the most appropriate one for the task. To comprehend and understand numerous motion control examples for domestic and industrial applications. b. Understand the in-depth knowledge of motion drive and sensing techniques, and the ability to use them in real engineering applications. c. Have a broad understanding of motion control platform hardware and a visionary perspective on the future developments of computing/control hardware.
Subject Synopsis/ Indicative Syllabus	1. ***Structures of intelligent motion systems*:** Specifications and requirements of intelligent motion systems. Operating modes: point to point motion, trajectory path tracking, velocity path tracking, force and tension control, compliance control, vibration damping. Switching between operation modes. 2. ***Motion actuators and driving techniques*:** Using Voice Coil Motors and DC brush motors in motion control. AC brushless motors, linear direct drive AC brushless motors and their driving techniques. Stepping motors and their limitations in motion tracking systems. Microstepping and electronic damping of stepping motors. 3. ***Motion sensing and estimation techniques*:** Optical encoders: working principle, decoding method, and resolution enhancement through interpolation. Syncro-resolvers: working principle and interface electronics. Velocity estimation and position estimation methods for large speed range actuators. 4. ***Motion control platform*:** Computer hardware requirements. Tightly coupled systems versus distributed systems. Application of DSPs in motion control. Communication methods in motion systems. Real time operating system for motion control. 5. ***Intelligent algorithms for motion control and trajectory generation*:** PID controllers and their variations. Servo tuning methods. Motion control systems based on state space configuration. States observation and Kalman filters. Using Notch filters in non-rigid systems. Profile generation and motion planning algorithms. 6. ***Issues in multi-axis intelligent motion systems*:** co-ordinate mapping and dynamics transformation. Multi-axis motion planning and profile generation. Motion synchronisation between axis. Decoupling inter-axis motion interference. Applying MIMO structure in tightly coupled system.
	7. ***Case studies in intelligent motion systems*:** Three examples will be selected from the following list: a. Optical based position tracking in CD-ROMs and Laser discs. b. Magnetic head positioning in hard disk drives. c. Motion control system design in multi-axis robot manipulators. d. Gantry robot motion systems for SMT component insertion machines. e. Motion systems in high precision CNC tooling machines. **Case study:** Report on a high performance motion control application example
Teaching/Learning Methodology	Delivery of the subject is mainly through formal lectures, complemented by tutorials and worked examples. Self-learning on the part of students is strongly encouraged and extensive use of web resources will be made. A term paper and a related presentation enable students to develop skills in literature survey and writing. Oral presentation sessions develop students' skills in spoken communication and peer evaluation.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lectures	√	√	√
Tutorials	√	√	√
Assignment and oral presentation	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Examination	60%	√	√	√
2. Test	30%	√	√	√
3. Report	5%	√	√	√
4. Oral presentation	5%	√	√	√
Total	100%			

One end-of-semester written examination; one mid-semester-test; one end-of-semester test; a report on an assigned topic; and a power point presentation for the particular topic.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	30 Hrs.
▪ Presentation/Test	9 Hrs.
Other student study effort:	
▪ Case study	18 Hrs.
▪ Self-study	48 Hrs.
Total student study effort	105 Hrs.

Reading List and References

References books:

1. Precision Motion Control: Design and Implementation (Advances in Industrial Control) Dec 10, 2010 by Kok Kiong Tan and Tong Heng Lee, Springer
2. Motion Control Systems, Feb 21, 2011 by Asif Sabanovic and Kouhei Ohnishi, Wiley
3. S. Meshkat, Advanced Motion Control, PCIM reference series in Power Conversion and Intelligent Motion, 1988
4. M.M. Gupta, Intelligent Control Systems: Concepts and Applications, IEEE Press, 1996
5. K. Rajashekara, Sensorless Control of AC Motors, IEEE Press, 1996

June 2022

Subject Description Form

Subject Code	EE521
Subject Title	Industrial Power Electronics
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide power electronics engineers with in-depth knowledge of the industrial power electronics. 2. To provide latest development in power supplies, industrial power electronics system and their applications in renewable energy systems. 3. To give industrial concern in power electronics design including passive components and standards 4. To introduce to students to the various topologies of the power electronics circuits. 5. To enable students to understand the power quality issues and the active and reactive power flow.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire a good understanding of power supply concept and design and be able to analyse the industrial needs for static power conversion. b. Understand the international standards on power electronics design. c. Have a global view on recent development on power electronics and be aware of applications of power electronics in various industries d. Understand the various topologies and working principles of basic power converters e. Work in teams and independently when conducting power electronics design and testing.
Subject Synopsis/ Indicative Syllabus	1. ***Industrial power systems:*** Static power systems, battery systems, AC systems, DC systems, AC-DC power conversion and recent advance in renewable energy systems such as wind and solar power 2. ***Power conversion:*** Soft-switching, power factor correction, inverter configurations and static converters. 3. ***Special environment power electronics:*** Power electronics distribution system, industrial guidelines, variable speed and constant frequency systems, actuation systems, brushless drives and other applications of power electronics in industry 4. ***Industrial power supplies:*** Converter topologies, decentralized power, power modules, electro-magnetic compatibility, international standards and reliability. 5. ***Power quality improvement:*** Fourier analysis of voltage current waveforms, total harmonic distortion, rectifier, passive/active filters, power quality issues, reactive power compensation. 6. ***Magnetics and capacitors:*** High frequency inductors and transformers, winding techniques, core loss analysis, optimization of magnetics and power capacitors. **Laboratory Experiments :** Select 2 experiments from topics in computer simulation, DC-AC and DC-DC power converters.

Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and practical applications are given through experiments and mini-projects, in which the students are expected to solve design problems with real-life constraints and to attain pragmatic solutions with critical and analytical thinking. Interactive laboratory sessions are introduced to encourage better preparation and hence understanding of the experiments. Experiments are designed to supplement the lecturing materials so that the students are encouraged to take extra readings and to look for relevant information.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	✓	✓	✓	✓	
Tutorials	✓	✓	✓	✓	
Experiments/Laboratory	✓				✓
Mini-project		✓	✓		✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	60%	✓	✓	✓	✓	
2. Test and/or Assignment	20%	✓	✓	✓	✓	
3. Laboratory performance & report	10%	✓			✓	✓
4. Mini-project & report	10%	✓	✓	✓	✓	✓
Total	100%					

One end-of-semester written examination; one mid-semester-test; one end-of-semester test; laboratory performance evaluation (including punctuality, initiative, and technical reasoning); and laboratory report on a particular experiment.

Student Study Effort Expected

Class contact:	
▪ Lecture/tutorial	33 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Lab report/Mini-project	15 Hrs.
▪ Self-study	51 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. A. M. Trzynadlowski, Introduction to Modern Power Electronics, Third Edition, Wiley, 2015.
2. M.Cirrincione, M. Pucci, G. Vitale, Power Converters and AC Electrical Drives with Linear Neural Networks, CRC Press, 2012.
3. N. Mohan, Power Electronics: Converters, Applications, and Design, John Wiley & Sons, 2012.
4. G. M. Masters, Renewable and efficient electric power systems, John Wiley & Sons, 2004
5. K.W.E. Cheng, Classical Switched Mode and Resonant Power Converters, The Hong Kong Polytechnic University, 2002

June 2022

Subject Description Form

Subject Code	EE522
Subject Title	Optical Fibre Systems
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To re-introduce to students the fundamentals of light emission, modulation, detection, amplification, and light propagation in optical fibres. 2. To enable students to understand the operating principle and performance specifications of various fibre-optic components, as well as their applications in modern fibre-optic systems. 3. To equip students with the ability to analyse and design simple fibre-optic communication and sensing systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Appreciate recent developments in fibre optic communication systems, importance of fibre optic technology to the development of communications, engineering applications of fibre-optic technologies, and advantages of fibre optic sensors to the electrical engineering industry. b. Understand the principles of different types of optical fibres, fibre components, sensors, and communication systems. c. Know the same function may be achieved by using different technologies and understand the advantages and limitations of each technology. d. Select the most appropriate passive and active fibre-optic components to design fibre-optic sensor systems and fibre optic communication links. e. Have hands-on experience in the use of fusion splicer to make low-loss fibre joints, optical spectrum analyzer to perform spectral measurements, and fibre grating sensors for temperature and strain measurements.
Subject Synopsis/ Indicative Syllabus	1. **Overview:** Introduction to lightwave communication and sensor systems. Historical perspective. Basic concept and components. Channel capacity. 2. **Optical fibres:** Theory of optical wave-guiding. Numerical aperture. Fibre modes. Fibre fabrication. Attenuation and dispersion. Special optical fibres. 3. **Passive fibre components**: Light coupling. Splices and connectors. Couplers and splitters. Optical filters. Wavelength multiplexers/de-multiplexers. Fibre Bragg gratings. Optical isolators and circulators. 4. **Optical sources:** Light emission and absorption. Light emitting diodes. Optical feedback. Threshold condition. Laser modes. Semiconductor lasers. Tunable lasers. Modulation of light. Optical transmitters. 5. **Optical amplifiers:** Rare-earth doped fibres. Optical fibre amplifiers. Semiconductor amplifiers. 6. **Optical detectors:** PIN and avalanche photodiode. Noise and response time. Responsivity. Optical receivers. 7. **Optical fibre communication systems:** System architectures. Operating wavelength and system limitations. Power and rise-time budgets. Noise effects and other source of power penalty. 8. **Optical fibre sensor systems:** Intrinsic and extrinsic sensors. Intensity modulation sensors. Phase modulation sensors. Polarisation modulation sensors. Wavelength and frequency modulation sensors. Fibre grating sensors. Multiplexed and distributed sensing systems. **Laboratory Experiments/Demonstrations:** Observation of fibre modal patterns; Measurement of source spectrums; Optical fibre splicing and insertion loss measurement; Fibre Bragg grating sensors.
Teaching/Learning Methodology	Lectures, quizzes, tests, laboratory experiments, mini-projects, and examination.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	✓	✓	✓	✓	
Tutorials		✓	✓	✓	
Demonstration/Experiments				✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1.Tests/Quizzes	18%	✓	✓	✓	✓	
2. Assignments	8%	✓	✓	✓	✓	
3. Lab and report	8%				✓	✓
4. Mini-project and report	6%	✓	✓	✓		
5. Examination	60%		✓	✓	✓	
Total	100%					

This subject introduces the theory and applications of optical fibre communication and sensor technology. The outcomes are assessed by quizzes, tests, mini-projects, laboratory experiments and examination.

Student Study Effort Expected	
Class contact:	
▪ Lectures/Tutorials/Laboratory demo	39 Hrs.
Other student study effort:	
▪ Mini-project and report	20 Hrs.
▪ Self-study and assignments	46 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. G. Keiser, Optical Fiber Communications, 3rd Edition, McGraw-Hill, 1999
2. J.M. Senior, Optical Fiber Communications-Principles and Practice, 3rd Edition, Prentice Hall, 2008
3. J.C. Palais, Fiber Optic Communications, 5th Edition, Prentice Hall, 2005
4. G.P. Agrawal, Fiber-optic Communication Systems, 3rd Edition, Wiley, 2002
5. J. P. Dakin and B. Culshaw, Optical Fibre Sensors, Artech House, Vols.1&2, 1989, and Vols.3&4, 1997.

July 2022

Subject Description Form

Subject Code	EE524
Subject Title	Open Electricity Market Operation
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To enable students to understand the key and practical issues of restructuring electricity supply industry and to establish a broad knowledge of open electricity market operation. 2. To enable students to understand the key issues in open electricity market operation including deregulated power system operation, transmission pricing, procurement of ancillary services, congestion management, available transmission capacity so that students are provided with knowledge and techniques they need to meet the electric industry's challenges in the 21st century.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire a good understanding of the rationale and key issues for restructuring electricity supply industry, practical operation and design considerations for real world electricity markets, and financial tools to hedge risks used in electricity supply industries. b. Analyse the available transmission capacity and formulate equitable transmission pricing in electricity markets. c. Assess ancillary services requirements and values based on security, economic and performance considerations. d. Present technical results in the form of technical report and verbal presentation
Subject Synopsis/ Indicative Syllabus	1. ***Restructuring of the Electricity supply industry (ESI)*:** ESI structures; Privatisation and competition; Market structures and architectures; Regulation of Electricity Markets; Role of existing players. 2. ***Electricity market*:** Timeline coordination, design considerations and practical operation of a real-world electricity market system. Use of different financial contracts/tools including derivatives and electricity futures for risk management in electricity markets. Game theory approach for market competition analysis. Transmission congestion management in electricity market. Security considerations. 3. ***Transmission and ancillary services*:** Transmission ownership and restructuring. Measuring available transmission capacity in energy markets. Purchasing transmission capacity. Network and point to point transmission services. Fixed and firm transmission rights. Ancillary services and technical specifications, and performance based cost model. 4. ***Transmission pricing*:** The costs of transmission services. Locational prices. Embedded cost allocation methods. Stranded assets. Short-run marginal cost. Long-run marginal cost. Integrated approach of transmission pricing.

Teaching/Learning Methodology	The concept of electricity market modelling and economic analysis framework will be presented through lectures and tutorials with reference to real-life market environment. Students will be required to form groups to work through cases covering the market structure and operational aspects so as to develop ability to critically evaluate principles and operation of electricity markets. Tutorials will be structured on different sessions for better understanding on the theoretical concepts which require sufficient contributions from students. Students will also learn through active participation in the presentation of finding of their case studies.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Case Studies & Presentation	✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	62%	✓	✓	✓	
2. In-class tests	19%	✓	✓	✓	
3. Cases study & presentation	19%	✓	✓	✓	✓
Total	100%				

The outcomes on the concepts of modelling, analysis and applications are assessed by the usual means of examination and tests whilst those on problem-solving techniques and presentation of findings, as well as technical reporting and teamwork, are evaluated by the case study exercise.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	33 Hrs.
	▪ Presentation	6 Hrs.
	Other student study effort:	
	▪ Case study and report	15 Hrs.
	▪ Self-study	51 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. D. Gan, D. Feng and J. Xie, Electricity Markets and Power System Economics, CRC Press, 2013
2. D. Kirschen, G. Strbac, Fundamentals of Power System Economics, 2nd Edition, John Wiley & Sons, 2018
3. K. Bhattacharya, M.H.J. Bollen, and J.E. Daalder, Operation of Restructured Power Systems, Kluwer Academic Publishers, 2001

June 2022

Subject Description Form

Subject Code	EE526
Subject Title	Power System Analysis and Dynamics
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To introduce the students to the advanced concepts and analytical skills for the stability analysis in modern power systems. 2. To understand the causes and impact of different system instabilities. 3. To analyse and provide solutions to the power system stability problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire in-depth understanding of different types of power system stability problems. b. Model the dynamic behaviours of system components under disturbances. c. Apply mathematics and engineering knowledge and skills in the analysis of stability problems. d. Discuss the causes and effects of instabilities and recommend possible solutions. e. Acquire skills in presentation and interpretation of experimental results and communicate in written form
Subject Synopsis/ Indicative Syllabus	1. ***Power system stability*:** Basic concepts and classification. Past incidents of system instability and consequences. Power system stability issues and solutions. 2. ***Reactive power compensation*:** System Q-V Characteristics. Reactive support theory. Load Characteristics. Synchronous condensers, Static Var Compensators (SVS), Thyristor Switched Capacitor (TSC), Thyristor controlled Reactor (TCR). 3. ***Voltage stability*:** Fundamental concepts. Singularities and multiple load flow techniques, eigenvalue methods. Load modelling, tap-changer effects, voltage controllability and voltage compensation. Proximity of collapse, Measures against collapse. Practical experience. 4. ***Dynamic stability & power system stabilisers*:** Eigenvalue and modal analysis. Generator and load modelling. Power system stabiliser. Small-signal stability of multi-machine systems. Selection of input signal and installation location, parameter design and commissioning of PSS. 5. ***Application of HVDC, FACTS and ESS in improving stability*:** HVDC link operation and its control for stability improvement. Flexible AC transmission devices, power angle control. Energy storage system, e.g. BESS, SOFC, FESS, and its application in stability control. **Mini-projects:** 1. Power system stability analysis using industrial power systems design and analysis software 2. Power system stabiliser design for damping of low frequency power oscillation

Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on system analysis, design and practical applications are given through experiments, in which the students are expected to solve the power system stability and control design problems with practical constraints and to attain pragmatic solutions with critical and analytical thinking. Students will be required to form groups to work through a mini-project for a selected topic. Mini-Projects are used to enhance students learning experiences and practical applications.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	✓	✓	✓	✓	
Tutorials			✓		
Mini-project	✓	✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1. Examination	60%	✓	✓	✓	✓	
2. Class Test	18%	✓	✓	✓	✓	
3. Mini-project/report	12%				✓	✓
4. Essay assignment	10%	✓			✓	✓
Total	100%					

The outcomes on concepts, design and applications are assessed by the usual means of examination and test Experiments and written reports assess those on analytical skills, problem-solving techniques and practical considerations of power system stability and control design as well as technical reporting.

Student Study Effort Expected	
Class contact:	
▪ Lecture/Tutorial	39 Hrs.
Other student study effort:	
▪ Mini-project and report	15 Hrs.
▪ Essay assignment/Self-study	51 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference Books:

1. P. Kundur, Power System Stability and Control, McGraw Hill, 1994
2. P.M. Anderson and A.A. Fouad, Power System Control and Stability, Wiley-IEEE Press, 2nd Edition, 2002
3. G. Rogers, Power System Oscillations, Springer, 1999
4. Voltage Stability of Power Systems: Concepts, Analytical Tools and Industry Experience, IEEE Publication 90th 0358-2-PWR, 1990
5. Y.H. Song, and A.T. Johns, Flexible AC Transmission Systems, IEE, 1999
6. T.V. Cutsem, and C. Vournas, Voltage Stability of Electric Power Systems, Springer, 2nd Edition, 2007

June 2022

Subject Description Form

Subject Code	EE528
Subject Title	System Modelling and Optimal Control
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide students with a sound knowledge of system identification and modelling techniques in areas of prediction and control. 2. To introduce modern control design techniques.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Model systems using State Variable and Transfer Functions. b. Design optimal controllers for system models. c. Apply computer packages for control system modelling and design.
Subject Synopsis/ Indicative Syllabus	1. ***System models*****:** functions, transformations and mapping, Laplace transformation and z-transformation, state variables and state space models of dynamic systems, relations between state space models and transfer function models, solutions of unforced linear state equations, matrix exponential, eigenvalues and eigenvectors, Jordan form, solutions of linear state equations, transition matrix. 2. ***Stability, controllability, and observability*****:** stability, Lyapunov stability, Lyapunov function, controllability and observability, definition and criteria, stabilizability and detectability, feedback control. 3. ***Optimal control*****:** Calculus of variations, formulation of optimal control problems, Pontryagin maximum principle, Riccati equation, application to linear regulator.
Teaching/Learning Methodology	Basic concepts and theories are taught in lectures and tutorials. Computer experiments will be assigned as part of the interactive assignments, where the students are expected to solve theoretical and practical control problems with critical and analytical thinking.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Tutorials	✓	✓	✓	
Assignments			✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	
2. Assignments	40%	✓	✓	✓	✓
Total	100%				

The outcomes on concepts, analytical skills, problem-solving techniques, design and applications, and practical considerations of designing control systems are assessed by the usual means of examination and assignments, including computer-package-based assignments.

Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	39 Hrs.
	Other student study effort:	
	▪ Reading and studying	43 Hrs.
	▪ Completing assignments	23 Hrs.
	Total student study effort	105 Hrs.

Reading List and References	1. L. Ljung, System Identification: Theory for the User (2nd Edition), Prentice Hall. 2. C.C. Hang, T.H. Lee and W.K. Ho, Adaptive Control, Instrument Society of America. 3. N. Nise, Control Systems Engineering, Wiley. 4. P. J. Antsaklis and A. N. Michel, Linear Systems, McGraw Hill.

July 2022

Subject Description Form

Subject Code	EE530
Subject Title	Electrical Energy Saving Systems
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To enable students to establish a broad concept on energy saving using techniques of electrical engineering. 2. To provide an in-depth knowledge on selected topics of energy-saving systems in electrical engineering. 3. To enable students to understand typical energy storage systems, its associated issues of grid connection and related technical considerations. 4. To enable students to understand the potential of solar energy and characteristics & performance of various kinds solar energy systems. 5. To enable students to understand various techniques and systems for control and monitoring of energy saving, as well as the related communication protocol and interfacing requirements. 6. To enable students to understand control gears for lighting systems and variable speed drives for HVAC systems & elevators.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Describe the operation principle & control strategy of various energy storage systems and topologies of these systems and identify their benefits & impacts. b. Describe the principle and characteristics of various solar energy devices, and identify the potentials of solar energy. Calculate available solar irradiation for a given location. c. Describe the operation principle and characteristics of typical control and monitoring systems for energy saving, including the communication protocols. d. Identify different energy saving control for industrial plants and multi-storey buildings, including giving examples. e. Describe the operation principle and characteristics of typical control gear for lighting and variables speed drives. f. Given a technical topic, carry out literature search and report the findings in a presentation and be able to work and communicate effectively in a team setting.
Subject Synopsis/ Indicative Syllabus	1. ***Energy storage systems*:** Utility Load Factor, peak lopping and valley filling, energy storage systems, battery energy storage, super-capacitor, power electronics topologies, control strategy, grid connection, voltage support, power quality improvement, environmental impact, improvement of utility energy efficiencies. 2. ***Solar energy utilization*:** Solar irradiation on earth, potentials of solar energy, solar thermal system systems, photovoltaic systems, characteristics and performance of typical BIPV systems and estimation of its energy output, distributed power generation, passive solar devices on buildings for energy saving, and case study. 3. ***Energy saving control and monitoring systems*:** Theory of energy saving, concept of building energy efficiency, control and monitoring systems and some of its related communication protocols. Application examples.

	4. ***Lighting, ballast, and variable speed drives*:** Magnetic ballast, electronic ballast, lighting design, fluorescent, LED and HID lamps, variable speed drives for HVAC systems and elevators, energy storage and regeneration for elevators, harmonics implications. **Laboratory Experiments, Seminars, Site Visits:** Demonstration on operating principles of some selected energy-saving systems. **Case study:** Selections of practical real life energy-saving systems in Hong Kong.
Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Practical experiences on power electronics design, energy saving and applications are given through mini-projects. Mini-projects are given in the beginning of the study. Students are encouraged to form group to jointly investigate an industrial problem and they have to present the projects in front of the class.

Teaching/Learning Methodology	Outcomes					
	a	b	c	d	e	f
Lectures	✓	✓	✓	✓	✓	
Tutorials	✓	✓	✓	✓	✓	
Mini-project						✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Examination	60%	✓	✓	✓	✓	✓	
2. Class Test and/or Assignment	30%	✓	✓	✓	✓	✓	
3. Mini-project & Report	10%	✓	✓	✓	✓	✓	✓
Total	100%						

It is a fundamental energy saving subject. The outcomes on concepts, design and applications are assessed by the usual means of examination, assignment and test whilst those on analytical skills, problem-solving techniques and practical considerations of circuit design, as well as technical reporting and teamwork, are evaluated by experiments, mini-project and the reports.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	30 Hrs.
▪ Seminar/Case study	9 Hrs.
Other student study effort:	
▪ Mini-project/report	20 Hrs.
▪ Self-study	46 Hrs.
Total student study effort	105 Hrs.

Reading List and References	**Reference books:** Battery Storage Systems 1. D. Andrea, Battery Management Systems for Large Lithium Ion Battery Packs, Artech House, 2010. 2. P.W. Parfomak, Energy storage for Power Grids and Electric Transportation: A Technology Assessment, Congressional Research Service, 2012. 3. Y. Brunet, Energy storage, Wiley, 2013 4. F. S. Barnes, J.G. Levine, Large Energy Storage Systems Handbook, CRC Press, 2011 Solar Energy Utilisation 5. S. Yannas, Solar Energy and Housing Design, Architectural Association, 2005/2006 6. R. Messenger, Photovoltaic Systems Engineering, CRC Press, 2017 edition 7. C. Prapanavarat, Investigation of the Performance of a Photovoltaic AC Module, Generation, Transmission and Distribution, IEE Proceedings, Vol: 149, Issue 4, Jul 2002 8. Web site of Energy Efficiency and Renewable Energy from the Dept. of Energy of USA, http://www.eere.energy.gov/ 9. Web site of the Key Centre of Photovoltaic Engineering in University of New South Wales, http://www.pv.unsw.edu.au/ 10. S. Kouro, Grid-connected photovoltaic systems – an overview of recent research and emerging PV converter technology, IEE Industrial Electronics Magazine, 2015. Energy Saving Control and Monitoring Systems 11. EMSD of HKSAR Govt, Code of Practice for Energy Efficiency of Building Services Installation, 2012 12. EMSD of HKSAR Govt, Code of Practice for Building Energy Audit, 2012 13. Anna Magrini, Building Refurbishment for Energy Performance: A Global Approach (Green Energy and Technology) Springer, 2014th Edition. 14. Bela Liptak, Instrument Engineers' Handbook, 4th Edition, Volume Two: Process Control and Optimization, CRC 2005. Lighting, Ballast, and Variable Speed Drives 15. T. Q. Khanh, LED lighting: Technology and Perception, Wiley-VCH, 2015 16. J.R. Benya, D.J. Leban, Lighting Retrofit and Relighting: A Guide to Energy Efficient Lighting, John Wiley & Son, 2011 17. M.H. Rashid, Power Electronics Handbook: Devices, Circuits and Applications, Academic Press, 2010 18. Guidelines on Energy Efficiency of Lift and Escalator Installations, 2007 Edition, Electrical and Mechanical Services Department (EMSD), the Government of the HKSAR, Hong Kong 19. K.W.E.Cheng, Design and Fabrication of Electronics and Optical Systems for Advanced Automotive Lighting Systems, The Hong Kong Polytechnic University, 2007

June 2022

Subject Description Form

Subject Code	EE545
Subject Title	Modern Generation and Grid Integration Technologies
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Students are expected to have substantial knowledge about electrical power systems. Exclusion: EE501
Collaboration Institute	HK Electric Institute
Objectives	1. To enable students to establish a broad concept on modern power generation technologies, including local relevant renewable energy and gas turbines. 2. To enable students to understand typical renewable energy technologies and related energy storage systems, its associated characteristics, performance, issues of application and related technical considerations. 3. To provide an in-depth knowledge on gas turbine power plants, combined cycle systems, cogeneration and trigeneration systems. 4. To enable students to understand how to integrate renewable energy into power grid, its related issues, concept of micro grid, smart grid, distributed generation and distribution automation.
Intended Learning Outcomes	Upon Completion of the subjects, student will be able to: a. Identify suitable renewable energy source and fuel-mix for electricity generation in Hong Kong under current situations b. Explain the principle of operation for the generation technologies, including their integration into the modern power grid or micro grids. c. Design the overall architecture for the power generation systems and the interfacing parts, and analysis their performance.
Subject Synopsis/ Indicative Syllabus	1. Energy resources and types (1.5 weeks): Renewable and non-renewable energy resources. World potential and trends. Environmental effects. Local relevant renewable energy types and present developments. Role and importance of renewable energy. 2. Wind and solar energy (2 weeks): Overview of wind energy, wind turbine technology, onshore and offshore wind farms, planning considerations for offshore wind farm, wind resource assessment, wind farm siting and optimization, case study. PV technology, PV panel comparison (performance, cost) and criteria for PV module selection, photovoltaic conversion systems, feasibility study and site selection, design and monitoring techniques, new development in PV technology, case study. 3. Energy storage technology (2 weeks): Types of utility scale energy storage systems and the associated power electronic systems and energy management: pumped water storage, hydroelectric dams, batteries, supercapacitors, superconducting magnetic energy and hydrogen storage. Concept of vehicles-to-grid. 4. Gas turbine and cogeneration technology (1 week): comparison of its emission with other fossil fuel plants. Types of gas turbines and its characteristics and operation features. Combined cycle, cogeneration and trigeneration. Major equipment of a Combined Cycle Generation Unit, Thermal cycle and performance indices of combined cycle generation unit.

	5. Electrical System in a Power Generation Plant (1 week): Theory of Electricity Generation, Major Electrical Equipment and Machines of a Generation Unit, Power Distribution Systems in a Power Plant, Case study. 6. Grid integration (3 weeks): Integrating renewable energy sources into the power grid, the issues, the associated power electronic systems and its design, load levelling, energy demand response & management, related power dispatching issues. Complementary characteristics among RE sources and energy storages. Case studies: possible example is Longyangxia Dam Solar Park and Alto Rabagao Solar Dam. Applications of smart grids in this area. Concept of micro-grid and distributed generation & distributed automation. 7. Application examples, demonstration and trends (1.5 weeks): Demonstration projects or case study on micro-grid, smart meters, distributed automation, co-generation, trigeneration and vehicle-to-grid concept. Future trends. **Note:** 1 week is reserved for test(s) and revision. **Site Visit in a weekend:** Lamma Power Station and Lamma Winds 1. L9 Combined-Cycle Generation Unit 2. Gas Receiving Station 3. PV Solar Panel System 4. Wind Turbine
Teaching/Learning Methodology	Delivery of the subject is mainly through formal lectures, complemented by tutorials, work examples/case studies and a visit/ demonstration. Self-learning on the part of students is strongly encouraged and extensive use of web resources will be made. Assignments, in-class assignments, tests and final examination will be the assessment tools.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lectures	✓	✓	✓
Work examples/ case studies	✓	✓	✓
Visit/demonstration		✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Examination	60%	✓	✓	✓
2. Tests	15%	✓	✓	✓
3. Assignments	15%	✓	✓	✓
4. In-class assignments	10%	✓	✓	
Total	100%			

This is an advanced and yet appreciation subject for students who are interested in power and energy systems. The outcomes are assessed by usual means of examination, tests and assignments.

Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	39 Hrs.

	Other student study effort:	
	▪ Assignment and Self-study	66 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. Ibrahim Dincer and Calin Zamfirescu, "Advanced power generation systems", Elsevier Science, 2014 2. Nicu Bizon, "Advances in energy research : distributed generations systems integrating renewable energy resources", Nova Science Publishers, 2011 3. IEA, "The power of transformation : wind, sun and the economics of flexible power systems", PECD Publishing 2014 4. Mukund R Patel, "Wind and solar power systems : design, analysis, and operation", CRC Press 2006 5. Rolf Kehihofer, "Combined-cycle gas & steam turbine power plants", PennWell, 2009 6. Masoos Ebrahimi and Ali Keshavarz, "Combined cooling, heating and power : decision-making, design and optimization", Elsevier, 2015 7. Ashok D Rao, "Combined cycle systems for near-zero emission power generation", Oxford England : Woodhead Pub., 2012 8. Q Zhong and T Hornik, "Control of power inverters in renewable energy and smart grid integration", John Wiley & Sons, 2013 9. Antonio Moreno-Munoz, "Large scale grid integration of renewable energy sources", IET 2017 10. Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley, 2011 11. Fereidon P Sioshansi, "Smart grid integrating renewable, distributed & efficient energy", Elsevier/Academic Press, 2011 12. K. Salman, "Introduction to the Smart Grid: concepts, technologies and evolution", IET 2017	

June 2022

Subject Description Form

Subject Code	EE546
Subject Title	Electric Energy Storage and New Energy Sources for Electric Vehicles
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To acquire a broad knowledge on classical and modern electric energy storage 2. To understand the development of energy storage from technological, environmental, and societal perspectives.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the importance of energy storage as it pertains to environmental concerns, energy sustainability and climate change. b. Understand various underpinning technologies for conventional and modern energy storage including both portable and stationary systems, such as batteries, supercapacitors, compressed air, flow batteries, new fuel, and fuel cells. c. Explain the role of energy storage in new energy in electric vehicles (EV) and discuss how energy storage devices can be optimally integrated for these applications.
Subject Synopsis/ Indicative Syllabus	1. ***Concept of energy storage***: History of energy storage, classification of the types of energy storage. 2. ***Electrochemical storage***: Lead-acid and Nickel batteries, Lithium/sodium-based battery, Flow and Redox batteries, Fuel cell, Sustainability considerations for future electrochemical systems. 3. ***Carbon-hydride:*** Carbon hydride energy storage system, non-carbon based fuel, cracking, fuel transportation, fuel storage. 4. ***Mechanical storage***: Compressed air energy storage, pumped hydro energy storage, flywheels. 5. ***Static Energy Storage***: Super-capacitor, Magnetic Energy storage. 6. ***Electrical energy storage parameters***: State of Charge, State of Health, cell impedance and electrochemical impedance spectroscopy, cell models 7. ***Energy management System***: Battery management, Energy management, cell equalization, conditional monitoring. 8. ***New Energy for vehicles***: Solar vehicles, Fuel cell vehicles, hydrogen engine, compressed gas vehicles, power conversion for new energy.
Teaching/Learning Methodology	Delivery of the subject is mainly through formal lectures, complemented by tutorials. worked examples and assignment. Self-learning on the part of students is strongly encouraged and extensive use of web resources will be made.

Teaching/Learning Methodology	Intended subject learning outcomes		
	a	b	c
1. Lectures	✓	✓	✓
2. Tutorials	✓	✓	✓
3. Assignment	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Assignment	20%	✓	✓	✓
2. Test	20%	✓	✓	✓
3. Examination	60%	✓	✓	✓
Total	100 %			

The assignment is designed to assess students' understanding of the energy storage principles and whether they can present the study clearly. It may include take-home assignment and/or miniproject.

The test is designed to assess students' understanding of the topics that they have learnt relative to learning outcomes (a), (b) and (c). The test is usually conduced in the mid-semester to measure students' performance.

Examination: questions are designed to assess learning outcomes (a), (b) and (c). Students are required to answer questions that cover all of the learning outcomes.

Student Study Effort Expected	
Class contact:	
▪ Lecture	30 Hrs.
▪ Tutorial and presentation	9 Hrs.
Other student study effort:	
▪ Mini project or Assignment	27 Hrs.
▪ Self-study	49 Hrs.
Total student study effort	115 Hrs.

Reading List and References

1. "Battery Systems Engineering", A John Wiley & Sons, Ltd., Publication, 2013
2. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer New York, 2013
3. Gregory L. Plett, "Battery Management Systems", Boston : Artech House 2015
4. Serguei N. Lvov, Introduction to Electrochemical Science and Engineering. Boca Raton: CRC Press, 2015.
5. G. Pistoia and B.Liaw, "Behaviour of Lithium-Ion Batteries in Electric Vehicles: Battery Health, Performance, Safety, and Cost", Green Energy and Technology, 2018.
6. R.Xiong, "Battery Management Algorithm for Electric Vehicles", 1st ed., Kindle Edition, 2020.
7. Junqiu Li, "Modeling and Simulation of Lithium-ion Power Battery Thermal Management (Key Technologies on New Energy Vehicles) Springer, 2022.

July 2022

Subject Description Form

Subject Code	EE547
Subject Title	Electric Vehicle Charging Systems
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To acquire a broad knowledge of electric vehicle charging technology 2. To understand the development of electric vehicle charger from technological, environmental, and societal perspectives.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a Understand the importance of chargers as it pertains to environmental concerns, energy sustainability, climate change, and global policy. b. Understand various underpinning technologies for charger including conductive, wireless and battery swapping. c. Acquire the knowledge of charger practice, charger policy and infrastructure.
Subject Synopsis/ Indicative Syllabus	1. ***Introduction to electric vehicle charging technology:*** Charging system, Constant voltage, Constant current, Pulse charging. 2. ***Charger Circuit:*** Circuit topology, Charging control, AC and DC chargers, Semi-fast, fast and quick chargers. 3. ***Inductive charging:*** Concept of wireless power transfer, Dynamic wireless charger, Coil design, Coupling, Electromagnetic interference. 4. ***Charger standards:*** Wireless standards including Qi, PMA, A4WP, Magnet, conductive charger standard including CHAdeMO, SAE and IEC, Connection and plug. 5. ***Charger infrastructure:*** Charging station and network, pantograph, load management, Vehicle to Grid, EV Penetration, Synergistic control of EV and planning. 6. ***Other Charging technologies***: Battery swapping, Hydrogen and solid fuel.
Teaching/Learning Methodology	Delivery of the subject is mainly through formal lectures, complemented by tutorials. worked examples and assignment. Self-learning on the part of students is strongly encouraged and extensive use of web resources will be made.

Teaching/Learning Methodology	Intended subject learning outcomes		
	a	b	c
1. Lectures	✓	✓	✓
2. Tutorials	✓	✓	✓
3. Assignment	✓	✓	✓
4. Laboratory		✓	

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Assignment	10%	✓	✓	✓
2. Laboratory performance & reports	10%		✓	
2. Test	20%	✓	✓	✓
3. Examination	60%	✓	✓	✓
Total	100 %			

The assignment is designed to assess students' understanding of the electric vehicle charging principles and whether they can present the study clearly. It may include the take-home assignment and/or miniproject.
Laboratory class is designed to teach students some practical understanding of a charger and its operation.
The test is designed to assess students' understanding of the topics that they have learnt relative to learning outcomes (a), (b) and (c). The test is usually conduced in the mid-semester to measure students' performance.
Examination: questions are designed to assess learning outcomes (a), (b) and (c). Students are required to answer questions that cover all of the learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	27 Hrs.
▪ Laboratory, Tutorial and Presentation	12 Hrs.
Other student study effort:	
▪ Mini project or Assignment	21 Hrs.
▪ Laboratory	6 Hrs.
▪ Self study	49 Hrs.
Total student study effort	115 Hrs.

Reading List and References

1. K.T.Chau, "Battery Systems Electric Vehicle Machines and Drives", Wiley 2015.
2. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer New York, 2013
3. Rik De Doncker, Duco W.J. Pulle, André Veltman, "Advanced Electrical Drives - Analysis, Modeling, Control", Springer Dordrecht Heidelberg London New York, 2011.
4. The Institution of Engineering and Technology, "Code of Practice for Electric Vehicle Charging Equipment Installation", IET Standard, 3rd edition, 2018.
5. C.T.Rim, C.Mi, "Wireless Power Transfer for Electric Vehicles and Mobile Devices", Wiley – IEEE, 1st Edition, Kindle Edition, 2017.
6. L.A.Kumar, S.A.Alexander, "Power Converters for Electric Vehicles", 1st Edition, Kindle Edition, 2020.
7. Per Enge, Nick Enge, Stephen Zoepf, Electric Vehicle Engineering", McGraw Hill, 2021.

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Subject Description Form

Subject Code	EE548
Subject Title	Advanced Electric Vehicle Technology
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE512
Objectives	1. To acquire a high level of electric vehicles technology and future EV design 2. To understand the development of the impact of electric vehicles on society and security.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the advanced knowledge of the electric vehicle. b. Understand various advanced parts and components in electric vehicles. c. Understand the future energy sources and storage for electric vehicles. d. Impact of electric vehicles and emerging technologies.
Subject Synopsis/ Indicative Syllabus	1. ***Future EV design and demand:*** All electric parts and components design, configurable EVs, high speed vehicles, hyperloop vehicle, Magnetic levitation vehicle. 2. ***Advanced motor drive:*** In-wheel motor, anti-braking system (ABS), Continuously Variable Transmission (CVT), active suspension. 3. ***Advanced energy storage:*** Distributed energy storage, future battery, future fuel cell. 4. ***Power electronics for EV:*** High power density power electronics, High current power electronics. 5. ***EV and security:*** Advantage and disadvantage of EVs, Autocrypt V2G, EV accidents and safety, EV maintenance, Internet of Thing (IoT) for EVs, Intra vehicle security, Vehicle to Data Center security 6. ***Autonomous vehicles:*** Layers of autonomy, Unmanned ground vehicle (UGV), Advanced Driver Assistance Systems (ADAS), Smart sensors, radar, Lidar, Path control. 7. ***Future power sources for EV:*** Photovoltaic to EV, Catenary-free electric trains and Trolley bus, Non-Carbon fuel, New energy for EVs. 8. ***EV policy:*** Government Policy in EVs, Infrastructure of EVs, sustainability and the environment.
Teaching/Learning Methodology	Delivery of the subject is mainly through formal lectures, complemented by tutorials, worked examples and assignment. Self-learning on the part of students is strongly encouraged and extensive use of web resources will be made.

	Teaching/Learning Methodology: Intended subject learning outcomes (a, b, c, d) 1. Lectures ✓ ✓ ✓ ✓ 2. Tutorials ✓ ✓ ✓ ✓ 3. Assignment/mini-project ✓ ✓ ✓ ✓
Assessment Methods in Alignment with Intended Learning Outcomes	Specific assessment methods/tasks; % weighting; Intended subject learning outcomes to be assessed (a, b, c, d) 1. Assignment/mini-project 15% ✓ ✓ ✓ ✓ 2. Test 25% ✓ ✓ ✓ ✓ 3. Examination 60% ✓ ✓ ✓ ✓ Total 100 % The assignment is designed to assess students' understanding of the advanced electric vehicle principles and its impact to society and whether they can present the study clearly. Oral presentation for their assignment is needed. It includes the take-home-assignment and mini-project. The test is designed to assess students' understanding of the topics that they have learnt relative to learning outcomes (a), (b), (c) and (d). The test is usually conduced in the mid-semester to measure students' performance. Examination: questions are designed to assess learning (a), (b), (c) and (d). Students are required to answer questions that cover all of the learning outcomes.
Student Study Effort Expected	Class contact: ▪ Lecture 30 Hrs. ▪ Tutorial and presentation 9 Hrs. Other student study effort: ▪ Mini project or Assignment 27 Hrs. ▪ Self-study 49 Hrs. Total student study effort 115 Hrs.
Reading List and References	1. Mark Daly, "Electric Vehicles: A Guide for Just About Anyone", Eninserv Limited, 2017. 2. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer New York, 2013. 3. Tom Denton, "Electric and Hybrid Vehicles", Routledge, Taylor & Francis Group, 2016. 4. Wanrong Tang, Y. J. Zhang, "Optimal Charging Control of Electric Vehicles in Smart Grids", Springer, 2017. 5. Hanky Sjafri. "Introduction to Self-Driving Vehicle Technology", Chapman & Hall/CRC Artificial Intelligence and Robotics Series, 2019. 6. S. Liu, L. Li, J. Tang, S.Wu, J.Gaudiot, "Creating Autonomous Vehicle Systems", Synthesis Lectures on Computer Science, 2020.

July 2022

Subject Description Form

Subject Code	EE549
Subject Title	Modern Sensor Technologies
Credit Value	3
Level	5
Pre-requisite/ **Co-requisite/ Exclusion**	Undergraduate-level circuit and electromagnetic theory
Objectives	1. To acquire the fundamentals of sensor technologies. 2. To make the students to understand the structures and working principles of resistive, capacitive, piezoelectric, acoustic, electric and magnetic sensors. 3. To enable the students to understand and design thermal and mechanical sensors, optical sensors, optical fiber sensors and micro-electromechanical system (MEMS) sensor technologies. 4. To know the applications of sensors in Electrical Engineering.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire the operation principles and recent developments of sensors and transducer technologies, including thermal and mechanical sensors, electric and magnetic sensors, optical sensors as well as MEMS sensors technologies. b. Understand the structures and working principles of thermal sensors, mechanical sensors, acoustic sensors, electric and magnetic sensors for practical applications. c. Select the most appropriate optoelectronic components and optical fiber devices to design optical sensors and optical fiber sensor systems. d. Comprehend the structures and multidisciplinary working principles of MEMS-technology and sensor networks. e. Have hands-on experience in the assembling and testing of electric/optical sensors or MEMS sensors.
Subject Synopsis/ Indicative Syllabus	1. ***Introduction to sensor fundamentals***. Definition of sensors; sensor and information; physical quantities; relation between quantities; sensor classification; uncertainty aspects. 2. ***Thermal, mechanical and acoustic sensors***. Resistivity and resistance; construction, general properties and applications of potentiometric sensors; strain gauges and their applications; thermoresistive sensors; capacitance and permittivity; flat-plate and multi-plate capacitive sensors; silicon capacitive sensors and applications. 3. ***Electric and magnetic sensors***. Magnetic induction, permeability and magnetostriction; magnetic field sensor; magnetic and induction based displacement and force sensors; piezoelectric materials and parameters; piezoelectric force, pressure and acceleration sensors and applications. 4. ***Optical sensors and optical fiber sensors.*** Electro-optical components; classification of optical sensors; optoresistive sensors; optical displacement sensors; optical acoustic sensors; optical fiber grating sensors; optical fiber distributed sensors and applications. 5. ***MEMS and optical MEMS sensors.*** Production of MEMS; MEMS-based pressure sensors, mass air flow sensors, inertial sensors and angular rate sensors; optical MEMS sensors. 6. ***Applications: sensors in Electrical Engineering.*** Electrical and optical current sensors; power cable fault-detection methods; smart railway monitoring systems. **Laboratory Experiments:** Testing and calibration of force sensors and on-board MEMS accelerometers.
Teaching/Learning Methodology	Lectures, quizzes, tests, laboratory experiments, mini-projects, and examination.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	√	√	√	√	
Tutorials	√	√	√	√	
Experiments/Mini-project	√		√		√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
1.Tests/Quizzes	18%	√	√	√	√	
2. Assignments	6%	√	√	√	√	
3. Lab and mini-project	16%	√		√		√
4. Examination	60%	√	√	√	√	
Total	100%					

This subject introduces the structures, working principles and applications of electrical/optical sensor technologies. Tests/assignments/examination will be used to assess the outcomes about the structures and operation principles and applications of various electrical/magnetic/optical sensors. Experiments/mini-project will be used to assess the hands-on experience in electrical/optical sensors and MEMS devices.

Student Study Effort Expected

Class contact:	
▪ Lectures/Tutorials/Laboratory demo	39 Hrs.
Other student study effort:	
▪ Mini-project and report	20 Hrs.
▪ Self-study and assignments	46 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Sensors for Mechatronics, 2nd edition, Paul P. L Regtien, Edwin Dertien, Elsevier, 2018.
2. Sensors, actuators, and their interfaces: a multidisciplinary introduction, Nathan

	Ida, SciTech Publishing, 2014. 3. Handbook of Modern Sensors: Physics, Designs, and Applications, Jacob Fraden, Springer International Publishing AG, 2015. 4. Sensors handbook, 2nd edition, Sabrie Soloman, McGraw-Hill, 2010.

July 2022

Subject Description Form

Subject Code	ELC1011
Subject Title	Practical English for University Studies
Credit Value	3
Level	1
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	This subject aims to develop and enhance students' general proficiency and communication skills in English. A strong focus will be given to enhancing communicative competence and confidence in text structure, grammar, vocabulary, pronunciation and fluency.
Intended Learning Outcomes	Upon successful completion of the subject, students will be able to: a. produce short written texts in a university context using appropriate structures, vocabulary and tone b. analyse and select information from a range of text types in order to present content and views in a university context c. apply multimodal communication strategies (e.g. spoken, written, visual and aural) to present information and views for an academic audience To achieve the above outcomes, students are expected to use language and text structure appropriate to the context, select information critically, and present their views logically and coherently.
Subject Synopsis/ Indicative Syllabus	1. Written communication Enhancing the use of accurate and appropriate grammatical structures and vocabulary for various communicative purposes; improving the ability to organise written texts logically; and improving cohesion and coherence in writing. 2. Spoken communication Developing verbal and non-verbal interaction strategies appropriate to the context and level of formality. 3. Reading and listening Understanding the content and structure of information delivered in written and spoken texts; developing effective reading and listening strategies. 4. Language development Improving and extending relevant features of grammar, vocabulary, pronunciation and fluency. 5. Multimodal communication Developing the application of multimodal communication strategies; using a range of media and modes to present information and opinions.
Teaching/Learning Methodology	The study method is a combination of seminar, self-access work and online learning. Following a blended delivery approach, activities include teacher input as well as in- and out-of-class individual and group work involving drafting of texts, information search, mini-presentations and discussions. Students will make use of eLearning resources and web-based work to improve their grammar and vocabulary, and other language skills.
	Learning materials developed by the English Language Centre are used throughout the course. Students will be referred to learning resources on the Internet and in the ELC's Centre for Independent Language Learning. Additional reference materials will be recommended as required.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)		
		a	b	c
1. Paragraph writing	20%	✓	✓	
2. Essay writing	40%	✓	✓	
3. Documentary presentation	40%	✓	✓	✓
Total	100 %			

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

The paragraph writing test, which assess students' grammar, vocabulary and paragraph organisation skills, necessitates achievement of LOs (a) and (b).

The essay writing assessment evaluates students' ability to write a longer text in using accurate and appropriate structures and vocabulary (ref. LOs (a) and (b)).

The documentary presentation assesses students' ability to speak accurately, appropriately and confidently. Students will research a topic, organise information from a variety of sources, and deliver the information as a digital documentary and mini-presentation (ref. LOs (a), (b) and (c)).

Students are required to complete further language training outside the class through face-to-face initiatives and online tasks which are aligned with all the three LOs and correspond to their learning in class.

Student Study Effort Expected		
	Class contact:	
	▪ Seminar	39 Hrs.
	Other student study effort:	
	▪ Self-study/preparation	78 Hrs.
	Total student study effort	117 Hrs.

Reading List and References

Course material

Learning materials developed by the English Language Centre

Recommended references

1. Boyle, J. & Boyle, L. (1998). *Common Spoken English Errors in Hong Kong*. Hong Kong: Longman.
2. Brannan, B. (2003). *A writer's workshop: Crafting paragraphs, building essays (3rd ed.)*. Boston: McGraw-Hill.
3. Hancock, M. (2003). *English pronunciation in use*. Cambridge: Cambridge University Press.
4. Nettle, M. and Hopkins, D. (2003). *Developing grammar in context: Intermediate*. Cambridge: Cambridge University Press.
5. Redman, S. (2003). *English vocabulary in use: Pre-intermediate and intermediate*. Cambridge: Cambridge University Press.
6. Powell, M. (2011). *Presenting in English. How to get successful presentations.* USA. Heinle & Heinle Publishers.

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Subject Description Form

Subject Code	ELC1012 / ELC1013
Subject Title	English for University Studies (This subject will be offered in two versions for students who will primarily be using (1) APA/Harvard referencing styles or (2) IEEE/Vancouver referencing styles in their university studies.)
Credit Value	3
Level	1
Pre-requisite / Co-requisite/ Exclusion	Students entering the University with Level 3-5** from the HKDSE will be required to take this course.
Objectives	This subject aims to help students study effectively in the University's English medium learning environment, and to improve and develop their English language proficiency within a framework of university study contexts.
Intended Learning Outcomes	Upon successful completion of the subject, students will be able to: a. refer to sources in written texts and oral presentations b. paraphrase and summarise materials from written and spoken sources c. plan, write and revise expository essays with references to sources d. deliver effective oral presentations To achieve the above outcomes, students are expected to use language and text structure appropriate to the context, select information critically, and present information logically and coherently.
Subject Synopsis/ Indicative Syllabus	1. Written communication Analysing and practising common writing functions; improving the ability to write topic sentences and strategies for paragraph development; understanding common patterns of organisation in expository writing; taking notes from written and spoken sources; practising summarising and paraphrasing skills; improving coherence and cohesion in writing; developing revision and proofreading skills. 2. Spoken communication Recognising the purposes of and differences between spoken and written communication in English in university study contexts; identifying and practising the verbal and non-verbal interaction strategies in oral presentations; developing and applying critical thinking skills to discussions of issues. 3. Language development Improving and extending relevant features of grammar, vocabulary and pronunciation.
Teaching/Learning Methodology	The study method is primarily seminar-based. Following a blended delivery approach, activities include teacher input as well as in- and out-of-class individual and group work involving drafting and evaluating texts, mini-presentations, discussions and simulations. The process approach to writing is adopted, and students make use of eLearning resources to engage in academic discussions and to reflect on their learning. Learning materials developed by the English Language Centre are used throughout the course. Students will be referred to learning resources on the Internet and in the ELC's Centre for Independent Language Learning. Additional reference materials will be recommended as required.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Academic essay 1	25%	✓	✓	✓	
2. Academic essay 2	35%	✓	✓	✓	
3. Oral presentation	40%	✓	✓		✓
Total	100 %				

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

Assessments 1 and 2 necessitate achievement of LOs (a), (b) and (c) in order to write an effective academic essay via the process of extending and improving the essay for assessment 1. In order for students to present an effective academic oral presentation, as demanded in assessment 3, they will need to read, note and synthesise from a variety of sources, and refer to those sources in their presentation (ref. LOs (a), (b) and (d)).

In addition to these assessments, students are required to complete further language training, through web-based language work, reading tasks and online reflections. The additional language training offered in online tasks is aligned with all the four LOs. In some of the tasks, students critically read and summarise information contained in a variety of sources, as required in LOs (a) and (b).

Student Study Effort Expected	
Class contact:	
▪ Seminars	39 Hrs.
Other student study effort:	
▪ Self study/preparation	78 Hrs.
Total student study effort	117Hrs.

Reading List and References

Course material

Learning materials developed by the English Language Centre

Recommended references

1. Bailey, S. (2014). *Academic writing: a handbook for international students*. Abingdon: Routledge.
2. Comfort, J. (2001). *Effective presentations.* Oxford: Cornelsen & Oxford University Press.
3. Hung, T. T. N. (2005). *Understanding English grammar: A course book for Chinese learners of English*. Hong Kong: Hong Kong University Press.
4. Tang, R. (2012). *Academic writing in a second or foreign language: Issues and challenges facing ESL/EFL academic writers in higher education contexts*. London: Continuum International Pub.
5. Zwier, L. J. (2002). *Building academic vocabulary.* Ann Arbor, MI: University of Michigan Press.

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Subject Description Form

Subject Code	ELC2011
Subject Title	Advanced English Reading and Writing Skills
Credit Value	3
Level	2
Pre-requisite / Co-requisite	Pre-requisite: ELC1012 / ELC1013 English for University Studies
Objectives	This subject aims to help students become more effective readers and writers. It focuses on developing students' facility to read a variety of texts in a critical manner, both intensively and extensively; and to write texts that demonstrate knowledge and insight.
Intended Learning Outcomes	Upon successful completion of the subject, students will be able to examine a variety of texts, including literary texts, and: a. reflect on and critically analyze texts of different genres and styles, identifying the writer's aims and stance b. identify and evaluate language used to make claims and support these with valid arguments c. write a text on a chosen topic that includes their opinion and interpretation of some key issues and demonstrates critical thinking and creativity
Subject Synopsis / Indicative Syllabus	Reading strategies Reading extensively to appreciate the use of language, acquire information, promote understanding, and develop empathy. Reading intensively to investigate a particular topic and develop an in-depth understanding of issues and stances. Reading critically to extract implications, identify writers' assumptions and purposes, and analyze issues raised in texts written from different perspectives. Writing strategies Describing and analyzing the structure, meaning and characteristics of a variety of texts. Presenting views and arguments to educated readers with sophisticated language and appropriate visual images and formats.
Teaching/Learning Methodology	The study method is primarily seminar-based. Following a blended learning approach, activities include teacher input as well as in- and out-of-class work involving sharing and discussion of reading experiences; and reading, evaluating and drafting texts. The process approach to writing is adopted, and students make use of e-learning resources to engage in discussions and to reflect on their learning. Learning materials developed by the English Language Centre are used throughout the course. Students will be referred to learning resources on the Internet and in the ELC's Centre for Independent Language Learning. Additional reference materials will be recommended as required.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)		
		a	b	c
1. Analyzing genres of writing	30%	✓	✓	
2. Reflective writing	30%	✓		
3. Feature article writing	40%			✓
Total	100%			

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

Assessment 1 requires students to employ effective critical reading and thinking skills to interpret texts, identify the writer's style and stance, and evaluate the choice of language used; and is aligned with ILOs (a) and (b). Assessment 2 requires students to write a reflection after reading a range of literary genres and sharing their ideas in class; and is aligned with ILO (a). Assessment 3 requires students to first conduct research and gain some insight into a particular topic, then produce an article which can inform and impress readers through its substance, structure and language; and is aligned with ILO (c). Through these assessments, students will be able to develop and demonstrate more advanced reading and writing skills.

Student Study Effort Expected

Class contact:	
Seminars	39 Hrs.
Other student study effort:	
Online forums and blogs Readings and sharing session preparation Research and drafting/revising of texts	78 Hrs.
Total student study effort:	117 Hrs.

Reading List and References

Course material

Learning materials developed by the English Language Centre

Recommended references

1. Best, J. (2001). *Damned lies and statistics: Untangling numbers from the media, politicians, and activists.* Berkeley, CA: University of California Press.
2. Cooper, S. & Patton, R. (2010). *Writing logically, thinking critically.* New York, NY: Longman.
3. Damer, T. E. (2009). *Attacking faulty reasoning: A practical guide to fallacy-free arguments.* Belmont, CA: Wadsworth Cengage Learning.
4. Kennedy, X. J. & Gioia, D. (2010). *Literature: An introduction to fiction, poetry, drama, and writing* (11th ed.). New York, NY: Longman.
5. Mefcalfe, M. (2006). *Reading critically at university.* Thousand Oaks, CA: Sage.

June 2022

Subject Description Form

Subject Code	ELC2012
Subject Title	Persuasive Communication
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: ELC1012 or ELC1013 English for University Studies
Objectives	This subject aims to help students become more persuasive communicators in a variety of contexts that they may encounter at university and in the workplace.
Intended Learning Outcomes	By the end of the subject, students should be able to communicate effectively in an English-medium environment through: a) writing persuasive texts intended for a variety of audiences b) communicating persuasively in oral contexts c) making persuasive arguments in formal discussions To achieve these, students are expected to use language and text structure appropriate to the context, select information critically, and present and support stance and opinion.
Subject Synopsis/ Indicative Syllabus	1. Preparing for effective persuasion Assessing the situation; selecting relevant content; organising ideas and information; selecting an appropriate tone, distance and level of formality to support the communication of messages. 2. Persuasion through writing Developing and practising appropriate language, tone, style and structure; achieving cohesion and coherence. 3. Persuasion through speaking Developing and practising appropriate verbal and non-verbal skills for persuasive oral communication; improving and extending relevant pronunciation features, including articulation, pausing, intonation, word stress and sentence stress.
Teaching/Learning Methodology	The study method is primarily seminar-based. Activities include teacher input as well as individual and group work involving reading and appreciating texts, discussions and presentations of ideas. Learning materials developed by the English Language Centre are used throughout the course. Students will be referred to learning resources on the Internet and in the ELC's Centre for Independent Language Learning. Additional reference materials will be recommended as required.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)		
		a	b	c
1. Speech	30%		✓	
2. Persuasive written text	40%	✓		
3. Debate	30%		✓	✓
Total	100 %			

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

Assessment 1 is an individual speech. Assessment 2 concentrates on persuasive writing. Assessment 3 examines a different aspect of persuasion, the debate.

Student Study Effort Expected	
Class contact:	
▪ Seminars	39 Hrs.
Other student study effort:	
▪ Self study/preparation	78 Hrs.
Total student study effort	117 Hrs.

Reading List and References

Required readings

ELC-provided subject materials.

Other readings

1. Breaden, B. L. (1996). *Speaking to persuade.* Fort Worth, TX: Harcourt Brace College.
2. Covino, W.A. (1998). *The elements of persuasion.* Boston: Allyn and Bacon.
3. Edwards, R. E. (2008). *Competitive debate: The official guide.* New York: Alpha Books.
4. Leanne, S. (2008). *Say it like Obama: The power of speaking with purpose and vision.* New York: McGraw Hill.
5. Rogers, W. (2007). *Persuasion: messages, receivers, and contexts.* Lanham, MD: Rowman & Littlefield Publishers.
6. Stiff, J. B. (2003). *Persuasive communication* (2nd ed.). New York: Guilford Press.

June 2021

Subject Description Form

Subject Code	ELC2013
Subject Title	English in Literature and Film
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: English for University Studies (ELC1012/1013)
Objectives	This subject aims to introduce students to a range of literary genres in English as well as to enable them to consider differences in media representations of genres, and to appreciate and negotiate the meanings of a variety of literary texts. It is also intended that the subject will help students further develop literacy, as well as higher order thinking and life-long learning skills.
Intended Learning Outcomes	Upon successful completion of the subject, students will be able to: a. examine and analyse literary texts from different perspectives b. discuss literary techniques employed by writers c. appreciate and articulate differences in textual and visual media representations To achieve the above outcomes, students are expected to use language and text structure appropriate to the context, select information critically, and present and support stance and opinion.
Subject Synopsis/ Indicative Syllabus	1. Written communication Describing and interpreting content and language in literary texts; employing appropriate grammatical structures and vocabulary. 2. Spoken communication Presenting critical evaluation of literary works effectively and convincingly. 3. Reading Developing understanding of and competence in using literary devices such as metaphor, simile and symbolism, via reading literary texts and viewing film versions. 4. Language development Improving fluency and pronunciation, and extending grammatical and lexical competence.
Teaching/Learning Methodology	The study method is primarily seminar-based. Following a blended delivery approach, activities include teacher input as well as in- and out-of-class individual and group work involving listening to and viewing a variety of audio-visual sources, reading and drafting texts, conducting internet research, making mini-presentations, participating in discussions, and comparing various representations of literature. Students will make use of eLearning resources and web-based work to further improve their English literacy skills. Learning materials developed by the English Language Centre are used throughout the course. Students will be referred to learning resources on the Internet and in the ELC's Centre for Independent Language Learning. Additional reference materials will be recommended as required.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below
Student Study Effort Expected	See table below
Reading List and References	**Recommended reading** The PolyU library retains either hardcopies or electronic copies of the following titles. The titles can also be found online. 1. Stam, R., and Raengo, A. (eds.). (2004). *A companion to literature and film*. [electronic source] Blackwell reference online. Malden: Blackwell. Call number PN1995.3.C65 2004e http://www.blackwellreference.com/subscriber/uid=262/book?id=g9780631230533_9780631230533&authstatuscode=202 Other readings will be specified by the ELC teacher, and may contain short fiction, novelettes, plays and poetry.

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)		
		a	b	c
1. Individual Essay	40%	✓	✓	✓
2. Group Presentation	30%	✓	✓	✓
3. Individual Project	30%	✓	✓	✓
Total	100 %			

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

In assessment 1, students are required to write an individual paper in which they critically reflect on their reading of prose, and by so doing, demonstrate their achievement of LO (a). Assessments 2 and 3 are aligned with all three LOs. Assessment 2 assesses students' understanding of a literary drama and requires comparison of the merits of its textual and theatrical versions. Assessment 3 is an individual project that requires interpretation and presentation of more creative literature and audio-visual sources.

Class contact:	
▪ Seminars	39 Hrs.
Other student study effort:	
▪ Self study/preparation	78 Hrs.
Total student study effort	117 Hrs.

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Subject Description Form

Subject Code	ELC2014
Subject Title	Advanced English for University Studies
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: English for University Studies (ELC1012/ELC1013) (unless exempted)
Objectives	This subject aims to help students study effectively in the University's English medium learning environment, and to improve and develop their English language proficiency within a framework of university study contexts.
Intended Learning Outcomes	Upon successful completion of the subject, students will be able to: a. research relevant academic texts for a topic and integrate the sources into a position argument essay appropriately and effectively; b. plan, research for, write and revise a position argument essay; and c. present and justify views effectively in a mini oral defence. To achieve the above outcomes, students are expected to use language and text structure appropriate to the context, select information critically, and present and support stance and opinion logically and persuasively.
Subject Synopsis/ Indicative Syllabus	1. Written communication Developing logical and persuasive arguments; applying a variety of organisation patterns in discursive writing, including the writing of explanatory and evaluative texts; selecting information from academic texts critically; supporting stance; maintaining cohesion and coherence in discursive writing; achieving appropriate style and tone. 2. Spoken communication Enhancing and practising the specific oral and aural skills required to participate effectively in an academic discussion and to present and justify views in an oral defence. 3. Reading and listening Understanding the content and structure of information in oral and written texts; comprehending, inferring and evaluating messages and attitude. 4. Language development Improving and extending relevant features of grammar, vocabulary and pronunciation.
Teaching/Learning Methodology	The study method is primarily seminar-based. Following a blended delivery approach, activities include teacher input as well as in- and out-of-class individual and group work involving drafting and evaluating texts, mini-presentations, discussions and simulations. The process approach to writing is adopted, and students make use of eLearning resources to engage in academic discussions and to reflect on their learning. Learning materials developed by the English Language Centre are used throughout the course. Students will be referred to learning resources on the Internet and in the ELC's Centre for Independent Language Learning. Additional reference materials will be recommended as required.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)		
		a	b	c
1. Position Argument Essay (draft)	20%	✓	✓	
2. Academic Presentation & discussion	35%	✓		✓
3. Position Argument Essay (final)	45%	✓	✓	
Total	100 %			

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

Assessments 1 and 3 assess students' abilities to produce a coherent academic text which requires research, and effective use and referencing of sources (ref. LOs (a) and (b)). Assessment 2 assesses their abilities to plan, present and justify their views in an oral defence (ref. LOs (a) and (c)).

In addition to their assessments, students complete further language training by carrying out academic research and by completing a variety of independent-learning tasks focussing on grammar and academic skills such as paraphrasing and discussion strategies.

Student Study Effort Expected

Class contact:	
▪ Seminars	39 Hrs.
Other student study effort:	
▪ Self study/preparation	78 Hrs.
Total student study effort	117 Hrs.

Reading List and References

Course material

Learning materials developed by the English Language Centre

Recommended references

1. Davies, B. (2012). *Reading research: A user friendly guide for health professionals* (5th ed.). Toronto, ON: Elsevier Canada.
2. Faigley, L. (2012). *Backpack writing: Reflecting, arguing, informing, analyzing, evaluating* (3rd ed.). Boston, MA: Pearson.
3. Madden, C. and Rohlck, T. N. (1997). *Discussion and interaction in the academic community*. Ann Arbor, MI: University of Michigan Press.
4. McWhorter, K. T. (2007). *Academic reading* (6th ed.). New York, NY: Pearson/Longman
5. Oshima, A. & Hogue, A. (2006). *Writing academic English* (4th ed.). White Plains, NY: Pearson/Longman.
6. Reinhart, S. M. (2013). *Giving academic presentations* (2nd ed.). Ann Arbor, MI: University of Michigan Press.
7. Rost, M. (2013). *Active listening.* Harlow, England: Pearson.
8. Wood, N. V. (2012). *Perspectives on argument* (7th ed.). Boston, MA: Pearson.

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Subject Description Form

Subject Code	ELC3531
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 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: a. plan, organise and produce professionally acceptable project proposals with appropriate text structures and language for different intended readers b. plan, organise and deliver effective project-related oral presentations with appropriate interactive strategies and language for different intended audiences c. 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)		
		a	b	c
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 Hrs.
	Other student study effort:	
	Researching, planning and writing the project Rehearsing the presentation	52 Hrs.

	Total student study effort:	78 Hrs.
Reading List and 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, *Contemporary Business Report Writing*, 4th ed. Mason, OH: South-Western, 2009. 4. M. H. Markel, *Practical Strategies for Technical Communication*. 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.	

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Subject Description Form

Subject Code	ENG2001
Subject Title	Fundamentals of Materials Science and Engineering
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	1. To realize the impact of the development of engineering materials on human civilization; 2. To enable students to establish a broad knowledge base on the structure and properties of materials for solving engineering problems. 3. To enable students to understand the applications and selection of engineering materials based on the consideration of properties, cost, ease of manufacture, environmental issues and their in service performance.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. comprehend the importance of materials in engineering and society; b. explain the properties and behaviour of materials using fundamental knowledge of materials science. c. apply the knowledge of materials science to analyze and solve basic engineering problems related to stress, strain and fracture of materials; d. select appropriate materials for various engineering applications taking into consideration of issues in cost, quality and environmental concerns.
Subject Synopsis/ Indicative Syllabus	1. Introduction Historical perspective; Evolution of engineering materials; Materials science and engineering; Classification of materials 2. Atomic Structure and Structures of Materials Atomic structure; Bonding forces and energies; Primary interatomic bonds and secondary bonding; Crystalline and non-crystalline materials; Phase diagram and microstructure of alloys 3. Electrical and Optical Properties of Materials Conductors and insulators; Semi-conductor materials; N-type and P-type semiconductors; P/N junction; Light interactions with materials; Light emitting diode (LED) and photovoltaics; Light propagation in optical fibers; Liquid crystal; Photoelasticity 4. Mechanical Properties of Materials Concept of stress and strain; Stress-strain behaviour; Elastic and plastic properties of materials; Concepts of dislocations and strengthening mechanisms; Tensile properties; Elastic recovery after plastic deformation; Hardness; Stress concentration; Impact energy, Fracture toughness; Design and safety factors 5. Introduction to Failure Analysis and Prevention Fundamentals of fracture: ductile, brittle, fatigue and creep; Corrosion; Nondestructive testing; Techniques for failure analysis and prevention 6. Selection of Engineering Materials Characteristics of metallic, polymeric, ceramic, electronic and composite materials; Economic, environmental and recycling issues
Teaching/Learning Methodology	The subject will be delivered mainly through lectures but tutorials, case studies and laboratory work will substantially supplement which. Practical problems and case studies of material applications will be raised as a focal point for discussion in tutorial classes, also laboratory sessions will be used to illustrate and assimilate some fundamental principles of materials science. The subject emphasizes on developing students' problem solving skills.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below.

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Assignments	15%	✓	✓	✓	✓
2. Test	20%		✓	✓	✓
3. Laboratory report	5%		✓	✓	
3. Examination	60%		✓	✓	✓
Total	100 %				

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

The assignments are designed to reflect students' understanding of the subject and to assist them in self-monitoring of their progress.

The laboratory report is designed to assess the capability of students in analyzing and reporting experimental data relates to learning outcome (b).

The test and examination are for determining students' understanding of key concepts as well as for assessing their achievement of the learning outcomes.

Student Study Effort Expected		
	Class contact:	
	▪ Lectures, tutorials, practical	39Hrs.
	Other student study effort:	
	▪ Guided reading, assignments and reports	37Hrs.
	▪ Self-study and preparation for test and examination	47Hrs.
	Total student study effort	123Hrs.

Reading List and References

1. William D. Callister, Jr., David G. Rethwisch, *Fundamentals of materials science and engineering,* 4th edition, *E-Text*
   John Wiley & Sons; ISBN: 978-1-118-53126-6
2. William D. Callister, Jr., David G. Rethwisch, *Materials Science and Engineering*, 8th edition, *E-Text*
   John Wiley & Sons; ISBN: 978-1-118-37325-5
3. Materials World
   (Magazine of the Institute of Materials, Minerals and Mining)

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Subject Description Form

Subject Code	ENG2002
Subject Title	Computer Programming
Credit Value	3
Level	2
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	1. To introduce the fundamental concepts of computer programming. 2. To equip students with solid skills in Python programming. 3. To equip students with techniques for developing structured and object-oriented computer programs. 4. To demonstrate the techniques for implementing engineering applications using computer programs.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** a. Familiarize themselves with at least one Python programming environment. b. Be proficient in using the basic constructs of Python to develop a computer program. c. Develop a structured and documented computer program. d. Understand the fundamentals of object-oriented programming and be able to apply it in computer program development. e. 5. Apply computer programming techniques to solve practical engineering problems.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. **Introduction to Programming** Components of a computer; Data representation in computers; Programming environment; Process of application development. 2. **Bolts and Nuts of Python** Data types; Variables and constants; Operators, expressions, and statements; Basic syntax; Functions and modules; Python IDE; Editing, saving, and running a script; Python modules; Absolute and relative import. 3. **Program Flow Control and Functions** Branching and looping; Iterators; Scope of variables; Python functions; static functions; Lambda function; Position arguments and default arguments; args and kwargs; Interface with command line; argparse 4. **Program Design and Debugging** Structured program design; Testing and debugging a program; Exception and assertion. 5. **Strings and File I/O** String encoding format; F-string; Unicode; String operations; String and number conversion; File and directory manipulations; The "os", "sys", and "shutil" modules; Reading/writing text and numbers from/to a file. 6. **Tuples, Lists, and Dictionaries** Basic tuple and list operations; Searching and sorting lists; Dictionary literals; Basic dictionary operations; Built-in tuple/list/dictionary methods and functions; Use of enumerate and zip 7. **Basic Object-Oriented Programming** Objects and classes; Attributes and methods; Inheritance and polymorphism; Special methods and operator overloading. 8. **Data Analytics with Python Libraries** Introduction to NumPy, Pandas, and Matplotlib; NumPy arrays, built-in methods, and mathematical operations; Reading/writing data files using Pandas; Pandas operations and functions; Data visualization with Matplotlib; OpenCV-Python for computer vision; Scikit-learn for machine learning.
Teaching/Learning Methodology	

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures, supplemented with short quizzes	2,3,4	Students are introduced to the knowledge of computer programming through explanation and illustrative examples. Comprehension of the knowledge is strengthened with short quizzes. Students will be able to monitor the skills of using Python and apply the techniques of developing structured object-oriented applications.
Laboratories/tutorials where problems are given to students for them to solve	1,2,3,4	Students apply what they have learnt in lectures and solve problems in exercises. The purpose is to ensure students have captured the important points. Tutors will aid the lecturer in helping the students finishing the exercises, and interactive Q&A will take place.
Assignment, tests and final examination	1,2,3,4,5	By doing assignment, students will develop a firm understanding and comprehension of the knowledge taught. They will analyse given Python applications and apply knowledge to solve problems. They will have to design solutions by evaluating different alternatives. To enhance the students' problem-solving skill in a given programming environment, open-book programming tests are arranged regularly. To assure students' understanding of fundamental concepts, a closed-book final examination is arranged.

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
1. In-class exercises and homework	15%	✓	✓	✓	✓	
2. Short-quizzes	10%		✓	✓	✓	
3. Programming tests	30%	✓	✓	✓	✓	✓
4. Assignment	25%	✓	✓	✓	✓	✓
5. Final examination	20%	✓	✓	✓	✓	✓
Total	100%					

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

The short-quizzes are for assessing the understanding of fundamental concepts. The in-class exercises and homework are conducted to help students familiarized with the programming language and skills. The programming tests are for assessing the ability of students on solving computer problems through programming within a specified period. Through doing assignments, students will be able to experience how to solve engineering problems and design solutions by using a systematic approach. The final examination is for assessing the students' ability on using the programming language and analysing computer programs.

Student Study Effort Expected

Class contact:	
• Lectures, Tests and Quizzes	26 Hours
• Laboratory/Tutorial	13 Hours
Other student study effort:	
• Self-studying	57 Hours
• Homework	12 Hours
Total student study effort:	**108 Hours**

Reading List and References

Reference Books:

1. G. v. Rossum and the Python development team, *Python Tutorial Release 3.10.0*, Nov. 2021.
2. C. Hill, *Learning Scientific Programming with Python*, 2nd ed., Cambridge University Press, Cambridge, UK, 2020.
3. Z. A. Shaw, *Learning Python 3 the Hard Way: A Very Simple Introduction to the Terrifyingly Beautiful World of Computers and Code,* Addison-Wesley Professional, Boston, MA, USA, 2017.
4. E. Matthes, *Python Crash Course: A Hands-On, Project-Based Introduction to Programming,* 2nd ed, No Starch Press, San Francisco, CA, USA, May 2019.

Subject Description Form

Subject Code	ENG2003
Subject Title	Information Technology
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	To provide the foundation knowledge in internet applications, computer networks, and database management that is essential to modern information system design
Intended Subject Learning Outcomes	Upon completion of the subject, students will be able to: Category A: Professional/academic knowledge and skills 1. Understand the functions and features of modern computing systems. 2. Understand the client-server architecture and be able to set up multiple internet applications. 3. Understand the principles of computer networks and be able to set up simple computer networks. 4. Understand the basic structure of a database system and be able to set up a simple database system. Category B: Attributes for all-roundedness 1. Solve problems using systematic approaches.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Introduction to computers Introduction to information technology using Internet of Things as a real life example. Introduction to modern computing systems. 2. Computer Networks Introduction to computer networks (Client-Server Architecture). Study different internet applications (HTTP/FTP/DNS). Explain basic concepts on packet routing (Data Encapsulation/IP Addressing/Functions of Routers). Introduction to basic network security measures. 3. Introduction to data processing and information systems Database systems – architecture, relational database concept, structural query language (SQL), database management systems, Web and database linking, database application development. Introduction to Information systems. Workflow management. Case study: Database design, implementation and management.
Teaching/Learning Methodology	There will be a mix of lectures, tutorials, and laboratory sessions/workshops to facilitate effective learning. Students will be given case studies to understand and practice the usage of modern information systems.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		A1	A2	A3	A4	B1
1. Quizzes (in tutorials)	3%	✓	✓	✓		✓
2. Quizzes (in lectures)	14%	✓	✓	✓	✓	✓
3. Workshops	14%	✓	✓	✓	✓	✓
4. Mid-term Test	11%	✓	✓	✓		✓
5. Assignment	8%				✓	✓
6. Examination	50%	✓	✓	✓	✓	✓
Total	100 %					

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

The assessment methods include an end-of-subject 2-hour written examination (total 50%) and other assessment methods (total 50%), including quizzes, a mid-term test, workshops, and an assignment, which cover intended subject learning outcomes A1, A2, A3, A4, and B1.

Student Study Effort Expected		
	Class contact:	
	• Lectures (18), tutorials (6), and workshops (15)	39 Hours
	Other student study effort:	
	• Workshops preparation (6/workshop)	30 Hours
	• Self study (3/week)	39 Hours
	Total student study effort	**108 Hours**

Reading List and References

1. B. Williams and S. Sawyer, *Using Information Technology: A Practical Introduction to Computers and Communications*, 11th ed., McGraw-Hill, 2014.
2. J. F. Kurose and K. W. Ross, *Computer Networking: A Top-Down Approach*, 7th ed., Pearson, 2016.
3. D. E. Comer, *Computer Networks and Internets*, 6th ed., Pearson, 2015.
4. B. A. Forouzan, *TCP/IP Protocol Suite*, 4th ed., Tmh, 2010.
5. W. Stalling, *Data and Computer Communications*, 10th ed., Pearson, 2013.
6. S. Morris and C. Coronel, *Database Systems: Design, Implementation, and Management*, 11th Edition, Course Technology, 2014.
7. M. Mannino, *Database Design, Application Development, & Administration*. 6th ed., Chicago Business Press, 2014.

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Subject Description Form

Subject Code	ENG3003
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 Learning Outcomes	Upon completion of the subject, students will be able to a. perform tasks in an organization related to organizing, planning, leading and controlling project and process activities; b. select appropriate management techniques for improving organizational structures, work procedures, and quality performance of operational tasks; c. analyze the factors that affect changes in the work environment, and be aware of the approaches in implementing change in an organization; d. be aware of the imperatives of ethical and business behaviors in engineering organizations in a fast-changing business environment.
Subject Synopsis/Indicative Syllabus	1. Introduction General management concepts in organizations; Functions and types of industrial organizations; Organizational structures; Corporate objectives, strategy, and policy 2. Industrial Management Roles of managers: Process of management, leadership, planning, organizing, motivating, and control of social and engineering activities; Quality management: Related tools and techniques 3. Project Management Project scope and objectives; Network analysis; Tools that support engineering operations and task scheduling 4. Management of Change Change leadership; Organizational change; Phases of planned change; Stress management; Factors that affect the execution of change 5. Effects of Environmental Factors The effects of extraneous factors on the operations of engineering organizations, such as ethics and corporate social responsibilities issues

Teaching/Learning Methodology	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.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Coursework • Group learning activities (10%) • Presentation (individual) (30%)	40%	✓	✓	✓	✓
2. Final examination	60%	✓	✓	✓	✓
Total	100%				

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.

Student Study Effort Expected	
Class contact:	
▪ Lectures and review	27 Hrs.
▪ Tutorials and presentations	12 Hrs.
Other student study effort:	
▪ Research and preparation	30 Hrs.
▪ Report writing	10 Hrs.
▪ Preparation for oral presentation and examination	37 Hrs.
Total student study effort	116 Hrs.

Reading List and References

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

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Subject Description Form

Subject Code	ENG3004
Subject Title	Society and the Engineer
Credit Value	3
Level	3
Pre-requisite/Co-requisite/Exclusion	Nil
Objectives	This subject is designed for engineering students as a complementary subject on the role of the professional engineer in practice and their responsibilities toward the profession, colleagues, employers, clients, and the public. The objectives of the subject are to enable students to 1. appreciate the historical context of modern technology and the nature of the process whereby technology develops and the relationship between technology and the environment, as well as the implied social costs and benefits; 2. understand the social, political, legal, and economic responsibilities and accountability of the engineering profession and the organizational activities of professional engineering institutions; 3. be aware of the short-term and long-term effects related to safety and health, and the environmental impacts of technology; 4. observe professional conduct, as well as the legal and other applicable constraints, related to various engineering issues; and 5. develop a strong vision to optimize their contribution to sustainable development.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. identify and evaluate the effects of technology as it applies to the social, cultural, economic, legal, health, safety, and environmental dimensions of society; b. explain the importance of local and international professional training, professional conduct and ethics, and responsibilities in various engineering disciplines, particularly the Washington Accord; c. evaluate and estimate, in a team setting, the impact of contemporary issues, planned projects, and unforeseen technological advances related to engineers; effectively communicate and present the findings to laymen and peers.
Subject Synopsis/ Indicative Syllabus	1. <u>Impact of Technology on Society</u> Historical cases and trends of technological innovation explored through their impact on social and cultural developments of civilization and their commonalities. 2. <u>Environmental Protection and Related Issues</u> Roles of the engineer in energy conservation, ecological balance, and sustainable development. 3. <u>Global Outlook for Hong Kong's Economy and Industries</u> Support organizations, policies and their impacts on industrial and economic development in Greater China, the Pacific Rim, and the world. 4. <u>Regulatory Organizations and Compliance</u> Discussion of engineer's responsibilities within different regulatory frameworks and environments; Examples from various entities such as the Labor Department and the Occupational Health and Safety Council; Legal dimensions to engineering such as liability, contract law, and industrial legislation. 5. <u>Professional Institutions</u> Local and overseas professional institutions; Washington Accord and the qualifications and criteria of professional engineers. 6. <u>Professional Ethics</u> Prevention of bribery and corruption; The work of the Independent Commission Against Corruption (ICAC); Social responsibilities of engineers.
Teaching/Learning Methodology	Class comprises short lectures to provide essential knowledge and information on the relationships between society and the engineer under a range of dimensions. Other methods include in-class discussions, case studies, and seminars to develop students' in-depth analysis of the relationships. Each student will submit two assignments based on their weekly learning activities, which will be part of the subject's evaluation. The assignments will deal with important issues of social, cultural, economic, legal, health, safety, and environmental dimensions of society. Students are assembled into groups; throughout the course, they will work on engineering cases by completing the following learning activities: 1. Case analysis where students explore the relationships between society and the engineering issues of a project under specific dimensions; 2. Construction and assembly of a case portfolio which includes i. Presentation slides ii. Feedback critiques iii. Individual Reflections 3. Final oral presentation
Assessment Methods in Alignment with Intended Learning Outcomes	See table below Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

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

	The coursework requires students to work in groups to study cases from the perspectives of the eight dimensions in an engineering setting. Based on these exercises, students' ability to apply and synthesize acquired knowledge can be assessed through their performance during groups' discussion, oral presentations, and the quality of their portfolio reports on the case studies. The take-home assignment is used to assess students' critical thinking and problem-solving skills when working on their own and give students more time and flexibility to complete an assignment. It provides students the opportunity to review and extend what they have learnt in class and to check their understanding and progress.	
Student Study Effort Expected	Class contact:	
	▪ Lectures and review	27 Hrs.
	▪ Presentation	12 Hrs.
	Other student study efforts:	
	▪ Research and preparation	55 Hrs.
	▪ Report and Assignments writing	25 Hrs.
	Total student study effort	119 Hrs.
Reading List and References	**Reference Books & Articles:** 1. Education for Sustainable Development - An Expert Review of Processes and Learning, UNESCO, 2011 2. Poel, Ibo van de, and Lambèr M. M. Royakkers. Ethics, Technology, and Engineering : an Introduction. Wiley-Blackwell, 2011 3. Engineering-Issues, Challenges and Opportunities for Development, USECO, 2010 4. Engineering for Sustainable Development: Guiding Principles, Royal Academy of Engineering, 2005 5. Securing the future: delivering UK sustainable development strategy, 2005 6. Johnston, F S, Gostelow, J P, and King, W J, 2000, *Engineering and Society Challenges of Professional Practice*, Upper Saddle River, N.J.: Prentice Hall 7. Hjorth, L, Eichler, B, and Khan, A, 2003, *Technology and Society A Bridge to the 21st Century*, Upper Saddle River, N.J.:Prentice Hall 8. The Council for Sustainable Development in Hong Kong, http://www.enb.gov.hk/en/susdev/council/ 9. Poverty alleviation: the role of the engineer, http://publications.arup.com/publications/p/poverty_alleviation_the_role_of_the_engineer **Reading materials:** Engineering journals: - Engineers by The Hong Kong Institution of Engineers - Engineering and Technology by The Institution of Engineers and Technology Magazines: Time, Far East Economic Review Current newspapers: South China Morning Post, China Daily, Ming Pao Daily	

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Subject Description Form

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

Assessment Methods in Alignment with Intended Learning Outcomes

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

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

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

Written examination: questions are designed to assess learning outcomes (a), (b), (c), and (d).

Student Study Effort Expected		
Class contact:		
▪ Lectures	3 hours/week for 9 weeks	27 Hrs.
▪ Tutorials / Case studies	3 hours/week for 4 weeks	12 Hrs.
		39 Hrs.
Other student study effort:		
▪ Preparation for assignments, short tests, and the written examination		79 Hrs.
Total student study effort		118 Hrs.

Reading List and References

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

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Subject Description Form

Subject Code	ISE404
Subject Title	Total Quality Management
Credit Value	3
Level	4
Pre-requisite/Co-requisite/Exclusion	Students who do not have background knowledge in quality control and quality engineering should be prepared to do additional reading.
Objectives	This subject provides students with the knowledge to 1. understand the philosophy and core values of Total Quality Management (TQM); 2. determine the voice of the customer and the impact of quality on economic performance and long-term business success of an organization; 3. apply and evaluate best practices for the attainment of total quality.
Intended Learning Outcomes	Upon completion of the subject, students will be able to a. select and apply appropriate techniques in identifying customer needs, as well as the quality impact that will be used as inputs in TQM methodologies; b. measure the cost of poor quality and process effectiveness and efficiency to track performance quality and to identify areas for improvement; c. understand proven methodologies to enhance management processes, such as benchmarking and business process reengineering; d. choose a framework to evaluate the performance excellence of an organization, and determine the set of performance indicators that will align people with the objectives of the organization.
Subject Synopsis/ Indicative Syllabus	1. Principles of Total Quality Concepts of quality; Core values and paradigms for TQM, including corporate citizenship and protection of the environment; Models for performance excellence: Deming Prize, Baldrige Quality Award, European Quality Award 2. Customer Needs Internal and external customers; Voice of the customer; Customer satisfaction; Customer loyalty; Service recovery; Crisis management 3. Economics of Quality Classification and analysis of quality costs; Implementing quality costing systems; Economic value of customer loyalty and employee loyalty 4. TQM Methodologies Quality Function Deployment (QFD); Benchmarking; Business process reengineering; Process improvement 5. Learning and Growth Organizational learning; Organizational renewal; Change management; Employee empowerment 6. Strategic Quality Management Vision, strategy, goals, and action plans; Measurement of organizational performance
Teaching/Learning Methodology	A mixture of lectures, group discussions (tutorials), and mini-case studies are used to achieve the objectives of this subject. Some topics are taught in the classroom environment; students have to learn these topics by themselves in the process of writing problem-based assignments. Directed study is also used to develop the self-learning ability of students.
Assessment Methods in Alignment with Intended 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</th></tr><tr><th>a</th><th>b</th><th>c</th><th>d</th></tr><tr><td>1. Assignments</td><td>35%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>2. Tests</td><td>20%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>3.Examination</td><td>45%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Total</td><td>100%</td><td colspan="4"></td></tr></table> The assignments, reflective journals, essays, and case studies facilitate the application of concepts and skills learned in analyzing and attaining total quality while emphasizing factors that may affect decisions. Examination/tests allow students to demonstrate the extent of their understanding of concepts, as well as their abilities to analyze and solve problems related to the subject.
Student Study Effort Expected	<table><tr><td>Class contact:</td><td></td><td></td></tr><tr><td>▪ Lecture/Tutorial</td><td>2 hours/week for 13 weeks</td><td>26 Hrs.</td></tr><tr><td>▪ Tutorial/Case Study</td><td>1 hour/week for 13 weeks</td><td>13 Hrs.</td></tr><tr><td>Other student study effort:</td><td></td><td></td></tr><tr><td>▪ Studying and self learning</td><td></td><td>50 Hrs.</td></tr><tr><td>▪ Assignment and report writing</td><td></td><td>28 Hrs.</td></tr><tr><td>Total student study effort</td><td></td><td>117 Hrs.</td></tr></table>
Reading List and References	1. Besterfield, DH, et.al. 2003, *Total Quality Management*, 3rd edn, Prentice Hall 2. Goetsch, DL & Davis, B 2006, *Quality Management: Introduction to Total Quality Management for Production, Processing and Services*, 5th edn, Pearson 3. Gryna FM 2001, *Quality Planning & Analysis*, 4th edn, Jr., McGraw-Hill 4. Selected articles in Quality Progress and the web site of American Society for Quality

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Subject Description Form

Subject Code	MM4522
Subject Title	China Business Management
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Exclusion: China Trade Management (MM4521)
Role and Purposes	This course covers the business environment and key issues about doing business in China. The course offers a broad survey of a wide range of topics related to China business rather than in-depth study of particular aspects. The primary objectives are to introduce the students to the broad terrain, and help them to explore those aspects in their future pursuit.
Subject Learning Outcomes	Upon completion of the subject, students will be able to: a. understand, analyse, and evaluate the nature and changing shape of business connection between Hong Kong and the Chinese Mainland b. explain and assess the institutional and legal issues of doing business in China (**BBA Outcome 3**) c. describe, analyse and evaluate business strategies and practices in China (**BBA Outcome 3**) d. develop critical thinking about how different contextual and cultural factors affect business success, and learn to better communicate with people in different institutional environment (**BBA Outcome 3**) e. have further developed their oral and written communication skills (**BBA Outcome 1**)
Subject Synopsis/ Indicative Syllabus	- The economic system and economic reforms in China - Understanding the Chinese bureaucracy - China's integration into the global economy - China - Hong Kong Business relations - The regulations of China's foreign trade - China's tax system - Foreign direct Investment and management - Marketing strategies in China
Teaching/Learning Methodology	Lectures, tutorial discussion, group project (presentation and written report)

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed				
		a	b	c	d	e
Continuous Assessment	**50%**					
1. Group Project Presentation	15%	✓	✓	✓	✓	
2. Written Report	15%					✓
3. Class Participation in Discussion and Evaluations	10%				✓	
4. In-class Quizzes/Exercises	10%				✓	
Examination	**50%**	✓	✓	✓	✓	
Total	100%					

**Weighting of assessment methods/tasks in continuous assessment may be different, subject to each subject lecturer.*

To pass this subject, students are required to obtain Grade D or above in **BOTH** the Continuous Assessment and Examination components.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: the various methods are designed to ensure that all students taking this subject

The assessments are designed to motivate the students to read the recommended materials and participate in the required activities to achieve the learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Group project	20 Hrs.
▪ Reading	48 Hrs.
Total student study effort	107 Hrs.

Reading List and References

This course does not have a textbook. Readings are drawn from *China Hand*, a data base compiled and edited by the Economist Intelligence Unit, and *China Business Review*, a publication of the US-China Business Council, and other sources. The readings have been uploaded to WebCT.

References

Tim Clissold's ***Mr. China*** (Constable & Robinson, 2004)

Pete Engardio (ed.), ***Chindia: How China and India are Revolutionizing Global Business*****,** McGraw-hill, 2007

James McGregor, ***One Billion Customers: Lessons from the Front Line of Doing Business in China*****,** (Nicholas Brealey Publishing, 2005).

Edward Tse, ***The China Strategy: Harnessing the Power of the World's Fastest-growing Economy***, Basic Books, 2010.

Sheryl WuDunn, ***China Wakes: The Struggle for the Soul of a Rising Power*****,** Vintage Books, 1995

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