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2011/2012 Bachelor of Engineering (Honours) in Electrical Engineering (41070)

THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

Bachelor of Engineering (Honours) in Electrical Engineering

Full-time / Sandwich

Programme Code : 41070

2011/2012

DEFINITIVE PROGRAMME DOCUMENT

Department of
Electrical Engineering
電機工程學系

BEng (Hons) in Electrical Engineering
2011 – 2012

Bachelor of Engineering (Honours) in Electrical Engineering 2011/12

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Important

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

1 Preamble

The BEng (Hons) programme is the major Electrical Engineering degree programme in Hong Kong at the present time. Changes are introduced as necessary from time to time in order to reflect the latest technological development. Most of the changes have taken place since 1990 when a major revision was undertaken to enhance the programme.

The revised scheme in 1990, which was in place until 94/95, included two modifications of particular importance: the use of a semester structure and making the third year (industrial attachment/sandwich) optional.

In 1995, the BEng (Hons) programme in the Department required another revalidation. At that time the Department decided to take a natural step in converting all programmes from modular structure to credit-based framework. Both The Institution of Electrical Engineers (IEE) and The Hong Kong Institution of Engineers (HKIE) were invited to accredit the BEng (Hons) degree programme.

In the credit-based structure, the students are able to determine their own pace of study. This is very much in line with modern education philosophy. With the introduction of the credit-based structure, students are able to make up a specific programme to suit their personal aspirations within the confines of the framework of the BEng (Hons) curriculum. Being flexible, there is no 'year' concept in a credit-based system and the subjects are offered at distinct levels. The subjects in Level 2 must be taken by all students in the programme although they can defer a few subjects until later. Electives are available in Levels 3 and 4. However, students must take a compulsory set of subjects which are designed to give vertical integration in electrical engineering. The Department conducted a self critical review of the curriculum which included feedback from employers, graduates and current students. Hence, English and Chinese, telecommunication, environmental awareness, electrical building services and total quality management were all given increased weight in the 94/95 revision. Elective subjects in Level 4 were also reviewed to address changes in career aspirations of graduates and advances in technology.

The Undergraduate Programme Committee believes it is advantageous for budding potential engineers to undertake a sandwich training year since experience has shown that working in industry broadens the outlook of students, helps them to put their studies in a proper perspective and certainly makes them more mature. An added advantage of the credit-based structure is that, subject to timetable constraints, the sandwich students may make use of the evenings during the sandwich year to study Levels 2 or 3 subjects which have been deferred previously or, in some cases, take some Level 4 subjects in advance. Students have more flexibility in determining their study pace and the optional sandwich year is expected to have more appeal under the credit-based structure. Besides, students are still required to undertake a minimum of six weeks of employment in industry.

In early 2005, an institutional exercise was carried out to reduce credit number for undergraduate programmes. The programme components were then adjusted to fit the 90-credit requirement (excluding training components). Curriculum review was incorporated in this exercise to introduce outcome-oriented model in the curriculum design. The intended learning outcomes were clearly articulated at programme and subject levels and the teaching and assessment methods are aligned accordingly to achieve the intended outcomes. Further, the mandatory Work-Integrated Education (WIE) component was introduced, in which the activities must be structured and measurable.

From the 2007/08 academic year, the Department was given the flexibility to enhance the credit requirement of the programme up to 99. As a result, the English subjects were then substantially strengthened while the 2-credit technical subjects were expanded to 3 credits in alignment with other technical subjects. A subject to prepare the students on their Individual Projects, Project Methodologies, was also introduced. This programme thus seized the maximum increase of credit requirements, with a total of 99 credits.

With the notion of outcome-based education in full swing, the programme outcomes were reviewed after two years of operation and hence the subject outcomes were fine-tuned accordingly to fully support and reflect the programme outcomes. This timely revision was put into implementation for the 2008/09 cohort. To better equip students for the demands of the engineering careers in Hong Kong and China, subjects on accounting, finance and management were included in the curriculum.

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.

For the 2009/10 cohort, changes in Industrial Centre Training scheme and Summer Industrial Training requirements were implemented. Minor changes in General Assessment Regulations were also made to align with those approved by the University.

For the 2011/12 cohort and onwards, the curriculum is changed to comply with the university's new requirements on languages. As a result the graduation requirement of the programme is increased from 99 credits to 102 credits.

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

A student normally takes 3 years full-time with an option of an additional year for sandwich. The maximum period of registration is 6 years for the full-time mode of attendance; and 7 years for the sandwich mode.

2.3 Final Award

The award is a bachelor degree with honours in Electrical Engineering and it carries no speciality or stream.

2.4 Implementation Dates

October, 1984 (initial implementation)
October, 1989 (first major revision)
October, 1995 (second major revision for *en bloc* introduction)
October, 1997 (alignment exercise for *phase in* implementation)
October, 2001 (minor revision with more broadening subjects in the first year)
September, 2005 (reduced credit requirement, outcome-based curriculum and WIE)
September, 2007 (enhanced credit requirement from 90 to 99 credits)
September, 2008 (revised outcome-based curriculum, inclusion of compulsory business and management subjects)
September, 2009 (revised Industrial Training scheme and Summer Industrial Training requirements; changes in General Assessment Regulations regarding retaking of subjects)
September, 2011 (revised Industrial Training scheme; credit requirement for graduation increased to 102 after the introduction of a compulsory 3-credit subject on Chinese language; abolition of the mandatory requirements of GSLPA for graduation)

2.5 Minimum Entrance Requirements

For Entry with HKALE Qualifications

The General Minimum Entrance Requirements of the University and the following specific subject requirement(s) are to be satisfied:

<table>
<tr><td>E in two of the following HKALE subjects: Physics, Engineering Science, Pure Mathematics, Applied Mathematics, Chemistry or Computer Studies</td><td>OR</td><td>E in one of the following HKALE subjects: Physics, Engineering Science, Pure Mathematics, Applied Mathematics, Chemistry or Computer Studies; and

E in two of the following HKALE(AS-Level) subjects: Physics, Design & Technology, Mathematics & Statistics, Electronics, Applied Mathematics, Chemistry or Computer Applications (similar subjects at HKALE and HKALE(AS-Level) are mutually exclusive)</td></tr>
<tr><td colspan="3">AND</td></tr>
<tr><td colspan="3">C in HKCEE Mathematics or Additional Mathematics (only required for applicants without E in HKALE Applied Mathematics or Pure Mathematics, or HKALE(AS-Level) Applied Mathematics or Mathematics & Statistics); and

D in HKCEE Physics or Engineering Science (only required for applicants without E in HKALE Physics or Engineering Science, or HKALE(AS-Level) Physics or Design & Technology)</td></tr>
</table>

Alternative Entry Route

A Higher Diploma in Electrical Engineering
OR
An Associate Degree in Engineering
OR
Equivalent qualifications

2.6 Major/Minor Option

In line with the University's Regulations, students in this programme are offered the option of either continuing with the single-discipline degree programme (i.e. BEng (Hons) in Electrical Engineering) or following the major/minor option. Usually, the student may choose to exercise this option at the second semester of the first year of the programme. The Major programme details are given in Appendix III.

Non-EE students opting to study 'Minor' in Electrical Engineering must take 18 credits of EE subjects, of which 9 credits must be of Level 3 or above.

2.7 Summer Training/Industrial Placement

Summer Training at the Industrial Centre (IC) and practical work experience in industry are vital components to attain the programme outcomes. The training/industrial placement is credit-bearing and compulsory in the programme, constituting the Work-Integrated Education activities as stipulated by the University. The required credits, structure and assessment of the Work-Integrated Education and Industrial Centre training are described in details in Sections 4.3 and 4.4.

2.8 Student Exchanges

Exchanges to Universities overseas for a semester or an academic year are possible through various exchange schemes organised by the PolyU or individual departments. While the number of exchanges is limited, students are encouraged to participate to enhance their all-roundedness and broaden their experience.

Block credit-transfers may be given to exchanged-out students. However, in order to ensure attaining pre-requisite knowledge for smooth integration of study, the students will be counselled on subject selections in the visited Universities before they leave for the exchange.

2.9 External Recognition

The BEng (Hons) degree programme has been internally validated by the University. It is also accredited by The Hong Kong Institution of Engineers (HKIE) as meeting the academic requirements for its Corporate and Graduate Membership.

2.10 Summer Term Teaching

Usually, there will be no summer term teaching on Engineering subjects. Industrial Centre Training or External Training will take place during summers of the first two years.

2.11 Daytime and Evening Teaching

Subjects will be offered predominantly during the day. Some subjects, particularly the elective subjects in the senior years, may be made available only in evenings or Saturdays.

2.12 Mathematics Benchmark Test (MBT)

The following categories of students admitted to this programme will be requested to take a mandatory Mathematics Benchmark Test prior to the commencement of their studies:
1) JUPAS admittees who do not have a "pass" in any A-level Mathematics subjects; and
2) Non-JUPAS admittees who are not given credit-transfer for the subject AMA201, OR who do not have a "pass" in any A-level Mathematics subjects.

Students who have taken and passed AS-Level Mathematics subject(s) only are also required to take the MBT.

Those who fail the MBT will be required to take a mandatory subject Foundation Mathematics (AMA106) in the first semester of the first year.

2.13 Foundation Mathematics (AMA106)

Students who are required to take Foundation Mathematics (AMA106) must pass the subject before taking other mathematics subjects in the curriculum. Foundation Mathematics AMA106 is thus a pre-requisite to AMA201 for students who do not pass the MBT, but it does not constitute part of the curriculum. As the subject is non-credit bearing, the grade will NOT be counted towards the GPA or WGPA, but it will be recorded in the transcript of studies.

3 Aims and Rationale

3.1 Programme Philosophy and Objectives

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

Bearing in mind that engineers frequently change activities and also employment during their careers, education to prepare students for working life, rather than their first jobs, is the aim. Emphasis is, therefore, placed on the understanding of fundamental concepts which will always be applicable and valid. The teaching of particular techniques which may have a shorter duration of applicability, however, cannot be neglected. Applications will change rapidly as technology develops but the underlying theories hardly change. It is therefore important not to emphasise training at the expense of education.

It is our perception that industrial employers recruit engineers who have a broad-based education, but, at the same time, possess adequate specialist knowledge to undertake detailed technical work in design and production. Therefore, the Programme is designed to produce graduates who have not only developed a thorough understanding of electrical engineering including interdisciplinary aspects, but also acquired a broad and general appreciation of engineering activity outside the confines of electrical engineering. The students are guided to learn the interfaces between specialist engineering areas and to be prepared to work in a multidisciplinary work environment which usually involves colleagues from other engineering backgrounds.

At the same time, the students must become aware that ‘a good engineering solution’ is one which fulfils economic and financial criteria as well as the engineering design specifications. This necessitates the inclusion of the study of finance, accounting and management with particular reference to engineering activities, as well as the inter-relations between engineering activities and society as a whole.

Engineers must be able to express themselves clearly, both in written reports or verbal presentations. This has led to the inclusion of English and communication subjects, as well as a teaching approach which involves seminars, discussions, in-class feedback, assessed presentations, demonstrations of project work and formal laboratory reports in the programme. The Department has increased the contact hours in the English-related subjects in order to curtail any deficiencies that our graduates may have.

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

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

- to develop their social abilities (personal and public relations, team work, handling of responsibility/authority etc).

In this undergraduate programme, the fundamentals of electrical engineering are covered in the non-deferrable subjects in Level 2, the basic knowledge areas are covered in Level 3 and the specialisms are introduced in Level 4. All the deferrable subjects in Level 2 must be completed before any student can graduate. Students should *not* be under the illusion that deferrable subjects are unimportant. The credit-based structure described in this booklet has been discussed extensively, and it has been reckoned that the students will benefit from such a structure as the subject materials are to be disseminated in better organised breadth and depth.

Students are provided with training at the Industrial Centre so that they learn the applications of engineering technologies. They are also required to undertake industrial attachment during the summer at the end of the second year of study, which gives them the opportunity to experience the industrial working environment. A full year spent in industrial attachment for the sandwich students allows a deeper appreciation of EE in the industrial context. Again the credit-based structure should make the sandwich year more attractive, since the students can take some of their academic subjects during the sandwich year, thereby maintaining their links with the Department whilst earning their professionally recognised training experience. The fact that the students are being trained to control their own pace of study without imposing any major burden upon the Department is seen as a good training for potential engineers, who must learn time management skills in order to cope with tight time schedules in their careers.
The programme objectives are given as follows:

1. To produce students with a broad base of knowledge in the fundamentals of electrical engineering and its current applications.
2. To prepare students for working life including the skills needed for lifelong learning.
3. To produce engineers with the understanding of their obligations to society.

3.2 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.

<u>Category A: Professional/academic knowledge and skills</u>
On successful completion of the programme, a student will have shown that he or she can
1. Apply fundamental principles of mathematics, science and engineering to identify, formulate and solve practical problems in the areas of electrical engineering and related disciplines.
2. Design and conduct experiments with appropriate techniques and tools; and interpret and analyse the data.
3. Design a system, component or process according to given specifications and requirements in the areas of electrical engineering and related disciplines.
4. Identify constraints, other than technical considerations, which may influence engineering problems, systems or projects.
5. Keep abreast of developments in electrical engineering and related disciplines and be aware of the need of lifelong learning.
6. Appreciate and understand the ethical, managerial and social responsibilities of a professional engineer.

Category B: Attributes for all-roundedness

On successful completion of the programme, a student will have shown that he or she can

1. Communicate effectively via graphic, numeric, verbal and written media with proficiency in both English and Chinese.
2. Reason critically and develop alternative views or solutions.
3. 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 3.2.

		Programme Objectives		
		1	**2**	**3**
Programme Outcomes	**A1**	√		
	A2	√		
	A3	√		
	A4	√	√	
	A5		√	
	A6		√	√
	B1	√		
	B2	√		
	B3		√	√

Table 3.2 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 Descriptions Forms in Appendix I.

4 Curricula

The time-tabled student hours for each subject and the type of activity (lecture [Lt], tutorial [Tu] and laboratory [Lab]) are given in the Tables 4.1.1-4.1.3. The abbreviations used in these tables are:

AF	Accounting and Finance
AMA	Applied Mathematics
BSE	Building Services Engineering
CBS	Chinese & Bilingual Studies
CSE	Civil & Structural Engineering
EE	Electrical Engineering
ELC	English Language Centre
ENG	Engineering Faculty
GEC	General Education Centre
IC	Industrial Centre
ISE	Industrial and Systems Engineering
MM	Management and Marketing

In general, a normal student in the BEng (Hons) programme must complete 35, 40 and 27 credits in Levels 2, 3 and 4, respectively as shown in the typical progress patterns in Tables 4.2.1 to 4.2.4. In other words, a student must complete a total of 102 credits, in addition to the credits earned in IC training and WIE and the requirements on languages and co-curricular activities, before graduation.

Students who opt for the "Major in Electrical Engineering" are required to complete 81 credits in prescribed subjects, and 18 credits in a Minor programme, before they are qualified to graduate.

Subjects are referenced by a Departmental prefix (e.g. EE corresponds to Electrical Engineering) followed by a reference number. Each subject is also categorised as non-deferrable (**Non-Def**), deferrable (**Def**) or **Elective**. In the reference numbers, the first digit (i.e. 2, 3 or 4) indicates the level of the subject.

'*Non-def* ' are those subjects which form the backbone of the vertical integration must be taken by every student in the prescribed semester, unless prevented from doing so due to non-compliance with prerequisites.

'*Def* ' are those subjects which must be satisfactorily completed before the student becomes eligible for an award but the timing of the subject is determined by the student. Tables in Section 4.1 show the times (semesters) in which these subjects are *recommended* to be taken if the programmes are to be completed in the minimum time.

'*Electives*' are those subjects which are optional. Electives give students choices in composing their study programme. All elective subjects are deferrable.

4.1 Curricula for Various Levels

THE HONG KONG POLYTECHNIC UNIVERSITY BENG (HONS) IN ELECTRICAL ENGINEERING Level 2		Curriculum					Assessment Method	
		Teaching Dept.	Contact Hours		Credits	GPA Weight (W_i)		
Subject Code	Subject Title		Lt/ Tu	Lab			Continuous	Examination
	Non-Def Subjects							
AMA201	Mathematics I	AMA	42	-	3	0.2	40%	60%
AMA202	Mathematics II	AMA	42	-	3	0.2	40%	60%
EE2011	Applied Electromagnetics	EE	36	12	3	0.2	40%	60%
ENG224	Information Technology	ENG	37	17	3	0.2	40%	60%
ENG232	Engineering Science	ENG	54	4	3	0.2	40%	60%
ENG236	Computer Programming	ENG	53	-	3	0.2	100%	-
ENG237	Basic Electricity and Electronics I	ENG	51	9	3	0.2	40%	60%
ENG238	Basic Electricity and Electronics II	ENG	55	11	3	0.2	40%	60%
MM2021	Management &Organisation	MM	42	-	3	0.2	50%	50%
AF2108	Financial Accounting	AF	42	-	3	0.2	50%	50%
ELC2501	University English I	ELC	28	-	2	0.2	100%	-
ELC2502	University English II	ELC	28	-	2	0.2	100%	-
	Def Subjects							
CBS2080	Fundamentals of Chinese Communication	CBS	42	-	3	0.2	60%	40%
*GEC2801 or equivalent	China Studies	GEC	28	-	2	0.2	#	#
**GEC2XXX	Broadening General Education Subject	GEC/other	28	-	2	0.2	#	#
	IC Training		Duration					
IC2131	Freshman Seminars for Engineering	IC	57 hours in Semester 1 and 2		2 Training credits	-	100% Assessed and graded	-
IC2132	Engineering Drawing and Industrial Safety	IC	63 hours in Semester 1, 2 and 3		2 Training credits	-	100% Assessed and graded	-
IC2112	IC Training I (EE)	IC	120 hours in Summer		4 Training credits	-	100% Assessed and graded	-

Table 4.1.1

* All students can take one of the China Studies subjects in lieu of GEC2801 to satisfy their *China Studies* category GE requirement. The China Studies subjects and their syllabi are available at: www.polyu.edu.hk/~gec/geprogramme/101-ChiStudies.php

** Subject code depends on the actual subject to be taken.

Depends on the subject chosen.

THE HONG KONG POLYTECHNIC UNIVERSITY BENG (HONS) IN ELECTRICAL ENGINEERING Level 3		Curriculum					Assessment Method	
		Teaching Dept.	Contact Hours		Credits	GPA Weight (W_i)		
Subject Code	Subject Title		Lt/ Tu	Lab			Continuous	Examination
	Non-Def Subjects							
EE3011	Analogue and Digital Circuits	EE	36	12	3	0.3	40%	60%
EE3021	Electromechanical Energy Conversion	EE	36	12	3	0.3	40%	60%
EE3031	Power Electronics and Drives	EE	36	12	3	0.3	40%	60%
EE3041	Power Transmission and Distribution	EE	36	12	3	0.3	40%	60%
EE3051	Systems and Control	EE	38	8	3	0.3	40%	60%
EE3061	Analysis Methods for Engineers	EE	38	8	3	0.3	40%	60%
ELC3504	English for Effective Workplace Communication	ELC	28	-	2	0.3	100%	-
ENG307	Society and the Engineer	ENG	42	-	3	0.3	60%	40%
	Def Subjects							
EE3111	Project Methodologies	EE	28	-	2	0.3	100%	-
EE3121	Computer System Principles	EE	36	12	3	0.3	40%	60%
EE3131	Telecommunication Fundamentals	EE	39	6	3	0.3	40%	60%
EE321	Electrical Services in Buildings	EE	42	-	3	0.3	40%	60%
AF3901	Economics for Engineers	AF	42	-	3	0.3	50%	50%
EE3502	Summer Practical Training	Industry	A minimum of 6 weeks (Full-time BEng (Hons) Students). Optional for Sandwich Students		3 Training credits	-	100% assessed on Pass/Fail basis	-

Table 4.1.2

Note: The Department reserves the right of NOT offering all electives in each year.

THE HONG KONG POLYTECHNIC UNIVERSITY BENG (HONS) IN ELECTRICAL ENGINEERING Levels 4 and 5		Curriculum					Assessment Method	
		Teaching Dept.	Contact Hours		Credits	GPA Weight (W_i)		
Subject Code	Subject Title		Lt/ Tu	Lab			Continuous	Examination
	Non-Def Subjects							
EE4021	Electrical Machines	EE	36	12	3	0.5	40%	60%
EE4031	Power Systems	EE	38	8	3	0.5	40%	60%
EE4041	Engineering Project Management	EE	42	-	3	0.5	40%	60%
	Def Subjects							
EE4121	Individual Project	EE	-	-	9	0.5	100%	-
	Specialist Electives (Def Subjects)							
BSE463	Design of Mechanical Systems in Buildings	BSE	36	-	3	0.5	40%	60%
EE4011	Digital Control and Signal Processing	EE	38	8	3	0.5	40%	60%
EE4211	Advanced Power Electronics	EE	38	8	3	0.5	40%	60%
EE4221	Applied Digital Control	EE	38	8	3	0.5	40%	60%
EE4251	Electric Traction and Drives	EE	45*	-	3	0.5	40%	60%
EE4261	Fibre Optics	EE	36	12	3	0.5	40%	60%
EE4281	Industrial Computer Applications	EE	36	12	3	0.5	40%	60%
EE4291	Intelligent Buildings	EE	42	-	3	0.5	40%	60%
EE4301	Power System Protection	EE	38	8	3	0.5	40%	60%
EE4341	Intelligent Systems Applications in Electrical Engineering	EE	36	12+	3	0.5	40%	60%
	Non-Technical Broadening Electives (Def Subjects)							
AF5107	Accounting for Engineers	AF	42	-	3	0.5	50%	50%
CSE462	Environmental Impact Assessment – Th. and Practice	CSE	42	-	3	0.5	50%	50%
CSE516	Urban Transport Planning – Theory and Practice	CSE	42	-	3	0.5	40%	60%
ISE404	Total Quality Management	ISE	42	-	3	0.5	55%	45%
MM4521	China Trade Management	MM	42	-	3	0.5	50%	50%
	MSc Subjects (Def Subjects)							
EE501	Alternative Energy Technologies	EE	42	-	3	0.5	40%	60%
EE502	Modern Protection Methods	EE	36	12	3	0.5	40%	60%
EE505	Power System Control & Operation	EE	42	-	3	0.5	40%	60%
EE509	High Voltage Engineering	EE	42	-	3	0.5	40%	60%
EE510	Electrical Traction Engineering	EE	36	6	3	0.5	40%	60%
EE512	Electric Vehicles	EE	42	-	3	0.5	40%	60%
EE514	Real Time Computing	EE	36	6	3	0.5	40%	60%
EE517	Fibre Optic Components	EE	39	3	3	0.5	40%	60%
EE520	Intelligent Motion Systems	EE	42		3	0.5	40%	60%
EE521	Industrial Power Electronics	EE	30	12	3	0.5	40%	60%
EE522	Optical Fibre Systems	EE	42	-	3	0.5	40%	60%
EE524	Open Electricity Market Operation	EE	42	-	3	0.5	40%	60%
EE525	Energy Policy and Restructuring of Electricity Supply Industry	EE	42	-	3	0.5	40%	60%
EE526	Power System Analysis and Dynamics	EE	38	8	3	0.5	40%	60%
EE527	Auto-tuning for Industrial Processes	EE	42	-	3	0.5	40%	60%
EE528	System Modelling and Optimal Control	EE	33	9	3	0.5	40%	60%
EE529	Power Electronics for Utility Applications	EE	42	-	3	0.5	40%	60%
EE530	Electrical Energy-saving Systems	EE	42	-	3	0.5	40%	60%

Table 4.1.3

Note: The Department reserves the right of NOT offering all electives in each year. Students must seek approval for enrolling on Level 5 subjects.

* Lecture: 39 hrs; Seminar: 6 hrs.
\+ Miniproject: 12 hrs.

4.2 Normal Progression Pattern

A student in the First Year is advised to take the following curriculum as indicated in Table 4.2.1 below and obtain a total of 36 credits on completion of first year.

	Semester One
AMA201	Mathematics I
ELC2501	University English I (2 credits)
ENG224	Information Technology
ENG232	Engineering Science
ENG236	Computer Programming (2 credits in semester 1)
ENG237	Basic Electricity and Electronics I
	16 credits
	Semester Two
AMA202	Mathematics II
CBS2080	Fundamentals of Chinese Communication
ELC2502	University English II (2 credits)
EE3061	Analysis Methods for Engineers
ENG236	Computer Programming (1 credit in semester 2)
ENG238	Basic Electricity and Electronics II
GEC2801 or equivalent	China Studies (2 credits)
MM2021	Management & Organisation
	20 credits
IC2131	Freshman Seminars for Engineering (57 hours in semester 1 and 2) (2 training credits)
IC2132	Engineering Drawing and Industrial Safety (63 hours in semester 1, 2 and 3) (2 training credits)
IC2112	IC Training I (EE) (120 hours in summer) (4 training credits)

Table 4.2.1

A student in the Second Year is advised to take the following curriculum as indicated in Table 4.2.2 below and obtain 36 credits on completion of year 2.

	Semester One
ELC3504	English for Effective Workplace Communication (1 credit in semester 1)
EE2011	Applied Electromagnetics
EE3011	Analogue and Digital Circuits
EE3041	Power Transmission and Distribution
EE3131	Telecommunication Fundamentals
AF2108	Financial Accounting
GEC2XXX	Broadening General Education Subject (2 credits)
	18 credits
	Semester Two
ELC3504	English for Effective Workplace Communication (1 credit in semester 2)
EE3021	Electromechanical Energy Conversion
EE3121	Computer System Principles
EE3031	Power Electronics and Drives
EE3111	Project Methodologies (2 credits)
EE321	Electrical Services in Buildings
AF3901	Economics for Engineers
	18 credits
	Semester Three (Summer Period at the end of Year 2)
EE3502	Summer Practical Training (6 weeks in summer) (3 training credits)

Table 4.2.2

A student may opt for sandwich training after the second year of study and he or she is required to take the following training subject in Table 4.2.3 during the sandwich year.

EE4001	External Industrial Training (Students are required to take a minimum of 44 weeks of training in industry) (22 training credits)

Table 4.2.3

A student is advised to take the following curriculum as indicated in Table 4.2.4 and obtain 30 credits in the final year. He/she must accumulate a total of 99 academic credits to qualify for graduation.

	Semester One
EE3051	Systems and Control
EE4021	Electrical Machines
EE4031	Power Systems
EE4041	Engineering Project Management
EE4121	Individual Project (This is continued in semester 2. Total 9 credits for semesters 1 & 2)
	Electives
	1 elective should be taken*. A number of electives from Table 4.1.3 will be offered in each semester of Year 3.
	15 credits
	Semester Two
EE4121	Individual Project (This is a continuation from Semester 1. This subject is of 9 credits for both semesters 1 & 2)
ENG307	Society and the Engineer
	Electives
-	1 elective should be taken*. A number of electives from Table 4.1.3 will be offered in each semester of Year 3.
	15 credits

Table 4.2.4

Note: The Department reserves the right of NOT offering all the electives in each year.

* Out of the two electives taken in Year 3, no more than one should be a Non-technical Broadening Elective.

4.3 Subject Support to Programme Outcomes

Table 4.3 illustrates how the subjects support the Programme Outcomes through teaching activities, practice on the part of students, and measurements.

		PROGRAMME OUTCOMES								
		A1	A2	A3	A4	A5	A6	B1	B2	B3
SUBJECTS	AF2108				√	√	√	√	√	
	AF3901				√	√	√	√	√	√
	AF5107				√	√	√	√	√	√
	AMA106	√			√				√	
	AMA201	√			√				√	
	AMA202	√			√				√	
	BSE463	√		√	√	√			√	
	CBS2080					√		√		
	CSE462	√			√	√	√	√	√	
	CSE516	√		√	√	√	√	√	√	
	EE2011	√		√		√		√		√
	EE3011	√	√	√	√		√	√	√	
	EE3021	√	√					√		
	EE3031	√	√					√		√
	EE3041	√	√	√	√	√		√	√	
	EE3052	√		√				√		
	EE3061	√		√		√		√		√
	EE3111				√	√		√	√	
	EE3121	√	√	√				√		√
	EE3131	√	√					√		
	EE321	√			√			√	√	
	EE4001	√			√	√	√		√	
	EE4011	√		√				√		
	EE4021	√		√	√	√		√		√
	EE4031	√	√					√	√	
	EE4041									
	EE4121		√	√	√	√	√	√	√	√
	EE4211	√		√	√	√		√		√
	EE4221	√		√				√		
	EE4251	√		√	√	√	√	√	√	
	EE4261	√	√	√	√				√	
	EE4281	√		√		√		√		
	EE4291	√		√				√	√	
	EE4301	√	√		√			√	√	
	EE4341	√	√					√	√	√
	EE3502	√			√	√	√		√	
	ELC2501					√		√		
	ELC2502					√		√		
	ELC3504					√		√		
	ENG224	√		√	√	√			√	
	ENG232	√			√				√	
	ENG236	√		√					√	
	ENG237	√	√		√				√	
	ENG238	√	√		√				√	
	ENG307				√	√	√	√		√
	GEC2xxx					√	√	√		

		PROGRAMME OUTCOMES								
		A1	**A2**	**A3**	**A4**	**A5**	**A6**	**B1**	**B2**	**B3**
SUBJECTS	IC2131				√	√	√		√	√
	IC2132				√		√	√		
	IC2112	√	√		√		√			
	ISE404			√	√		√		√	
	MM2021				√	√	√	√	√	
	MM4521						√	√	√	
	EE501	√		√	√		√	√		√
	EE502	√				√				
	EE505	√	√					√	√	
	EE509	√	√	√	√	√		√	√	
	EE510	√		√	√	√	√	√	√	
	EE512	√		√		√		√	√	
	EE514	√	√	√						
	EE517	√		√		√		√	√	
	EE520	√		√				√		
	EE521	√		√	√	√		√		√
	EE522	√	√	√	√				√	
	EE524	√			√	√		√		
	EE525	√			√	√		√		
	EE526	√	√							
	EE527	√		√				√		
	EE528	√		√		√		√		√
	EE529	√		√	√	√		√		√
	EE530	√		√	√	√		√	√	√

Table 4.3 Support of programme outcomes by individual subjects

4.4 Work-Integrated Education and Summer Practical Training

Work-Integrated Education (WIE) is introduced as a University exercise. 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 real working settings and develop students' critical thinking and problem solving capabilities.

Summer Practical Training (EE3502) normally takes place during the summer at the end of Year Two. Students are required to undertake a minimum of 6 weeks (3 training credits) of summer training, of which at least 2 weeks (1 credit) are of valid 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 Preferred Graduate Development Programme (PGDP) organised by the Student Affairs Office (SAO) of the PolyU is one of the main sources of placement opportunities for students locally and in the Mainland China as well as in overseas. There is no requirement on the WIE activities being paid jobs. 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 as part of a sandwich programme.
- Summer placement in a suitable organisation participating in the Preferred Graduate Development Programme.
- Relevant placement as student helpers in PolyU administrative departments and the Industrial Centre.
- Assisting in PolyU activities that have an external collaboration or service component such as, Innovation and Technology Fund projects, RAPRODS 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 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.

In order to ensure that students have useful experience, the summer practical training must be suitably chosen and properly organised. Students are required to initiate and formulate a training proposal or learning contract to indicate the expected work-based learning experiences, as well as a learning portfolio to review their achievements and intended learning outcomes.

Accordingly, the WIE officer will coordinate the following learning support activities:

(I) Orientation

To allow sufficient time for the formulation of training proposals and/or learning contracts, students should start their preparatory work by the commencement of the second semester of their second year study. In the orientation meeting, students will first learn the basic requirements of a good proposal in terms of learning outcomes and then, the basic skills in undertaking practical training.

- Information on search techniques to find national/international work-base employment, attachments etc.
- Life skills to be successful in the workplace
- Develop a positive attitude to work-based learning
- Planning and scheduling for successful completion of assessment instruments
- Consolidation of Training Proposal and/or Learning Contract
- Consideration of taking this chance for the preparation of Final Year Project

Students are required to submit their practical training proposals and learning contracts by **end of June.**

(II) Progress Monitoring

During the practical training, students are required to maintain a weekly training journal to identify their progress of their training. If applicable, site visits will be arranged by the supervisor during the practical training.

(III) Learning Evaluation

After returning from the practical training, students are required to submit a learning portfolio which should cover all periods of practical training. The learning portfolio is expected to demonstrate development of practical and professional skills through technical experience and application of theoretical knowledge. Development of skills in dealing with people, and communication skills are part of the subject learning outcomes. The student should be able to present the learning portfolio to prospective employers, as a complement to their degree.

Learning Portfolio

In writing the portfolio, the following should be observed:

- *Preliminary Information:* A contents list, abstract and employment details should precede the main learning portfolio. The abstract should be a summary of the portfolio and comprise about 300 words on one page. The employment details should set out names of employing organisations, method of obtaining employment, specific periods of employment, and nature of appointments (eg. trainee engineer etc.). Also required are details of job locations, name, phone number and designation of immediate superior (for possible contact by the course coordinator), projects in which the student was directly involved, and their degree of responsibility.
- *Content:* The major portion of the portfolio should be set out as a technical report, divided into suitable sections, and with an introduction to each major or different aspect of work. Students need to report on all projects listed in the employment

details. Noteworthy technical details of projects in which the student was directly involved, or of projects which the student observed, should also be included. These may include investigation, feasibility, design, management, commissioning or operational aspects etc. Students should openly discuss aspects of the work they have performed or observed and indicate their involvement in their work throughout the text. To be able to produce an accurate and comprehensive portfolio it is recommended that students keep a diary, along with photographs and any other information regarding their work. This diary will not be assessed; it will however be helpful in writing the final portfolio. All project data and information must be cleared by the employers for confidentiality prior to its incorporation in the portfolio. It is generally advisable to avoid all sensitive information related to the employment by limiting the contents to the general or public aspects of each specific project. References should be made in the text to books, technical papers, standards etc., used during the training period and should be listed. Finally, a conclusion should include comprehensive comments on the type and value of experience gained, and how this relates to the student's future professional career.

A student will be given a **PASS** grade only if he/she meets the following requirements with satisfactory performance:

1. Fulfilment of at least 6 weeks of summer practical training for full time students or 44 weeks for students taking the sandwich mode option, with at least 2 weeks of valid WIE activities as recognised by the University.
2. Punctual submission of training proposals and/or learning contracts, training journal and learning portfolio.

An academic staff will be allocated to each student as his or her training tutor to certify that all of the above requirements have been satisfactorily met. The training tutor has the right to ask the student to re-submit the training proposal and/or learning portfolio after giving the student the necessary feedback.

While the Department will be the responsible party to pursue WIE opportunities as vigorously as possible for the students so that they meet the graduation requirements, the students are expected to play their part in ensuring that they meet the WIE requirements for graduation and that they are employment worthy.

4.5 IC Training

Besides the WIE training components, students are required to undertake training at the IC, which is equivalent to 8 training credits. The training is scheduled partly during term time of Year One and partly in the summer at the end of Year One. The students will not pay any training fee, nor receive any stipend. IC training is however not parts of WIE activities.

4.6 Language Requirements and Programmes

With effect from the 2011/12 cohort of intakes, students on UGC-funded full-time undergraduate degree programmes (including the 2-year articulation degree programmes) will be required to complete two compulsory 3-credit language subjects (one in English and one in Chinese).

To comply with the above and other language requirements prescribed by the university, all students in the BEng (Hons) in Electrical Engineering programme are required to study three compulsory English subjects (totalling 6 credits). Starting from the 2011/12 intake cohort, all students are also required to study a compulsory 3-credit subject Fundamentals of Chinese Communication.

Chinese/English Language Enhancement Programmes (LEPs) will be prescribed to individual students by the Department of Chinese and Bilingual Studies (CBS) and/or English Language Centre (ELC) of the University upon their admission. The students are expected and encouraged to complete the LEPs but non-completion will not affect the students' eligibility for graduation.

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

4.7 Co-curricular Activities

PolyU aspires to develop all its students as all-round graduates with professional competence, and has identified a set of highly valued graduate attributes as the learning goals for students. While many of these graduate attributes can be developed through the curricular activities of this programme, some (including global outlook, interest in local and international affairs, interpersonal skills, sense of social and national responsibility, cultural appreciation, and leadership, etc.) are primarily addressed through co-curricular activities offered by faculties, departments, and various teaching and learning support units of the University. Students are encouraged to make full use of such opportunities to develop these attributes.

All students admitted on and after 2005/06 are required to participate in at least one non-credit bearing co-curricular activity during their study period, which is a mandatory requirement of general education for graduation. Starting from the 2008/09 entry cohort of full-time undergraduate degree students, a minimum of 6 hours' participation in co-curricular activities is required.

The co-curricular activities should be non-credit bearing, and they aim at rendering additional values and helping students to broaden their horizons and inspiring them to actualize all-round development outside the classroom.

Activities like Complementary Studies Programme, Leadership and Competence for Success Programme, Physical Education Programmes, Personal Development Programmes, hall education programmes, pre-placement training or career training organised by the Student Affairs Office (SAO), seminars and lunch talks by prominent speakers, study tour, exchange activity offered or organised by Faculties, academic Departments or supporting units, cultural appreciation programme, and any other activities in a variety of forms that the Department consider essential as part of the overall requirement of general education will be counted as co-curricular activities. Students will be considered as having fulfilled the requirement if they have participated in any <u>one</u> of these co-curricular activities.

However, summer attachments, internships, mentorship programmes, community service and Work-integrated Education activities forming part of the formal programme curricular will not be counted as co-curricular activities.

Students' participation in co-curricular activities will be recorded in the Co-curricular Achievement Transcript (CAT) administered by the SAO.

Further information is available at the website: http://www.polyu.edu.hk/sao/cca/.

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 Officer and fully supported by the General Office 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 Programme 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 Class Tutors and Personal Tutors

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

As the 'Year' concept does not always apply in a credit-based system and the boundaries between years may become vague as a result of credit transfers/exemptions, the Class Tutors are responsible for the general welfare of the students progressing through the three years of study according to the normal study pattern. A Class Tutor may thus look after students at different years of study. Students may seek help from Class Tutors on general enquiry, subject selection and academic counselling at the respective years.

From 2003, a Personal Tutor, usually an academic staff member, is assigned to each newly admitted student and he/she will be with the student till graduation. Personal Tutors provide continuous and individual counselling and help guide the students through various difficulties, if any, which might affect their studies. The scope of counselling may sometimes go beyond academic matters.

6. Admission, Registration and Assessment

The admission, registration and assessment arrangements described below are in accordance with the University policies and regulations for credit-based programmes which lead to an award of the University, except where the Senate decides otherwise.

6.1 Admission/Registration

Students are normally admitted into the programme via the joint admission scheme (JUPAS) on a yearly basis. Non-JUPAS applicants are also considered on their academic merits, as well as non-academic achievements.

6.2 Credit Transfer/Subject Exemption

Students may be allowed to have credit transferred or be exempted on subjects from recognised previous study. Credits transferred and subjects exempted normally do not carry grades. Decisions regarding granting or rejecting a subject credit transfer or exemption are entirely with the subject-offering departments. Students who have completed an approved student exchange programme may be granted a block transfer of the equivalent number of credits that have been successfully completed.

In cases that credit transfer is accompanied with grade, the actual grade as approved will be used in calculating the GPA/WGPA. The Department will not approve more than 27 credits normally but special consideration will be given in certain cases, such as advanced-standing students, subject to the University's guideline on maximum number of credits to be transferred (i.e. If the credits attained from previous study are from the PolyU, the total credit transferred should not exceed 67% of the required credits for the award. If the credits earned are from other institutions, the total credit transferred should not exceed 50%).
Subject exemption may be granted when it has clearly been identified that a student has *a priori* knowledge of a subject (in terms of content, academic level and achievement). In cases where exemption is given, no credits for that subject will be given and the student is required to take another subject assigned in lieu of the exempted subject.

The validity period of subject credits earned is 8 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 transfer of credits; students should submit all applications for credit transfer at the point of admission, i.e. Year 1.

6.3 Subject Registration/Add-drop of Subjects

Subject registration is carried out prior to the commencement of each semester. The timetables are then drawn up based on student's choices. In cases of timetable clashes, students will be allowed to re-select a different subject. Students may add and drop subjects during the add/drop period scheduled for each semester.

The University has a limit on the maximum study load that a student can take in a semester. For students admitted in 2005-06 or after, the maximum study load in a semester is 21 credits.

Students should study the definitive programme document, the subject pre-requisite, co-requisite and exclusion requirements and the specified progression pattern, if any, of the programme before subject registration. It is the student's responsibility to check if his/her subject registration will fulfil the graduation requirements.

Students are allowed to take additional subjects before graduation to broaden their interest. The selection of additional subjects will be done during the add/drop period. Full-time students can take additional subjects from within or outside his/her programme curriculum. Grades obtained from the additional subjects from outside curriculum will only be counted towards the student's GPA (Grade Point Average) but not towards the student's GPA for award classification. Additional fees will not be charged for students paying a fixed tuition fee per semester but will be charged for students paying a credit fee.

Students may apply for withdrawal of their registration on a subject after the add/drop period if they have a genuine need to do so. The application should be made to the relevant programme offering Department and will require the approval of both the subject lecturer and the host Department Programme Leader concerned (or an alternate academic staff authorised by the programme host Department). The application should be made to the Department no later than one month before the commencement of the examination period. For approved applications, the tuition fee paid for the subject will be forfeited and the withdrawal status of the subject will be shown in the examination result notification and transcript of studies but will not be counted towards the calculation of GPA. A handling fee will be charged by the University.

6.4 Zero Subject Enrolment/Deferment of Study

A student is not allowed to have zero subject registration in any semester without prior approval from the Department. Student failing to get prior approval for zero subject registration may be regarded as having withdrawn from the programme. All semesters in which the student is allowed to take zero subject enrolment will be counted towards the maximum period of registration. Students will be responsible for ensuring that they complete their studies within the maximum period of registration. A fee for retention of study place will be charged.

Application for deferment of study is only considered under very extraordinary circumstances. Deferment periods will not be counted towards the maximum period of registration. No retention fee will be incurred.

6.5 General Assessment Regulations

The University's General Assessment Regulations (GAR) applies to this Programme. The specific assessment regulations are set out here, having been developed within the framework of the GAR.

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 credit-based programme indicates the intellectual demand placed upon students and may characterise each subject with respect to its recommended sequencing within that programme.

A 'subject' is defined as a discrete section of the programme which is assigned a separate assessment.

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

6.6 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

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

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 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 VP(AD) and reported to the Senate.

6.7 Assessment Methods

Students' performance in a subject is assessed by continuous assessment and/or examinations. Where both methods are used, the weighting of each in the overall subject grade is clearly stated.

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 will nevertheless include some individual components therein. The contribution made by each student in continuous assessment involving a group effort is determined and assessed separately.

Assessment methods and parameters of subjects are determined by the subject-offering Departments.

At the beginning of each semester, the subject lecturer will inform students of the details of the assessments methods and criteria to be used within the assessment framework as specified in this document.

6.8 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.

If the Grade Point Average (GPA) of a student is below 2.0, he/she will be put on academic probation in the following semester. If the student is able to pull his/her GPA up to 2.0 or above at the end of the probation semester, the status of 'academic probation' will be lifted. The status of 'academic probation' will be reflected in the examination result notification but not in the transcript of studies.

A student is referred to the Board of Examiners of the Programme with the probable consequence of being de-registered from the programme if he/she falls within one of the following categories:

(a) the student's GPA is lower than 2.0 for 3 consecutive semesters.
(b) the student's GPA is lower than 2.0 for 2 consecutive semesters and his Semester GPA in the second semester is also lower than 2.0.
(c) the student has exceeded the maximum period of registration for the programme.

Notwithstanding the above, a student may be de-registered from the programme if his/her academic performance is so poor to the extent that the Board of Examiners deems that his/her prospect of attaining a GPA of 2.0 or above at the end of the programme is slim or the student is incapable of completing the programme at all.

In the event that there are good reasons, the Board of Examiners has the discretion to recommend that students who fall in categories (a) and (b) above to stay on the programme, and these recommendations should be presented to the relevant Faculty/School Board for final decision.

Under the current procedures, a student can appeal against the decisions of Boards of Examiners to deregister him/her. If such an appeal was upheld by the Department/School concerned, the recommendation (to reverse the previous decision to deregister the student) should also be presented to the relevant Faculty/School Board for final decision.

6.9 Retaking Subjects

Students may retake any subject for the purpose of improving their grade without having to seek approval, but they must retake a compulsory subject which they have failed, i.e. obtained an F grade. Retaking of subjects is with the condition that the maximum study load of 21 credits per semester is not exceeded. Students wishing to retake passed subjects will be accorded a lower priority than those who are required to retake (due to failure in a compulsory subject) and can only do so if places are available.

The number of retakes of a subject is not restricted. Only the grade obtained in the final attempt of retaking (even if the retake grade is lower than the original grade for originally passed subject) will be included in the calculation of the Grade Point Average (GPA). If students have passed a subject but failed after retake, credits accumulated for passing the subject in a previous attempt will remain valid for satisfying the credit requirement for award. (The grades obtained in previous attempts will only be reflected in transcript of studies.)

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.

6.10 Appeal Against Examination Results

A student may appeal against the decision of the Board of Examiners within 7 working days after the public announcement of the examination results. (This refers to the date when results are announced to students via the web.) Students appealing against the decision of a Subject Lecturer/ Subject Assessment Review Panel/Board of Examiners shall pay a fee. This fee shall be refunded if the appeal is upheld.

The appeal should be made to the Head of Department in writing. The appeal should be accompanied by a copy of the fee receipt, for inspection by the Department concerned. The student should give a complete account of the grounds for the appeal in the letter, and provide any supporting evidence. The person authorised to deal with the appeal will inform the student of the appeal results within 7 working days upon the receipt of all required information. Students may refer to the Student Handbook for more details on appeal procedures.

6.11 Grades, GPA and Award Classifications

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

Subject grade	Short description	Elaboration on subject grading description
A+	Exceptionally Outstanding	The student's work is exceptionally outstanding. It exceeds the intended subject learning outcomes in all regards.
A	Outstanding	The student's work is outstanding. It exceeds the intended subject learning outcomes in nearly all regards.
B+	Very Good	The student's work is very good. It exceeds the intended subject learning outcomes in most regards.
B	Good	The student's work is good. It exceeds the intended subject learning outcomes in some regards.
C+	Wholly Satisfactory	The student's work is wholly satisfactory. It fully meets the intended subject learning outcomes.
C	Satisfactory	The student's work is satisfactory. It largely meets the intended subject learning outcomes.
D+	Barely Satisfactory	The student's work is barely satisfactory. It marginally meets the intended subject learning outcomes.
D	Barely Adequate	The student's work is barely adequate. It meets the intended subject learning outcomes only in some regards.
F	Inadequate	The student's work is inadequate. It fails to meet many of the intended subject learning outcomes.

Table 6.11.1 Descriptions of Grades

'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.

Each grade is assigned a numerical value as indicated in Table 6.11.2. At the end of each semester, the GPA will be computed to indicate the student's performance up to and including the last semester. Exempted, incomplete and ungraded subjects for which credit transfer has been approved without assigning a grade, and subjects from which a student has been allowed to withdraw (i.e. those with grade 'W') will be excluded from the GPA calculation. Subject which has been given a 'S' subject code i.e. absent from examination, will be included in the GPA calculation and will be counted as 'zero' grade point. IC training credits are included in the GPA calculation.

$$GPA = \frac{\sum_{i} Subject\ Grade\ Point \times Subject\ Credit\ Value}{\sum_{i} Subject\ Credit\ Value}$$

where i = number of all subjects taken by the student up to and including the latest semester. For subjects being re-taken, only the grade obtained in the final attempt will be included in the GPA calculation.

Letter Grade	Grade Point	Description
A+	4.5*	Exceptionally Outstanding
A	4	Outstanding
B+	3.5	Very Good
B	3	Good
C+	2.5	Wholly Satisfactory
C	2	Satisfactory
D+	1.5	Barely Satisfactory
D	1	Barely Adequate
F	0	Inadequate
I#	N/A	Assessment to be completed
P	N/A	Pass on an ungraded subject
U	N/A	Fail on an ungraded subject
M	N/A	Pass with Merit
L	N/A	Subject to be continued in the following semester
S	0	Absent from assessment
W	N/A	Withdrawn from subject
Z	N/A	Exempted
T	N/A	Transfer of credit

Table 6.11.2 Grade/Codes used in Grade Point Average System

* The overall and weighted GPA will be capped at 4.0.

\# 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.

Subjects with the assigned codes I, P, L, U, M, W, Z, 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.

In order to graduate, a student must achieve a minimum GPA of 2.0, in addition to satisfying the programme-specific graduation requirements, such as IC training, WIE and exit language test. The awards will be classified based upon the weighted GPA (WGPA).

$$Weighted\ \ GPA = \frac{\sum_i Subject\ \ Grade\ \ Point \times Subject\ \ Credit\ \ Value \times W_i}{\sum_i Subject\ \ Credit\ \ Value \times W_i}$$

where W_i = weighting of between 0 and 1, to be assigned according to the level of the subject and the weighted GPA is capped at 4.0.

In determining the classification of awards, the credits earned at Levels 2, 3 and 4 are weighted 0.2, 0.3 and 0.5 respectively. Level 5 credits are also weighted 0.5. Not all subjects taken are included in the computation of the weighted GPA (WGPA). Training subjects and General Education subjects are excluded. A student is eligible for award if he/she satisfies all the conditions listed below:

(a) Accumulation of the requisite number of credits for the particular award.
(b) Satisfying all the requirements as defined in the definitive programme document and as specified by the University.
(c) Satisfying the WIE and IC Training requirements.
(d) Satisfying the residential requirement for at least one-third of the credits required for the award to be completed under the current enrolment at the PolyU, unless professional bodies stipulate the otherwise.
(e) Having a Grade Point Average (GPA) of 2.0 or above at the end of the programme.
(f) Having participated in a minimum of 6 hours' co-curricular activities.
(g) Having sat for GSLPA[#] in both Chinese and English (unless exemption is given).
(h) A pass in Foundation Mathematics (AMA106)*.

\# *The mandatory requirements for GSLPA will be abolished with effect from the 2011/12 cohort of intakes, including students on Foundation Year programmes in 2010/11 who progress to Stage 1 of FT undergraduate degree programmes in 2011/12. However, students admitted to Senior Years in 2011/12 either on advanced standing or under the Senior Year quota are required to take GSLPA before graduation.*

* *It is only applicable to admittees who do not have a "pass" in the A-level Mathematics subject(s) and who have not been given credit transfer for the subject AMA201. These students are required to take a mandatory Mathematics Benchmark Test (MBT) prior to the commencement of their studies. Those who pass the MBT are exempted from this graduation requirement and they follow the normal study pattern. Those who fail or do not attend the MBT are required to take a non-credit bearing subject AMA106 "Foundation Mathematics", which is a pre-requisite for AMA201. A pass in AMA106 "Foundation Mathematics" is thus a graduation requirement for such students.*

Table 6.11.3 shows the guidelines for the classifications. These are meant to be guidelines for reference only. The Board of Examiners shall exercise its judgement in coming to its conclusions as to the award for each student, and where appropriate, may use other relevant information.

Honours degrees	GPA or Weighted GPA@	Guidelines
1st	3.7^{+} - 4	The student's performance/attainment is outstanding, and identifies him as exceptionally able in the field covered by the programme in question.
2:i	3.2^{+} - 3.7^{-}	The student has reached a standard of performance/ attainment which is more than satisfactory but less than outstanding.
2:ii	2.3^{+} - 3.2^{-}	The student has reached a standard of performance/ attainment judged to be satisfactory, and clearly higher than the 'essential minimum' required for graduation.
3rd	2.0 - 2.3^{-}	The student has attained the 'essential minimum' required for graduation at a standard ranging from just adequate to just satisfactory.

@ Note: "+" sign denotes 'equal to and more than'; "–" sign denotes 'less than'.

Table 6.11.3 Degree Classification Guidelines

A Pass-without-Honours degree award will be recommended only under exceptional circumstances. When a student has demonstrated a level of attainment which is below the 'essential minimum' required for graduation with Honours from the programme 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 capability expected of Honours degree graduates. For example, if a student in an Honours degree programme has a GPA of 2.0 or more, but his WGPA is less than 2.0, he/she may be considered for a Pass-without-Honours classification.

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. If a student passes more elective subjects (or optional subjects) than the requirement for graduation in or before the semester within which he/she becomes eligible for award, the elective subjects with higher contribution (with the exception of the additional subjects taken out of interest and not for satisfying the award requirements) shall be counted in the grade point average calculation for award classification (i.e. the passed subjects with lower contribution will be excluded from the grade point calculation), irrespective of when the excessive elective subjects are enrolled.

6.12 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 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 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 (e.g. medical certificate). 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 Programme Leader or the Subject Lecturer concerned.

6.13 Aegrotat Award

If a student is unable to complete the requirement of the programme for the award due to very serious illness, or other very special circumstances which are beyond his control, and considered by the Board of Examiners as legitimate, the Faculty 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.

6.14 Compulsory Graduation

A student must graduate as soon as the criteria for graduation in the programme are satisfied. That is, a student will be allowed to register for more credits than needed only if adequate credits for graduation have not yet been accrued. This requirement has been stipulated in order to ensure the most efficient use of the PolyU resources.

Appendix I

Subject Description Forms

Content

Subject Description Form

Subject Code	AF2108
Subject Title	Financial Accounting
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	None
Role and Purposes	This subject contributes to the achievement of BBA Outcomes by enabling students to analyse financial reports (Outcome 9), apply accounting conceptual framework in the business problems analysis (Outcome 7) and process a foundation of financial accounting skills and knowledge, on which to base the process of continuous professional development (Outcome 13). It also contributes to the development of information technology skill (Outcome 6) and ethical reasoning (Outcome 5).
Subject Learning Outcomes	Upon completion of the subject, students will be able to: a. Explain the role and importance of accounting information in assisting decision-making in a business context. b. Apply the financial accounting conceptual framework in the recording, processing, summarizing and reporting phases of the accounting cycle. c. Evaluate the assumptions, principles and conventions underlying financial accounting processes. d. Identify and resolve accounting related ethical issues as they arise. e. Apply appropriate analytical tools for the interpretation of financial statements.
Subject Synopsis/ Indicative Syllabus	**The Business and Accounting Environment** Different types of businesses, their common objectives and basic features. The need for accounting as a basis for decision making. Ethical considerations in financial reporting. **The Financial Accounting Framework** Accounting equation and double entry bookkeeping system. Differences between cash and accrual bases of accounting. Preparation of journals, ledger accounts, trial balance and basic financial statements. Prepayments and accruals. Valuation of accounts receivables, inventory and fixed assets. Quality of earnings and earnings management. Internal control of cash through bank reconciliation statement. **Accounting Principles and Concepts** Fundamental accounting concepts and other accounting principles that underlie the preparation of financial statements. **Company Accounting** Features of the corporate form of business ownership. Rights and obligations of interested parties. Issues relating to company accounts. Preparation of financial statements of a company. **Analysis and Interpretation of Financial Statement** Need for analysis and interpretation of financial statements. Interpretation techniques including ratio analysis and statement of cash flow. Calculation and interpretation of basic financial ratios. Limitations of ratio analysis.

Teaching/Learning Methodology	A two hour lecture will be conducted each week to initiate students into the ideas, concepts and techniques of the topics in the syllabus, which is then reinforced by a one hour tutorial designed to consolidate and develop students' knowledge through discussion and practical problem solving. Students will be assigned and assessed with a group project which simulates the maintenance of a set of accounting records for a company
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	e	
Continuous Assessment	**50%**						
1. Project Assignment	10%		√				
2. Tests (close book)	40%		√		√		
Final Examination (closed book)	**50%**	√	√	√	√	√	
Total	100 %						

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

Student Study Effort Expected	Class contact:	
	▪ Lectures	28 Hrs.
	▪ Tutorials	14 Hrs.
	Other student study effort:	
	▪ Weekly preparation and review (3 hour X 12 weeks)	36 Hrs.
	▪ Assignments (3 hours X 12 topics) and project (10 hours)	46 Hrs.
	Total student study effort	124 Hrs.

Reading List and References

Recommended Textbook
Weygandt, J.J., D.E. Kieso and P.D. Kimmel, *Financial Accounting*, IFRS Edition, Wiley (latest version).

Recommended References
Williams, Haka, Bettner, Carcello, Lam and Lau, *Financial Accounting: Including International Financial Reporting Standards (IFRS)*, McGraw-Hill (latest version).

Ferrell, Fraedrich and Ferrell, *Ethical Decision Making for Business,* international edition, South Western (latest version).

Alexander and Nobes, *Financial Accounting: An International Introduction*, New York : Financial Times Prentice Hall (latest version).

Subject Description Form

Subject Code	AF3901
Subject Title	Economics for Engineers
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Exclusion: AF2617
Role and Purposes	This subject aims to equip students with the fundamental concepts of economics/finance/costing and to develop their ability to analyze and solve economic problems by applying these concepts in general (Outcomes 7, 10, and 12) and in the context of decision making in an engineering company in particular (Outcome 13). It aims to broaden students' global outlook by exposing them to economic issues in Hong Kong and in the world (Outcome 3). The assessment tools of the subject help students to develop their critical thinking and enhance their oral and written skills in English to enable them to communicate and work effectively with others (Outcomes 1 and 2).
Subject Learning Outcomes	Upon successful completion of this subject, students will be able to: a. understand the fundamental concepts of microeconomics, finance and costing in general, and in global business operations in particular; b. conduct analyses of economic and financial issues in real-life situations; c. assess the strategies and behaviors of firms operating under various market structures in the global economy; d. apply the budgetary planning and capital budgeting skills to appraise economic and financial issues in the context of engineering operations; and e. communicate and work effectively with others.
Subject Synopsis/ Indicative Syllabus	**Part I: Principles of Microeconomics** Basic principles of economics; Price mechanism; Theory of demand and supply; Behavior of the firm; Organization of industry. **Part II: Engineering Economics** Economic model of an engineering company; Composition of costs; Costing systems; Activity and time-based costing; Profit and loss control; Budgetary planning and control; Investment and sources of finance; Time value of money and investment appraisal.
Teaching/Learning Methodology	There is a two-hour lecture each week that focuses on the introduction and explanation of key concepts of engineering economics with specific reference to current issues wherever appropriate. The one-hour tutorial provides students with the opportunity to deepen their understanding of the concepts taught in lectures and to apply the theories to the analysis of real-life issues. The activities in tutorials include student presentations and discussions of examples and cases relevant to the subject.

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	e
Continuous Assessment	**50%**					
1. In-class participation and presentation	10%	√	√	√	√	√
2. Written assignments	20%	√	√	√	√	√
3. Tests	20%	√	√	√	√	√
Final Examination	**50%**	√	√	√	√	√
Total	100 %					

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

Student Study Effort Expected		
	Class contact:	
	▪ Lectures	28 Hrs.
	▪ Tutorials	14 Hrs.
	Other student study effort:	
	▪ Reading textbooks and other study materials	30 Hrs.
	▪ Preparation for presentation and assignments	15 Hrs.
	Total student study effort	87 Hrs.

Reading List and References

Textbooks

Parkin, Michael, *Economics*, 9th Edition, Addison Wesley, 2010.

William, Sullivan, Wicks Elin and Luxhoj James, *Engineering Economy*, 13th Edition, Prentice Hall, 2006.

Reference books

Drury, Colin, *Management and cost accounting*, 6th Edition, London: Thomson Learning, 2008.

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

Subject Description Form

Subject Code	AF5107
Subject Title	Accounting for Engineers
Credit Value	3
Level	5
Pre-requisite / Co-requisite/ Exclusion	None
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 (Please tick as appropriate)					
		a	b	c			
Continuous Assessment	**50%**						
1. Class Participation (assignments)	15%	√	√	√			
2. Quiz	10%	√	√				
3. Project & Presentation	15%	√	√	√			
4. Individual writing task	10%			√			
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 (1& 2), students are required to do some research and learning appraisals in assessment components 3 & 4.

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

Student Study Effort Expected

Class contact:	
▪ Seminar	42 Hrs.
▪	Hrs.
Other student study effort:	
▪ Reading books and working through assigned problems	45Hrs.
▪ Research, discussion & write-up	15Hrs.
Total student study effort	102Hrs.

Reading List and References

Kimmel, Weygandt and Kieso, *Accounting, Tools for Business Decision Making*, latest edition, John Wiley & Sons Inc.

Larson, Wild and Chiapetta, *Fundamental Accounting Principles*, latest edition, Mcgraw-Hill Irwin.

Williams, Haka, Bettne and Meigs, *Financial & Managerial Accounting: The Basis for Business Decisions*, latest edition, McGraw-Hill/Irwin.

Glautier and Underdown, *Accounting Theory and Practice*, latest edition, Prentice Hall.

Dyson, J. R., *Accounting for Non-Accounting Students*, latest edition, Financial Times.

Subject Description Form

Subject Code	AMA201
Subject Title	Mathematics I
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	To introduce students the fundamentals of basic engineering mathematics. Emphasis will be on the basic theory as well as application of mathematical methods to solving engineering problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. apply mathematical reasoning to analyse essential features of different engineering problems; 2. extend their knowledge of mathematical and numerical techniques and adapt known solutions to different situations; 3. apply appropriate mathematical concepts and techniques and adapt known solutions to different situations; 4. develop and extrapolate the mathematical concepts in synthesizing and solving new problems; 5. search for useful information in the process of problem solving.
Subject Synopsis/ Indicative Syllabus	*Algebra of complex number*: Complex numbers; Geometric representation; n-th roots of complex numbers. *Linear algebra:* Matrices and determinants; Vector space; Elementary algebra of matrices; Eigenvalues and eigenvectors; Normalization and orthogonality. *Ordinary differential equations*: First and second order linear ordinary differential equations; Laplace transforms; Convolution theorem; 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	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		1	2	3	4	5
a. Continuous Assessment	40%	✓	✓	✓	✓	✓
b. Examination	60%	✓	✓	✓	✓	✓
Total	100%					

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

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

To pass this subject, students are required to obtain grade D or above in both the continuous assessment and the examination components.

Student Study Effort Expected

Class contact:	
▪ Lecture	28 Hrs.
▪ Tutorial	14 Hrs.
▪ Mid-term test and Examination	5 Hrs.
Other student study effort:	
▪ Assignments and self-study	73 Hrs.
Total student study effort	120 Hrs.

Reading List and References

Textbook:

Chan, C.K., Chan, C.W. & Hung, K.F.	Basic Engineering Mathematics 2nd edition	McGraw-Hill 2008

References:

Anton, H.	Elementary Linear Algebra 9th edition	John Wiley & Sons 2004
Kreyszig, E.	Advanced Engineering Mathematics 9th edition	Wiley 2006
James, G.	Modern Engineering Mathematics 4th edition	Prentice Hall 2007
Thomas, G.B., Weir, M.D. & Hass, J.R.	Thomas' Calculus 12th edition	Addison Wesley 2009

Subject Description Form

Subject Code	AMA202
Subject Title	Mathematics II
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: Mathematics I (AMA201)
Objectives	This subject aims to introduce students to the differential and integral calculus of functions of several variables, vector field theory and partial differential equations of mathematical physics. Emphasis will be on the basic theory as well as application of mathematical methods to solving engineering problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. apply mathematical reasoning to analyse essential features of different engineering problems; 2. extend their knowledge of mathematical and numerical techniques and adapt known solutions to different situations; 3. apply appropriate mathematical concepts and techniques and adapt known solutions to different situations; 4. develop and extrapolate the mathematical concepts in synthesizing and solving new problems; 5. search for useful information in the process of problem solving.
Subject Synopsis/ Indicative Syllabus	*Calculus and functions of several variables:* Infinite series; Power series; Taylor series; Fourier series; Partial differentiation; Maxima and minima; Lagrange multiplier. *Partial differential equations:* Formulation of partial differential equations; Method of separation of variables; Initial and boundary value problems. *Vector Calculus:* Vectors; Scalar and vector products; Gradient, divergence and curl operators; Multiple integrals; Line, surface and volume integrals; Green's theorem, divergence theorem and Stokes' theorem.
Teaching/Learning Methodology	The subject will be delivered mainly through lectures and tutorials. The lectures aim to provide 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	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		1	2	3	4	5
a. Continuous Assessment	40%	✓	✓	✓	✓	✓
b. Examination	60%	✓	✓	✓	✓	✓
Total	100%					

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

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

To pass this subject, students are required to obtain grade D or above in **both** the continuous assessment and the examination components.

Student Study Effort Expected

Class contact:	
▪ Lecture	28 Hrs.
▪ Tutorial	14 Hrs.
▪ Mid-term test and Examination	5 Hrs.
Other student study effort:	
▪ Assignments and self-study	73 Hrs.
Total student study effort	120 Hrs.

Reading List and References

Textbook:

Chan, C.K., Chan, C.W. & Hung, K.F.	Basic Engineering Mathematics 2nd edition	McGraw-Hill 2008

References:

Van Valkenberg, M.E.	Network Analysis 3rd edition	Prentice Hall 1974
Kreyszig, E.	Advanced Engineering Mathematics 9th edition	Wiley 2006
James, G.	Advanced Modern Engineering Mathematics 3rd edition	Prentice Hall 2005
Thomas, G.B., Weir, M.D. & Hass, J.R.	Thomas' Calculus 12th edition	Addison Wesley 2009

Subject Description Form

Subject Code	BSE463
Subject Title	Design of Mechanical Systems in Buildings
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: ENG232 & EE321 (for Prog. 41070), EE321 (for Prog. 41080)
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 (Please tick as appropriate)					
		a	b	c	d	e	f
1. Group assignment	10			✓		✓	✓
2. Test	30	✓	✓	✓	✓		
3. Final 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 Expected	
Class contact:	
▪ Lectures	30 Hrs.
▪ Tutorials	6 Hrs.
Other student study effort:	
▪ Test	3 Hrs.
▪ Self study and assignment	91 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, 2002
PolyU Call Number TD345.W5 2002

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

Subject Proposal for the Purpose of General University Requirements (GUR)

Subject Offering Department	Chinese Language Centre, Department of Chinese & Bilingual Studies
Subject Code	CBS2080
Subject Title	Fundamentals of Chinese Communication (For students under 3-Year Curriculum)
Credit Value	3
Level	2
Planned Student Intake per Year	Optimal class size: 20 Planned number of sessions to be offered: Semester 1: 52 Semester 2: 52 Summer Term: 10
GUR Requirements Intended to Fulfil	Please indicate which of the following GUR requirements the proposed subject intends to fulfil [Please check ALL boxes that may apply.] ☒ **Languages and Communication Requirement** (LCR) ☐ **Requirement in Healthy Lifestyle** ☐ **Broad Discipline Requirement** (BDR) Please specify Broad Discipline Area: _____ ☐ **Cluster Area Requirement** (CAR) Please check the box(es) below to indicate the cluster area(s) the subject contributes in a major way: ☐ Human Nature, Relations and Development ☐ Community, Organization and Globalization ☐ History, Cultures and World Views ☐ Science, Technology and Environment ☐ **China-Study Requirement** (CSR) More than 60% CSR-related content? Yes ☐ or No ☐ (Please check as appropriate) ☐ **Eligible for "English Writing" (EW) designation** - include an extensive piece of writing (2,500 words)? Yes ☐ or No ☐ (Please check as appropriate) ☐ **Eligible for "Chinese Writing" (CW) designation** - include an extensive piece of writing (3,000 characters) Yes ☐ or No ☐ (Please check as appropriate) ☐ **Eligible for "English Reading" (ER) designation** - include a reading of an extensive text (100,000 words or 200 pages)? Yes ☐ or No ☐ (Please check as appropriate) ☐ **Eligible for "Chinese Reading" (CR) designation** - include a reading of an extensive text (100,000 characters or 200 pages) Yes ☐ or No ☐ (Please check as appropriate)
Proposed Instructor(s) *(Note 1)*	Academic staff of CLC
Medium of Instruction	Please check the appropriate box: ☐ English ☐ Cantonese* ☒ Putonghua* ☐ Others* (Please specify: _____) **Justification(s):** This is a Chinese language subject aiming at enhancing students proficiency in written Chinese and Putonghua. ** In line with the University policy, English will be the medium of instruction except for the Chinese culture- or Chinese literature-related subjects, which will normally be taught in Putonghua as recommended by the Working Group. For other subjects to be offered in Cantonese, Putonghua or other languages, justifications should be provided for special consideration.*

Student Study Effort Required	Class contact:	
	▪ Seminar	42 Hrs.
	Other student study effort:	
	▪ Outside class practice	3 x 14 = 42 Hrs.
	▪ Self-study	3 x 14 = 42 Hrs.
	Total student study effort	126 Hrs.

Pre-requisite and/or Exclusion(s) *(Note 2)*	Students whose HKALE result for Chinese Language and Culture is at grade D or below are advised to complete / concurrently take non-credit bearing Chinese Language Enhancement subject(s) as recommended.
Objectives *(Note 3)*	This subject aims to enhance and polish the communication skills of the students in both written Chinese and Putonghua for basic usage in the work-place.
Intended Learning Outcomes *(Note 4)*	Upon completion of the subject, students will be able to: (a) develop effective communication skills in both written Chinese and Putonghua required for basic usage in the work-place; (b) master the format, organization, language and style of expression of various genres of Chinese practical writing such as official correspondences, publicity materials, reports and proposals; (c) give formal presentation in Putonghua; (d) engage with formal discussion in Putonghua. **Please explain how the stated learning outcomes relate to the following three essential features of GUR subjects: Literacy, Higher order thinking, and Skills for life-long learning** Students will be required to read and write intensively for enhancing their proficiency level in written Chinese. They would be required to organize their own ideas, concepts in sensible and logical manner and present them in both written and spoken format for effective transmission of message in given contexts with specific purposes. Such learning activities would engage them in reasoning and analytical processes. The mastering of effective communication skills in both written Chinese and Putonghua will also facilitate their life-long learning in various disciplines.
Subject Synopsis/ Indicative Syllabus *(Note 5)*	1. Written Chinese for practical purposes • uses of words and sentences; • coherence in Chinese writing • format, organization, language and style of expression of official correspondences, publicity materials, reports and proposals; • context dependent stylistic variation 2. Formal Presentation in Putonghua • the articulation in Putonghua

<table>
<tr><td></td><td>

the flow of speaking
choice of words, manner and gesture

3. Formal Discussion in Putonghua

identification of main idea and key messages
evaluation of relevancy of information in a message
skills of seeking clarity/agree/disagreeing/answering to a question
skills of summarizing

</td></tr>
<tr><td>Teaching/Learning Methodology
(Note 6)</td><td>The subject will be conducted in Putonghua, in highly interactive seminars. The subject will motivate the students' active participation by assigning group presentation /discussion in class. In a forum-like format, students are guided to : (1) present to the class, their understanding of each genre designed for the syllabus for discussions and improvement; (2) modify passages in a given genre/style into other genres/styles for addressing different audiences and purposes; (3) give a power-point presentation in Putonghua in front of the whole class, then receive on spot feedback for discussion and improvement; then (4) prepare a written report/proposal on the same topic; and (5) engage in formal discussion in Putonghua on topics related to current issues and/or business operation; then (6) produce a written document on the same topic using a chosen genre.</td></tr>
<tr><td>Assessment Method
(Note 7)</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td></td><td></td></tr>
<tr><td>1. Written Assignment</td><td>30%</td><td>√</td><td>√</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. Oral Presentation</td><td>30%</td><td></td><td></td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>3. Final Examination</td><td>40%</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
</table>
</td></tr>
<tr><td>Reading List and Reference</td><td>Please indicate clearly in this section if the subject should have an "R" designation. If so, subject proposers should also indicate clearly which items on the Reading List constitute the expected reading requirement and include the page numbers.

路德慶主編(1982)《寫作教程》，華東師範大學出版社。
邵守義（1991）《演講全書》，吉林人民出版社。
陳建民（1994）《說話的藝術》，語文出版社。
李軍華（1996）《口才學》，華中理工大學出版社。
陳瑞端著（2000）《生活錯別字》，中華書局。
于成鯤、陳瑞端、秦扶一、金振邦主編（2011）《當代應用文寫作規範叢書》，復旦大學出版社。
邢福義、汪國勝主編（2003）《現代漢語》，華中師範大學出版社。
于成鯤主編（2003）《現代應用文》，復旦大學出版社。
鍾文佳（2004）《漢語口才學》，西南師範大學出版社。
李白堅、丁迪蒙（2004）《大學體型寫作訓練規程》，上海大學出版社。</td></tr>
</table>

Notes

Please refer to the Development Framework for CAR Subjects when completing this form. (https://www2.polyu.edu.hk/4yearug/Staff/policy.html)

Note 1: Proposed Instructor(s)
Please provide a 2-page curriculum vitae of each of the instructors, specifically tailored to substantiate his/her expertise in the subject area. Please indicate the Subject Leader.

Note 2: Pre-requisite and/or Exclusion(s)
GUR subjects normally should not have any pre-requisites. If pre-requisites are really needed by a given GUR-cluster subject, these pre-requisites should also be GUR-cluster subjects, and the number of pre-requisites should not be more than 1.
Departments should identify other subjects which have significant overlaps with the syllabus of the proposed subject and specify these subjects as the subject exclusion requirements.

Note 3: Objectives
This should include a description of the specific objectives of the subject which should be aligned with the overall objectives of GURs, and appropriate for the particular GUR Requirements the subject intends to fulfil. For "W"/ "R" label subject proposals, the objectives should be consistent with the "W"/ "R" designation.

Note 4: Intended Learning Outcomes
Intended learning outcomes should state what the students should be able to do or attain upon completion of the subject. Proposers are also expected to demonstrate that the stated learning outcomes have adequately addressed the following three essential characteristics for qualifying as a GUR subject: Literacy, Higher order thinking, and Life-long learning. For "W"/ "R" label subject proposals, the learning outcomes should be consistent with the "W"/ "R" designation.

Note 5: Subject Synopsis/Indicative Syllabus
Include a syllabus with sufficient detail to demonstrate how the learning outcomes are going to be achieved.

Note 6: Teaching/Learning Methodology
Please give a brief description of the teaching and learning methods to be employed to facilitate learning, and how they are aligned with the intended learning outcomes of the subject.

Note 7: Assessment Method
To ensure alignment with the curriculum design and an increased emphasis on learning outcomes, please state the assessment method(s) that will be used and its relative weighting, and indicate which of the subject intended learning outcome(s) are targeted by each assessment.

For "W" label subjects, the writing component should be clearly specified, i.e. the short lecture series focusing on writing strategies and the small group tutorials designed to provide in-depth feedback on the student's extensive writing. The distribution of weighting between the different assessment components should be determined by the subject instructor, consistent with the implementation guidelines.

For "R" label subjects, proposers should ensure that the assessment of the required reading is clearly included in the Assessment Methods and given appropriate weighting.

Note 8: Signature of Head of Department/ Director of School
The Head of Department/ Director of School is required to endorse the Subject Proposal before submission. When endorsing the subject, please take note of the following:
- The subject proposed is academically rigorous
- The subject proposed should be in line with the strategic objectives in the department's academic plan

Subject Description Form

Subject Code	CSE462
Subject Title	Environmental Impact Assessment – Theory and Practice
Credit Value	3
Level	400
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	To provide students with an overview of the principles and current practices of environmental impact assessment (EIA), especially in Hong Kong.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. understand the EIA process; b. analyse major environmental issues for large development projects; and c. conduct necessary monitoring and modeling tasks within an EIA cycle.
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 on EIA practices by invited speakers from government agencies and professional environmental 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 (Please tick as appropriate)		
		a	b	c
1. Continuous Assessment	50	√	√	√
2. Written Examination	50	√	√	√
Total Total	100 %			

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:	
	▪ Lectures	24Hrs.
	▪ Tutorials / Seminars	18Hrs.
	Other student study effort:	
	▪ Coursework exercise	20Hrs.
	▪ Seminar reports	2Hrs.
	▪ Self Study	62 Hrs.
	Total student study effort	126Hrs.

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 publications, including local case studies. Barbara Caroll, 2002. *Environmental Impact Assessment Handbook: A Practical Guide for Planners, Developers and Communities*. Thomas Telford, London. Canter, L.W., 1996. *Environmental Impact Assessment*, 2nd Ed., McGraw-Hill.

	Christopher Wood. 2003. *Environmental Impact Assessment: A Comparative Review*. Prentice Hall, New Jersey. Riki Therivel, Peter Morris, 2001. Methods of Environmental Impact Assessment, Spon Press, London. Hong Kong Environmental Protection Department http://www.epd.gov.hk/eia/

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 and computers consistent with undergraduate level study in civil 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.
Intended Learning Outcomes	Upon completion of the subject, students will be able : a. to apply basic traffic engineering approaches to determine appropriate solutions for solving traffic 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 traveller surveys for strategic transport planning and travel demand forecasting; and d. to utilize the four-steps 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; goals and objectives of traffic studies; levels of urban transport planning; traffic problems and transport policy. ii) Travel Demand and Data Collection The spatial characteristics; temporal characteristics; Hong Kong travel demand characteristics. Data collection and preparation; travel surveys and transportation system inventory. iii) 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. iv) Urban Transport Technology Evaluation of urban transport technology; classification of urban transport technologies; urban transport networks; examples of urban transport systems, traffic restraint and road pricing, intelligent transport systems, route guidance and traveller information systems. v) Generation and Evaluation of Solutions Solution generation; evaluation techniques; economic, operational and environmental evaluation; solution evaluation; case studies and review of Hong Kong Transport studies (e.g. New Town Study, Port and Airport Development Strategy Study, Comprehensive Transport Study etc.). vi) Special Topics Topic 1: Planning for Public Transport. Topic 2: Planning for Pedestrians. Topic 3: Urban Goods Movement. The special topics will be high-lighted with examples from higher density cities such as Hong Kong.

	vii) Project and 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.
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 on sites 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. Professionals from government or industry will 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** Bruton, Michael J., *Introduction to Transportation Planning*, 3rd Ed., Hutchinson (1985). Ortúzar, J. de D. and Willumsen, L.G., *Modelling Transport*, 3rd Ed., John Wiley & Sons (2001). **Reference Books** Hensher, David A. and Button, Kenneth J., *Handbook of Transport Modelling*, Elsevier Science Ltd. (2000). Hutchinson, B.G., *Principles of Urban Transport Systems Planning*, McGraw -Hill (1974). 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). The official link from MIT: http://web.mit.edu/sheffi/www/selectedMedia/sheffi_urban_trans_networks.pdf **Conference Proceedings and Symposia** Proceedings of Hong Kong Society for Transportation Studies (http://home.netvigator.com/~hksts) Proceedings of the International Symposium on Transportation and Traffic Theory **Journals** Journal of Advanced Transportation Journal of the Transportation Research Board Journal of Transportation Engineering , American Society of Civil Engineers (ASCE) Traffic Engineering and Control Transportation Planning and Technology Transportation Research Transportation Science Transportmetrica (http://www.transportmetrica.org/) **Reports** Technical reports by the Traffic and Transport Survey Division, Hong Kong Government Transportation Research Records, Transportation Research Board TRRL reports, Transport and Road Research Laboratory

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

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

Continuous assessment will be based on coursework and case study discussions.
Written examination is evaluated by final examination.

Subject Description Form

Subject Code	EE2011
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. Appreciate recent developments in computational electromagnetics. d. Have had 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, method of images, 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	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	24%	√		√						
3. Laboratory performance & reports	16%	√		√						
Total	100 %									

It is a fundamental subject of electromagnetics. The outcomes on physical concepts and analysis are assessed by the usual means of examination 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	36 Hrs.
	▪ Laboratory	12 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	45 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. W.H. Hayt, and J.A. Buck, Engineering Electromagnetics, 7th Edition, Boston: McGraw Hill, 2006

Subject Description Form

Subject Code	EE3011
Subject Title	Analogue and Digital Circuits
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ENG237 & ENG238
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 and hence the implications on their design. 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 from practical viewpoints and the importance of sound technical knowledge and team work.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Design basic digital combinational and sequential circuits and list the detail procedures and possible difficulties. 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. e. Write a technical report and present the findings. f. Recognise the constraints, technical or otherwise, on engineers in solving real-life problem and the need for organised preparation and teamwork.
Subject Synopsis/ Indicative Syllabus	**Digital Circuits** 1. ***Digital system fundamentals*:** Boolean algebra, number systems, logic gates and 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. Basic logic gates, input and output V-I characteristics; transfer characteristics, switching thresholds, noise margins, propagation delay. Inter-family interfacing of digital ICs. 4. ***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, flow tables, stable and unstable states. **Analogue Circuits** 5. ***Large-signal transistor circuits*:** Classification of power amplifiers; analysis of efficiency, power dissipation and distortion of class A, B, AB and C amplifiers. 6. ***Signal conversion*:** Voltage comparator, Schmidt triggers. 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; Successive-approximation converter; Counting converter; Dual-slope converter. **Laboratory Experiments:** Logic circuits I – CMOS logic gates characteristics and combinational logic circuit design Logic circuits II – TTL logic gates characteristics and sequential logic circuits design Power amplifiers – Classes A, AB & B **Mini project:** Circuit design and component selection on logic circuits with given specifications
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. On-the-spot assessments are conducted in the laboratory to provide additional incentives for student learning. 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	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. Class Test	12%	√	√	√							
3. Laboratory performance & reports	16%	√		√	√	√	√				
4. Mini-project & report	12%	√			√	√	√				
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 and teamwork, are evaluated by experiments, mini-project and the reports.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	36 Hrs.
▪ Laboratory	12 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	12 Hrs.
▪ Self-study	45 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Textbook:
1. M.M. Mano, Digital Design, 4th Edition, Prentice Hall, 2007

Reference books:
1. J.F. Wakerly, Digital Design: Principles and Practices, 4th Edition, Prentice Hall, 2006
2. N. Balabanian and B. Carlson, Digital Logic Design Principles, John Wiley and Sons, 2001

Subject Description Form

Subject Code	EE3021
Subject Title	Electromechanical Energy Conversion
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
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.
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 transformers and 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. ***Transformers:*** Operating principles. Equivalent circuits. Voltage regulation and efficiency. Parallel operation. Three-phase transformers and phase grouping. 4. ***Windings*:** Phase and commutator windings. Winding factors. E.m.f. equation. Harmonics. Production of rotating field. 5. ***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. 6. ***Synchronous machines*:** Construction. Synchronous impedance. Voltage regulation. Synchronising. Performance on infinite busbars. Power/load angle relationship. Stability. Synchronous motor. 7. ***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 motor V-curves. Temperature rise and ratings.

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. Tests	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	36 Hrs.
	▪ Laboratory	12 Hrs.
	Other student study effort:	
	▪ Revision, self-study, and assignment	48 Hrs.
	▪ Write-up of laboratory reports	9 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. C.G. McPherson and R.D. Laramore, An Introduction to Electrical Machines and Transformers, 2nd Edition, NY: John Wiley and Sons, 1990
2. S.A. Nasar, Schaum's Outline of Electric Machines and Electromechanics. NY: Macmillan Publishing Company, 1998

Subject Description Form

Subject Code	EE3031
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.
Intended Learning Outcomes	Upon completion of the subject, students will: a. Be able to explain both verbally and in written form 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. 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 Converter, 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:** DC/DC Buck Converter, Introduction to SCR circuits, PSPICE simulation of SCR Bridge.

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. 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
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 tests	30%	√	√	√						
3. Laboratory performance & reports	10%			√	√					
Total	100%									

The understanding on theoretical principle and practical considerations, analytical skills and problem solving technique 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	36 Hrs.
	▪ Laboratory	12 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	45 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. Ned. Mohan, Tore M. Undeland, William P. Robbins, Power Electronics: Converters, Applications & Design, 3rd Edition, Wiley, 2003
2. Muhammad H. Rashid, Power Electronics: Circuits, Devices and Applications, 3rd Edition, Prentice Hall, 2004

Reference books:

1. Bimal K. Bose, Power Electronics and Variable Frequency Drives: Technology and Applications, IEEE Press 1997
2. Philip T. Krein, Elements of Power Electronics, Oxford University Press, 1998
3. R. Krishnan, Electric Motor Drives: Modeling, Analysis, and Control, Prentice-Hall, 2001
4. Ned. Mohan, Electric Drives: an Integrative Approach, Minnesota Power Electronics Research & Education, 2003
5. P.C. Sen, Principles of Electric Machines and Power Electronics, 2nd Edition, Wiley, 1996
6. W. Shepherd, Power Electronics and Motor Control, 2nd Edition, Cambridge University Press, 1996

Subject Description Form

Subject Code	EE3041
Subject Title	Power Transmission and Distribution
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To introduce students to the fundamental knowledge which is essential for all electrical power engineers. It leads to a deeper insight into the design, planning, operation, equipment characteristics and environmental impacts of modern electrical power systems.
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 to power system design, planning, and operation, making use of mathematics and engineering techniques. c. Be able to work in teams when conducting laboratory investigations. d. Be able to write a technical report and present the findings.
Subject Synopsis/ Indicative Syllabus	1. ***Generation, energy and environment*:** Renewable and non-renewable resources and generation. Pump storage and wind turbine. Sources of pollution and environmental impacts. 2. ***Power system components*:** Busbar**.** Turbine and generator system. Concept of generation control and operating chart. Power Transformers. Line and Cable: RLCG and ABCD parameters and applications. 3. ***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 and bulk tariff. 4. ***Surges*:** Travelling wave, surge impedance and standing voltage. Lightning and switching surges. Surge mitigation, reflection and refraction. Use of lattice diagram. Protection against overvoltage. 5. ***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. 6. ***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:** 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 the 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 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	25%	√	√								
3. Laboratory Performance & Report	15%			√	√						
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 design, as well as technical reporting and teamwork.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	36 Hrs.
	▪ Laboratory	12 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	45 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Textbooks:
1. C.R. Bayliss and B.J. Hardy, Transmission and Distribution Electrical Engineering, Kindle, 3rd Edition, 2007
2. W.D. Stevenson, Elements of Power System Analysis, McGraw Hill, 4th Edition or later, 1982 or later
3. B.M. Weedy, Electric Power Systems, Wiley, 3rd Edition or later, 1988 or later

Reference Books:
1. L. Grigsby, Electric Power Generation, Transmission and Distribution, Electric Power Engineering Handbook, 2nd Edition, CRC Press, 2007
2. A.R. Bergen and V. Vittal, Power System Analysis, Prentice Hakk, 2nd Edition, 2000
3. T. Gönen, Modern Power System Analysis, Wiley, 1988 or later

Subject Description Form

Subject Code	EE3051
Subject Title	Systems and Control
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AMA201
Objectives	1. To introduce the principles and techniques used in the analysis and design of feedback control systems. 2. To provide the foundation for the later subjects in the areas of power systems, drives and control.
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. 3. ***System diagrams and simulations*****:** Block diagram, Signal flow graphs, Mason's formula, Simulation of continuous systems using Matlab. 4. ***Time domain analysis of linear systems*****:** First-order systems, Second-order systems, Transient response, Steady-state response, Routh-Hurwitz stability criterion. 5. ***Frequency domain analysis of linear systems*****:** Frequency response, Bode Diagrams, Gain margin and phase margin, Polar plots, Nyquist stability criterion, Nichols plots. 6. ***Compensators and PID controllers:*** Compensators, PID controllers, Controller tuning. 7. ***State-space analysis*****:** State-space models, Transfer matrix, State transition matrixt. **Laboratory Experiment:** Three-term controller Open-loop frequency response Modular position control system

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 tests	30%	√	√	√							
3. Laboratory reports	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	38 Hrs.
▪ Laboratory	8 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	12 Hrs.
▪ Self-study	47 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. K. Ogata, Modern Control Engineering, 4th Edition, Prentice-Hall, 2002
2. B.C. Kuo, Automatic Control Systems, 7th Edition, Prentice-Hall, 1995
3. R.C. Dorf and R.H. Bishop, Modern Control Systems, 10th Edition, Prentice-Hall, 2004
4. M. Gopal, Control Systems: Principles and Design, 3rd Edition, McGraw-Hill, 2008

Subject Description Form

Subject Code	EE3061
Subject Title	Analysis Methods for Engineers
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: AMA201
Objectives	1. To familiarise students with the essential numerical techniques and operations research methods which are applicable in most engineering problems. 2. To enable students to analyse 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 engineering sense.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Match the numerical techniques 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. Analyse essential features of different statistical problems in engineering. d. Apply computer software to develop 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. ***Probability & statistics:*** Random variables, probability distributions, sample distributions and means, Central Limit Theorem, significance and hypothesis testing, stochastic processes. 3. ***Optimisations***: Direct search and simple gradient methods; optimisations with constraints. 4. ***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. 5. ***Differential equations*****:** Numerical solutions of ordinary differential equations, Euler and Runge-Kutta methods, convergence and stability; simple finite difference methods for partial differential equations, boundary value problems. **Laboratory Experiments:** Analysis of errors in numerical algorithms through Matlab Numerical evaluation of Laplace solution of voltage distribution in insulated container Sensitivity analysis and performance 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	20%	√	√	√							
3. Assignments & class works	10%	√	√	√	√						
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	38 Hrs.
	▪ Laboratory	8 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study and assignments	47 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. S.C. Chapra, Applied numerical methods with MATLAB for engineers and scientists, McGraw Hill, 2008
2. F.S. Hillier, Introduction to operations research, McGraw Hill, 2005
3. R.E. Walpole, R.H. Myers, S.L. Myers and K.Y. Ye, Probabilities and Statistics for Engineers and Scientists, Prentice Hall, 2002

Reference books:

1. J.H. Mathews, Numerical methods using MATLAB, Pearson Prentice Hall, 2004
2. A.V. Balakrishnan, Introduction to random processes in engineering, John Wiley & Sons, 2005

Subject Description Form

Subject Code	EE3111
Subject Title	Project Methodologies
Credit Value	2
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To develop the students' project development skills necessary to write effective project proposals. 2. To develop project plans for securing delivery of the project objectives.
Intended Learning Outcomes	Upon completion of the subject, students will: a. Be able to compose feasible technical project proposals. b. Be able to develop effective and systemic project plans. c. Be able to develop critical strategies and problem solving methods to ensure delivery of the project objectives. d. Have improved competency on communication methodologies.
Subject Synopsis/ Indicative Syllabus	1. ***Basics concepts of project*:** Systems thinking; Creative thinking, Project initiation; Searching, Engine; Project selection methodologies. 2. ***Project Proposal*:** Project proposal design; Basic sections of project proposal. 3. ***Project Plan:*** Work Plan, Scheduling, Tracking and Budgeting of project; Risk management.
Teaching/Learning Methodology	The following activities in form of interactive discussion, seminar and workshop will be conducted: 1. ***Introductory Lectures*** will be presented by various staff members to cover essentially the subject contents including their research and/or practical project execution experiences. Each student will either choose or be assigned a potential supervisor who would probably be his/her final year Project Supervisor who shall introduce the technical aspects of the broad area of the subject to the students. 2. ***Writing Project Proposal*:** Students will spend a considerable amount of time writing a proposal for their projects. This is an iterative process where drafts are submitted to the Project Supervisor for comments and revisions. The process continues until the proposal reaches an acceptable standard.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures			√	√
Writing Project Proposal	√	√	√	

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. Quiz	20%		√								
2. Project Proposal Writing	80%	√	√	√	√						
Total	100%										

The quiz is a test of the understanding of the basic concepts in project planning, scheduling and management.

The contents of the proposal should include:

A. Aims of the project
B. Proposed specifications of the product (no matter it is a hardware or software project)
C. Summary of the literature search done up-to-date.
D. Proposed approach/methodology to be used
E. Some brief descriptions on the theory of the approach/methodology
F. Project scheduling

Assessment Criteria of the proposal
1. Literature research.
2. Problem definition.
Writing quality.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Seminar/Workshop	28 Hrs.
	Other student study effort:	
	▪ Materials searching	10 Hrs.
	▪ Proposal writing	28 Hrs.
	▪ Discussion with academic staff	4 Hrs.
	Total student study effort	70 Hrs.

Reading List and References

Reference books:

1. H. Kerzner, Project Management – A Systems Approach to Planning, Scheduling, and Controlling, 7th Edition, Van Nostrand Reinhold, NY, 2001
2. J.R. Meredith and S.J. Mantel, Project Management, A Managerial Approach, 5th Edition, John Wiley & Sons, NY, 2000
3. J.M. Nicholas, Managing Business and Engineering Projects: Concepts and Implementation, Prentice Hall, Englewood Cliffs, NJ, 1990
4. A. Shtub, Project Management, Process, Methodologies, and Economics, Prentice-Hall, Inc., Englewood Cliffs, NJ, 2005
5. M.R. Syed & S.N. Syed, Handbook of Research on Modern Systems Analysis and Design Technologies and Applications, Information Science Reference, 2009

Subject Description Form

Subject Code	EE3121
Subject Title	Computer System Principles
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ENG224
Objectives	1. To enable students to establish a broad knowledge of the organization and components included in a small computer system. 2. To enable students to understand and apply assembly language programming. 3. To enable students to develop a simple embedded computer system
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Given specifications of an application and the instruction set of the microprocessor, design an assembly program to carry out the necessary operations. b. Appreciate advanced features of the latest microprocessors and understand functions of basic computer peripherals. c. Given a set of conditions, design a basic computer system. d. Think logically and be able to present results in writing.
Subject Synopsis/ Indicative Syllabus	**Computer Systems Hardware and Operations** 1. ***Processor operation and internal architecture*:** Operations of data registers, buses and data path, operations of ALU, arithmetic hardware, and general pipeline architecture. Introduction to structure and operation of a modern microprocessor. 2. ***Memory organization*:** Characteristics of current memory technologies. Memory hierarchies and memory decoding mechanism. 3. ***Input and output systems*:** Direct I/O system and memory mapped I/O; handshaking control, programmed I/O; interrupt and polling mechanisms. Protocol for serial data communications. 4. ***Microprocessor hardware and interfacing*:** System bus organization and interfacing techniques, CPU bus timing, system bus structure, design of input/output system. Interface and operations of LSI chips applied in a computer system including: interrupt controller, timer, UART and PIO. **Assembly Language Programming** 5. ***Memory addressing space and data representation*:** Internal registers of 8086, Addressing modes in 8086 soft-ware model. 6. ***Assembly language program*:** Basic elements of an assembly language program, instruction mnemonics and directives, arithmetic operations and logical operations. 7. ***Programming techniques*:** Arithmetic manipulations, elementary programming constructs, parameter passing, data initialisation. 8. ***Coding and debugging*:** Conversion of source programs to machine codes, use of software debugging monitor, Compilation of assembly source program, linking of object files. **Laboratory Experiment:** Perform basic input/output operations of a microcontroller by assembly language programming. Speed control of a DC motor using a microcontroller and assembly language programming.

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 learning. Experiments are designed to supplement the lecturing materials, especially in assembly language 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 and tutorials	√	√	√	
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 performance & report	10%	√			√						
4. Programming test	15%	√		√	√						
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 by experiments, and the report.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	36 Hrs.
▪ Laboratory	12 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	12 Hrs.
▪ Self-study	45 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. B.B. Brey, The Intel Microprocessors Architecture, Programming, and Interfacing. 8th Edition, Prentice Hall, 2008
2. K.R. Irvine, Assembly Language for Intel-Based Computers, 5th Edition, Prentice Hall, 2006

Reference books:

1. A.K. Ray, Advanced Microprocessors & Peripherals, McGraw-Hill, 2006
2. R.J. Tocci and F.J. Ambrosio, Microprocessors and Microcomputers: Hardware and Software, 6th Edition, Prentice Hall, 2003
3. W.A. Triebel and A. Singh, The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications, 4th Edition, Prentice Hall, 2003

Subject Description Form

Subject Code	EE3131
Subject Title	Telecommunication Fundamentals
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide a broad treatment of the fundamentals of telecommunication systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the fundamentals of telecommunication systems. b. Analyze and evaluate different telecommunication systems c. Learn from practice on important telecommunication techniques.
Subject Synopsis/ Indicative Syllabus	1. ***Introduction to telecommunication systems*:** Overview of communication systems. Signal and noise in communication systems. Need for modulation. Key factors to evaluate the communication system performance. 2. ***Signal representation and analysis*:** Fundamental signals in communication systems. Signal and system classifications. Special functions. Fourier series. Frequency domain representation for signals. Fourier transform. Convolution. Signal power calculation. 3. ***Sinusoidal carrier modulation*:** Amplitude and frequency modulation: theory, generation and detection. Noise performance. Modulation system performance comparison. Frequency division multiplexing. 4. ***Pulse modulation*:** Sampling theorem. Pulse amplitude modulation. Time-division-multiplexing. Pulse code modulation: quantization, encoding. Quantization noise. Differential pulse code modulation. Delta modulation. 5. ***Digital communications*:** Digital transmission. Intersymbol interference. Eye diagram. Error probability. Coding (source, error control, line). Digital carrier modulation. 6. ***Brief introductions to optical fiber communications*:** Light sources in optical communication systems. Light transmission in optical fibers. Light detection. **Laboratory Experiments:** Amplitude modulation (AM) System Pulse code modulation (PCM)

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	60%	√	√								
2. Test	25%	√	√								
3. Laboratory	10%	√		√							
4. Home work or in-class exercises	5%	√	√								
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	39 Hrs.
	▪ Laboratory	6 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	48 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. J.J. O'Reilly, Telecommunication Principles, Chapman & Hill, 1994
2. B.P. Lathi, Modern Digital and Analogue Communication Systems, Oxford University Express, 2009
3. F.G. Stremler, Introduction to Communication Systems, Addison Welsey, 1990
4. J.M. Senior, Optical Fiber Communications: Principle and Practice, 3rd Edition, Prentice Hall, 2009

Subject Description Form

Subject Code	EE321
Subject Title	Electrical Services in Buildings
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	Nil
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.
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 a building. 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. Colour rendering. Utilisation 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. BTM/BCF systems. **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. Class Test/Quiz	25%	√	√	√	√						
3. Mini-project & report	15%	√	√	√	√	√					
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	42 Hrs.
	Other student study effort:	
	▪ Mini-project discussion/report	20 Hrs.
	▪ Self-study	43 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Textbooks and Reference books:

1. R. Barrie, Design of Electrical Services for Buildings, Spon Press, 4th Edition, 2005
2. G. Stokes, Handbook of Electrical Installation Practice, Blackwell Scientific Publication, 4th Ed., 2003
3. G.C. Barney, Elevator Traffic Handbook: Theory and Practice, Spon Press, 2003
4. J.R. Coaton, Lamps and Lighting, Wiley, 1997
5. F. Hall, Building Services Handbook, Butterworth-Heinemann, 4th Edition, 2007
6. D.C. Pritchard, Lighting, Longman, 6th Edition 1999

Subject Description Form

Subject Code	EE3502
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 the students an exposure to the industrial/engineering working environments before they complete their formal education. 2. To explore and extend their understanding of engineering study in a broader perspective. 3. To enrich students' all-round and/or global learning experience.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Develop and deliver a learning portfolio 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/engineering working. d. Develop a resourceful and speculative approach in making contacts and sourcing information. e. 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 (3 credits) industrial training with at least 2 weeks (1 credit) of valid WIE activities as recognized by the University. Students are required to indicate the expected training experiences prior to the commencement of their placement, as well as to submit a learning portfolio to 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 of their second year 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. Students are required to indicate the expected training experiences prior to the commencement of their placements. **(II) Progress Monitoring** During the practical training, students should maintain a weekly training journal to identify their progress of their training. The weekly journal may include: ◆ **Location**: Summarise 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 fulfil 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 returning from the practical training, students are required to submit a learning portfolio about the work term experience. It provides an opportunity for the student to reflect upon the learning gained at the work site. The framework of the portfolio includes: ◆ **Collection**: students collect relevant artifacts produced for the employer during the work term and/or from company interviews etc. ◆ Selection: students examine what has been collected to decide what should be included into the learning portfolio. ◆ **Reflection**: students articulate their thinking about each piece in the portfolio, as well as on the entire portfolio. 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. ◆ **Direction**: after reflection on their workplace experience, students set goals and directions for future learning, such as formulate the objectives of their Final Year Project. **Examples of valid WIE activity** ◆ Full-time placement in a suitable organization as part of a sandwich programme. ◆ Summer placement in a suitable organization participating in the Preferred Graduate Development Programme. ◆ Any other placement in any suitable external organization for a specified period of time. ◆ Relevant placement as student helpers in PolyU administrative departments and the Industrial Centre. ◆ Assisting in PolyU activities that have an external collaboration or service component such as, Innovation and Technology Fund projects, RAPRODS 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 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 setting. In addition to the orientation, students consult with teaching staff on a one-to-one basis. Teaching/Learning Methodology: Industrial placement — Outcomes: a √, b √, c √, d √, e √
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. Learning Portfolio — 80% — √ √ √ √ √ 2. Placement Questionnaire — 20% — √ √ √ √ Total — 100% The outcomes on this subject are assessed by means of student learning portfolios as well as questionnaire to industrial supervisors.
Student Study Effort Expected	Class contact: — Other student study effort: — ▪ Industrial Placement — 6 weeks Total student study effort — 6 weeks
Reading List and References	Nil

Subject Description Form

Subject Code	EE4011
Subject Title	Digital Control and Signal Processing
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3051
Objectives	1. To introduce the fundamentals and design techniques in digital control, filtering and signal processing. The analysis and design of these digital systems will be described with the aid of practical examples and CAD packages.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Analyse the stability, transient response and steady-state response of sampled-data systems. b. Design digital controllers for sampled-data systems. c. Analyse discrete-time signals and extract features using different digital signal processing techniques. d. Design a range of FIR and IIR filters. e. Write technical reports and present the findings.
Subject Synopsis/ Indicative Syllabus	1. ***Stability and transient analysis*****:** Sampling and z-transform, Sampled-data systems, Stability of closed-loop systems, Transient and steady state responses. 2. ***Digital control design*****:** Translation of analogue design to digital design, Designs based on frequency response methods, Analytical design method. 3. ***Design in state space*****:** Controllability, Observability, Pole placement, State observer, Output feedback, Servo problem. 4. ***Digital filters*****:** Forms of realization, Design of nonrecursive and recursive filters, Finite word length effect. 5. ***Spectrum analysis*****:** DFT, FFT, Power spectrum, Windowing. Computation of convolution and correlation, Estimation of signal in noise. **Laboratory Experiment:** Digital controllers Digital signal analysis and filter design
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	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. Class tests	30%	√	√	√	√						
3. Laboratory reports	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	38 Hrs.
	▪ Laboratory	8 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	47 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. G.F. Franklin, J.D. Powell and M.L. Workman, Digital Control of Dynamic Systems, 3rd Edition, Addison-Wesley, 1997
2. B.C. Kuo, Digital Control Systems, 2nd Edition, Oxford University Press, 1995
3. K. Ogata, Discrete-time Control Systems, 2nd Edition, Prentice Hall, 1995
4. E. Ifeachor and B. Jervis, Digital Signal Processing: A Practical Approach, Addison-Wesley, 1993
5. R. Kuc, Introduction to Digital Signal Processing, McGraw Hill, 1988
6. J. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1989

Subject Description Form

Subject Code	EE4021
Subject Title	Electrical Machines
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3021
Objectives	1. After completing an elementary subject on electromechanical energy conversion, the students are exposed to the more challenging topics such as 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 the local industry. 3. To give the knowledge various electrical machines such as AC, DC and power electronic driven.
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, condition monitoring and temperature-rise for the 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. ***Winding parameters and transformation*****:** Inductance parameters. Winding Transformation. Circuit equations, conversion process, torque, equation of motion. 2. ***Appreciation of machine design*****:** Appreciation of the economic and basic technological factors. Winding design. 3. ***Synchronous machines*****:** Load characteristics of isolated generator. Linearized equations of small oscillations. Natural frequency. Transient and sub-transient reactance, field transient. 4. ***Induction machines*****:** Performance analysis of single- and three-phase induction machines. Unbalanced operation. Dynamic Operation. Temperature-rise simulation tests. Condition monitoring. 5. ***Drives for induction machines*****:** Induction motor drives fed from stepped wave/PWM inverters. Harmonics analysis for drives. 6. ***Control of machines*****:** Open loop and closed loop control. Concept of vector control, torque control. 7. ***Switched mode driven machines*****:** Power electronics interfacing to machines, switched reluctance machines, DC brushless machines. **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 control and design 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%										

It is a subject of the specific topics of electrical machines. 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 electrical machine control and design, 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	12 Hrs.
	Other student study effort:	
	▪ Mini-project/report	12 Hrs.
	▪ Self-study	45 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. G.K. Dubey, Power Semiconductor Controlled Drives, Prentice Hall, 1989
2. C.V. Jones, The Unified Theory of Electrical Machines, Butterworths, 1967
3. B.K. Bose, Power Electronics and AC Drives, Prentice-Hall, 2002
4. P. Vas, Vector control of AC machines, Clarendon Press: Oxford University Press, 1990
5. D. Hanselman, Brushless Permanent Magnet Motor Design, The Writers' Collective, 2003
6. R. Krishnan, Switched Reluctance Motors Drives: Modeling, Simulation, Analysis, Design, and Applications, CRC Press, 2001

Subject Description Form

Subject Code	EE4031
Subject Title	Power Systems
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3041
Objectives	1. To provide students with a sound knowledge of modern power systems, which is essential for all electrical power engineers to understand power system operation and control. It also provides a continuation of study of power systems in level 3 subject EE3041 "Power transmission and Distribution" and lead to more advanced topics of power systems study in final year electives.
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 communication skills with others in a team environment. e. Have acquired skills in presentation and interpretation of experimental results and communicate in written form
Subject Synopsis/ Indicative Syllabus	1. ***Power system load flow*****:** Load flow concepts and formulation. Solution methods, including Gauss-Seidal, 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 configurations. Security concepts. Scheduling and coordination. Supervisory control and data acquisition. Computer control, communication and monitoring systems. Man-machine interface. Load forecasting. Energy management systems. Power quality. Power system regulation, deregulation and current issues. **Laboratory Experiment:** Power system load flow and security operation simulation of sample power system. Transient stability assessment of power system.

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 and mini-projects, in which the students are expected 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 so that the students are encouraged to take extra readings and practice specialty software tools for power system planning, operation and control.

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. Laboratory performance & report	15%	√	√	√	√	√					
3. Mini-project & report	15%	√			√	√					
4. Class test	10%	√	√	√							
Total	100%										

This comprises an examination, class tests, written assignment in the form of laboratory report and mini-project report. The examination and tests 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 experiments, to interpret the experimental results obtained and to communicate in written form.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	38 Hrs.
	▪ Laboratory	8 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	47 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

Subject Description Form

Subject Code	EE4041
Subject Title	Engineering Project Management
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Exclusion: LGT3019
Objectives	1. To introduce the concept of modern engineering project management to students. 2. To integrate theory and practical knowledge of engineering project development & execution to students. 3. To apply the principle of engineering project management to practical examples.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand engineering project management, development & execution stages. b. Analyse engineering project management skills. c. Be aware of new technologies development trends and environmental impacts of engineering projects.
Subject Synopsis/ Indicative Syllabus	1. ***Engineering project definitions and stages*****:** Characteristics of engineering projects. Life cycle models. Strategic and tactical issues. Factors affecting the success of project management. 2. ***Engineering project economic analysis*****:** Definitions of terms. Present worth, future worth calculations. Comparison of alternatives. Equivalent worth methods. Internal rate of return. Payback period. Inclusion of environmental considerations in analysis. 3. ***Project screening and selection*****:** Check list and scoring models. Benefit-cost analysis. Cost effectiveness analysis. 4. ***Organisation structure and work breakdown*****:** Organisation structures. Functional, project and matrix organisations. Work breakdown structure. Management of human resources in projects. 5. ***Project scheduling and control*****:** Gantt Chart. Network approach for CPM analysis. PERT and CPM methods. Examples. Budget management and resource management. Project control. Computer support for project management. Case studies. Project termination.
Teaching/Learning Methodology	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Practical applications are given through case studies and mini-project, in which the students are encouraged to develop critical and analytical thinking to solve problems. Teaching/Learning Methodology — Outcomes: a, b, c Lectures: √ √ √ Tutorials: √ √ Mini-project: √
Assessment Methods in	Specific assessment | % | Intended subject learning outcomes to

Alignment with Intended Learning Outcomes	methods/tasks	weighting	be assessed								
			a	b	c						
	1. Examination	60%	√	√	√						
	2. Class test	20%	√	√	√						
	3. Mini-project and report	20%		√	√						
	Total	100%									
	The usual means of examination and test are adopted to evaluate the concepts and theories. The important components of integrating theories into problems and applying knowledge in case studies are assessed by mini-projects and group-project reports.										

Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	42 Hrs.
	Other student study effort:	
	▪ Self-study	50 Hrs.
	▪ Mini-project and report	13 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. A. Shtub, Project Management-Engineering, Technology and Implementation, 2nd Edition, Prentice Hall, 2005
2. G.K. Kapur, Project Management for Information, Technology, Business and Certification, Prentice Hall, 2005
3. Moder, Phillips and Davies, Project Management with CPM, PERT and Precedence Diagramming, Latest Edition, Van Nostrand Reinhold

Subject Description Form

Subject Code	EE4121
Subject Title	Individual Project
Credit Value	9
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3111 (for Prog. 41070), EE3141 (for Prog. 41080), nil for Prog. 41081 and subject to the approval of the Project Coordinator
Objectives	1. The project accounts for more than 30% of the total assessment in Level 4 and it provides an opportunity for students to apply specialised professional engineering knowledge independently in the creative design, implementation, monitoring and evaluation of an engineering project. To achieve this goal, students are required to identify key engineering problems, to solve them and to communicate the findings in oral and written report format. The project is included in the Programme to cover some major professional and all-rounded learning outcomes and the assessment should provide evidences on how well students have achieved those outcomes.
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 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 expected to be proposed by the students. They may also be proposed by academic members of staff, or jointly by student and staff. Industrial experience and staff research and consultancy activities are fertile ground for ideas. Project proposals must include an objective, describe the method of approach, describe any innovative features, and provide an estimate of cost. The suitability of a proposal may be judged by factors such as its intellectual level, relevance to the aims of the Programme, practicality in terms of time, funding and availability of resources. **Project Proposal** At the beginning of the project, students are required to submit a clear project proposal. The proposal should not be too long but should cover such matters as: – problem statement – brief literature research – initial problem identification – preliminary suggestion on methodology – division outline of hardware and software – preliminary time schedule – cost estimate **Interim Report** At the middle of the project period, each student has to submit an Interim Report to summarise their progress to date. This gives the supervisor a more formal opportunity than at discussions to indicate his assessment of student progress and to eliminate discrepancies if necessary. Problem cases are brought to the notice of the subject coordinator by supervisors. **Final Project Report** A good project schedule includes adequate time for preparing a report of the appropriate standard. The final report should be submitted, before the examination period, and will be given to the Assessment Panel (see Assessment below) for understanding of the student's work and for assessment purposed. To ensure that the project reports are prepared properly and of appropriate standard, students must first submit a draft of the report to the supervisor for comments before final submission. At the end of the project period, each project is assessed by an Assessment Panel of three members, including a Chairman, an independent examiner and the project Supervisor. The Chairman and the independent examiner should have sufficient knowledge of the subject area, so as to form an independent opinion of the technical merit of the project and to independently assess achievements. The Project Supervisor will provide information on student's progress, originality, 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 read the project report before the assessment meeting. The Assessment Panel will reach their decision after: – listening to the student's presentation (can be a video clip), – examining him orally on his work, and – seeing a demonstration of the project's outcome (can be a video clip). In assessing the project, the panel will consider, normally with equal weight, the following aspects: a. Intellectual achievement; b. Depth of understanding of the topic and the relevant allied 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, seminar presentation and response to questions. The Chairman will ensure that all aspects of the study are thoroughly discussed by the Panel before arriving at a consensus on an overall grade to be awarded to the project. In arriving at their decision, the Panel will bear in mind their experiences in respect of the achievements in other projects in the Department in the current and previous years. If no consensus arises as to the overall grade to be awarded to the project, each panel member (i.e. the Chairman, the project supervisor and the independent examiner) will independently award grades to the project on an assessment form with written justification for their grades. A grade from the Assessment Panel will then be derived

by averaging (with the same weight) the conversion marks for the grades given by the three academics constituting the Assessment Panel.

Overall assessment: 1.00 × Continuous Assessment

(I) Formal Project Proposal

Students are required to submit a formal project proposal when the project is started. **This will contribute to 5% of the final grade.**

The contents of the proposal should include:

A. Aims of the project
B. Proposed specifications of the product (no matter it is a hardware or software project)
C. Summary of the literature search done up-to-date.
D. Proposed approach/methodology to be used
E. Some brief descriptions on the theory of the approach/methodology
F. Time table / schedule of your work of the entire project

If a student decides to carry the project which he/she developed in subject EE3111 (for Prog. 41070) or EE3141 (for Prog. 41080), he/she should give details on updated materials in every section in this formal project proposal, as compared with his previously submitted work in EE3111 or EE3141.

Assessment Criteria

1. *Literature research.*
2. *Problem definition.*
3. *Writing quality.*

(II) The Interim Report

Students are also required to submit an interim report at about the middle of project duration. **This will contribute to 15% of the final grade.**

The contents of the progress report should include:

A. Aims of the project (especially any change from the original aims).
B. 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 time table / schedule for the rest of the work up to the end of the project.
G. Difficulties expected in the coming period.

Assessment Criteria

1. *Method: innovation and feasibility.*
2. *Design / Implementation / Results.*
3. *Project management.*
4. *Writing quality.*

(III) The Final Report

The final project report should contain all the work carried out by the student in the project. The students are advised to form a framework for the report first, 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 50% of the final grade.***

The content of the final report includes:

A. Aims of the project (especially any change from the original aims).
B. The motivation behind the project and a brief outline of the project work.
C. A summary of work done or developed in the project (not work done by others).
D. The system design and the block diagram of the system, plus some brief descriptions on the theory.
E. Testing and simulation results.
F. Comments on results obtained.
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. 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.
J. A list of the references referred to the source of information in the report. This is compulsory.

Assessment Criteria

1. *Problem identification*
2. *Conceptual Clarity and Accuracy*
3. *Technical application*
4. *Literature research*
5. *Writing quality*

(IV) 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. 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 /software should function properly, and experiments should be able to support fulfilment of project objectives.

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

The presentation and demonstration will contribute to 30% of the final grade.

Assessment Criteria

1. *Problem identification*
2. *Conceptual accuracy and clarity*

3. Technical Application
4. Success of the demonstration.
5. Language competence in presentation

Note 1: Each student has to submit/carry out all the above four components before he/she is considered to complete the FYP.

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

Teaching/Learning Methodology

As the nature of the subject implies, there will not be many formal lectures in the subject, other than a few of hours of briefings on general information, some official procedures in administration of the project 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 carried 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	√		√			
Wiring 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	15%		√	√	√						
3. Final report	50%	√	√	√	√	√	√				
4. Presentation and demonstration	30%	√	√				√				
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	5 Hrs.
▪ Individual Discussions with supervisor	~15 Hrs.
Other student study effort:	
▪ information search, self study, execution of the project, report writing, preparation of presentation	~240 Hrs.
Total student study effort	260 Hrs.

Reading List and References

Nil

Subject Description Form

Subject Code	EE4211
Subject Title	Advanced Power Electronics
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3031
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.
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 converter and its method of loss reduction. c. Be able to apply the switched mode techniques to inverters. d. Be able to perform study on power electronics circuit simulation. e. Be aware of the impact of electromagnetic interference (EMI) and the reduction of EMI using power electronics techniques. f. Be able to present results of study in the form of simulation, design equation and basic model and work independently and in teams when conducting laboratory investigations and power electronics circuit design.
Subject Synopsis/ Indicative Syllabus	1. ***Pulse-Width-Modulated DC/DC converters*:** Basic topologies and higher order converters, transformer-isolated topologies, snubbers, 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. **Control and *CAD for power electronics:*** Small-signal model and control, analog and digital circuit simulation for power electronics, simulation techniques. 4. ***Switched-Mode inverters*:** Single-phase and three-phase voltage-source inverters, AC-AC conversion, Resonant inverters. 5. ***Electromagnetic interference*:** Generation of EMI, power factor, switched-mode EMI filter, International Standards., Reduction of EMI. **Laboratory Experiments:** Switched-mode power converters with parasitic components and snubbers. Resonant converters Mixed-mode circuit simulation EMC/EMI setup and measurement

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 technique, control method and electromagnetic interference (EMI) aspect. 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 principle 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. Class tests	20%	√	√	√		√					
3. Laboratory reports & assignments	20%	√	√	√	√	√	√				
Total	100%										

The understanding on theoretical principle and practical considerations, analytical skills and problem solving technique 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	38 Hrs.
▪ Laboratory	8 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	12 Hrs.
▪ Self-study	47 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. Ned. Mohan, Tore M. Undeland, William P. Robins, Power Electronics: Converters, Applications & Design, 3rd Edition, Wiley, 2003
2. K.W.E.Cheng, Classical Switched Mode and Resonant Power Converters, The Hong Kong Polytechnic University, 2002

Reference books:

1. K. Billings, Switched Mode Power Supply Handbook, 2nd Edition, McGraw-Hill, 1999
2. J.G. Kassakian, M.F. Schlecht and G.C. Verghese, Principles of Power Electronics, Addison-Wesley Publishing Co., 1991

Subject Description Form

Subject Code	EE4221
Subject Title	Applied Digital Control
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3051
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.
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. e. Effectively communicate experimental results in written and oral reports.
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*****:** Modified z-transform, PID algorithm, Cascade control, Finite-settling time control, Dead-time compensation, Internal model control. 3. ***Computer control methods*****:** Hierarchical control configurations, Distributed approach, Description of representative systems, 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 three 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	e
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	e				
1. Examination	60%	√	√	√						
2. Class test	20%	√	√	√						
3. Laboratory and case study reports	20%			√	√	√				
Total	100%									

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

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	38 Hrs.
	▪ Laboratory	8 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Case study preparation/report	12 Hrs.
	▪ Self-study	35 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. D.E. Seborg, Process Dynamics and Control, Hoboken, N.J.: Wiley, 2004
2. C.A. Smith, Automated Continuous Process Control, New York, John Wiley & Soncs, 2002
3. C.L. Smith and A.B. Corripi, Principle and Practice of Automatic Process Control
4. J.R. Leigh, Applied Digital Control: Theory, Design, and Implementation, New York, Prentice-Hall, 1992
5. P.E. Wellstead and W. Zarrop, Self-tuning Systems: Control and Signal Processing, Cichester, England: New York, Wiley, 1991
6. R. Isermann, Adaptive Control Systems, New York, Prentice Hall, 1992

Subject Description Form

Subject Code	EE4251
Subject Title	Electric Traction and Drives
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3031 & EE4021
Objectives	1. To enable students to develop a sound understanding of operation of modern electrified railway systems. 2. To provide an appreciation of the design and application of electric drives and operation principles of railway signalling. 3. To enable students to understand the implications of design of traction and signalling systems on railway operations and traffic control. 4. To introduce to students the vital problems of electromagnetic interference and hardware design of enhanced electromagnetic compatibility. 5. To enhance students' awareness on the use of computer simulation in railway planning and operation, as well as the future technologies in railway systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Outline the operation principles of the sub-systems and their components in an electrified railway system and compare their advantages and limitations with reference to practical railway lines. b. Elaborate on the impacts of the performance and properties of the sub-systems to the overall system safety and reliability. c. Engage in self-learning on latest technologies on railway systems at this advanced level of study.
Subject Synopsis/ Indicative Syllabus	1. ***Introduction*:** The trends of modernisation of railway systems. Technical and design aspects of railway electrification. Fundamentals of design and construction of rolling stock. Power supply systems: rectifier substations, distance and load sharing between substations, reduction of supply unbalance in single-phase traction. 2. ***D.C. drives*:** Single-phase dual-converter drives; Three-phase full-converter drives. Chopper drives: line filter design, chopping frequency selection; principles of powering and regenerative braking. Multiphase chopper, automatic variable field chopper. Case studies on local traction industry. 3. ***A.C. drives*:** Performance characteristics of induction motors: VVVF control, PWM control: mode transition, pulse dropping; CVVF control; Vector Control. 4. ***Railway signalling*:** Basic functions. Fixed and moving block signalling schemes. Route and cab signalling. Principles of headway and block length. Factors affecting signal layout. Track circuits: principles, operation and function. Interlocking. Traffic control. Automatic train control. 5. ***Train movement and simulation*:** Train operation modes. Factors determining train movement: resistance, speed restriction, gradient and curvature of tracks. Movement control: Precise stopping at stations and inter-station runs. Computer simulation: time-based and event-based models, simulation levels, applications. 6. ***Electromagnetic compatibility*:** Track circuit interference. Substation harmonics. Hardware designs with enhanced electromagnetic compatibility. 7. ***Future trends of transit systems*:** Guided vehicles under computer control. Magnetic levitation and suspension techniques. Advanced automatic train control of registers, counters and memory units. Design of asynchronous circuits, flow tables, stable and unstable states.

	Laboratory Experiments: Traction power load flow simulation **Case Study:** HK MTR systems
Teaching/Learning Methodology	Video clips together with computer animations are used to supplement conventional lectures. Case studies will be used extensively to highlight the practicality of the subject materials being covered. Practitioners are also invited to have experience sharing sessions with the class. A group project is to be carried out to demonstrate and integrate the knowledge learned.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lectures	√	√	
Tutorials	√		√
Experiments			√
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
1. Mini-project (group project)	20%			√
2. Tests	20%	√	√	
3. Examination	60%	√	√	
Total	100%			

This is an advanced and yet appreciation subject for students who are interested in railway engineering. The subject encompasses all the important elements in a typical railway and a number of case studies are used to supplement the analytical discussions. The outcomes are assessed through a mini-project (which aims to integrate the various aspects learnt), tests and written examinations.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	39 Hrs.
	▪ Seminar	6 Hrs.
	Other student study effort:	
	▪ Assignment and self-studies	60 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. M.H. Rashid, Power Electronics: Circuits, Devices and Applications, 3rd Edition, Prentice Hall 2004
2. Managing railway operations & maintenance : best practices from KCRC / edited by Robin Hirsch ; technical co-editors, Felix Schmid, Michael Hamlyn. A & N Harris ; Birmingham : University of Birmingham Press, 2007

Reference books/journals:

1. J. Pachl, Railway Operation and Control. VTD Rail Publishing, Mountlake Terrace (USA) 2004.
2. Bonnett, Clifford F. Practical railway engineering, London : Imperial College Press, 2005.
3. O.S. Lock, Railway Signalling, 3rd Edition, A & C Black, 1993
4. Selected papers from IEE Proceedings – Electric Power Applications

Subject Description Form

Subject Code	EE4261
Subject Title	Fibre Optics
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3131
Objectives	1. To introduce to students the physical laws that govern the behaviour of fibre-optics components. 2. To give students an understanding of the principles of fibre-optic sensing and optical fibre communications. 3. To equip students with the knowledge to design simple fibre-optics sensor systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the basics of generation, modulation and detection of light signals, and light transmission in optical fibres. b. Understand the functions and test the performance of various fibre-optic components and sub-systems. c. Design simple optical fibre sensors and communication systems considering the performance of the fibres (e.g., dispersion, loss) and component constraints.
Subject Synopsis/ Indicative Syllabus	1. ***Overview*:** Introduction to the significance of fibre optics for electrical engineering. Summary of applications in high-field environments. 2. ***Optical fibres*:** Propagation theory. Wave-guiding. Fibre types. Optical loss. Fibre dispersion. Mechanical properties. Special fibres. Fibre-optic cables and cable design examples. 3. ***Fibre optic connections*:** Coupling losses. Splices. Connectors. Coupling devices and techniques. Distribution systems. Devices for wavelength-division-multiplexing. 4. ***Fibre optic test methods*:** Power measurements. Fibre loss and dispersion measurements. Optical time-domain reflectometry. Reliability. 5. ***Optical sources for fibres*:** Wavelength considerations. Emitter materials. Light-emitting-diodes. Laser diodes. Emitter lifetime. 6. ***Optical detectors for fibres*:** Photo-detectors: noise, response time, materials. PIN and avalanche photodiodes. Receivers. 7. ***Optical modulation*:** Modulation of LED and laser diodes. Drive circuits. Formats for digital modulation. Direct and coherent transmission systems. Noise and error mechanisms. Receiver sensitivity and circuit design. 8. ***Optical fibre sensors*:** Extrinsic, evanescent, intrinsic sensors. Optical components for fibre sensor systems. Power transmission, actuation and safety aspects of design. Applications. 9. ***Fibre optic systems design*:** Fibre optic communication system design considerations. Attenuation and dispersion budgets. Digital system design. 10. ***Applications of fibre optics in electrical engineering*:** Optical groundwire. Enhancing power system telecommunications and control with overhead and underground fibre optic cables. Fibre optic sensors for measuring voltage, current, temperature. Location of cable faults by using optical fibre sensing. **Laboratory Experiments/Demonstrations:** Insertion loss measurement of optical fibres using optical power meters and optical spectrum analyzers Optical spectrum analyzer for spectral measurements of light sources Fibre Bragg grating sensors
Teaching/Learning Methodology	Lectures, quizzes, tests, laboratory experiments, mini-projects, and examination.

Teaching/Learning Methodology	Outcomes									
	a	b	c							
Lectures	√	√	√							
Tutorials		√	√							
Experiments/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. Quizzes	2%	√	√	√							
2. Tests	28%	√	√	√							
3. Laboratory experiment report	5%		√	√							
4. Mini-projects	5%		√	√							
5. Examination	60%	√	√	√							
Total	100%										

This subject introduces the physical laws that govern the behaviour of optical fibres, semiconductor light sources and detectors, and how to employ them to design simple fibre-optics sensor systems. The outcomes are assessed by quizzes, tests, mini-projects, laboratory experiments and examination.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	36 Hrs.
	▪ Laboratory	12 Hrs.
	Other student study effort:	
	▪ Mini-projects	20 Hrs.
	▪ Self-study	37 hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. J.M. Senior, Optical Fiber Communications-Principles and Practice, 3nd Edition, Prentice Hall, 2008
2. J.C. Palais, Fiber Optic Communications, 5th Edition, Prentice Hall, 2005
3. G. Keiser, Optical Fiber Communications, 3rd Edition, McGraw-Hill, 1999
4. G.P. Agrawal, Fiber-optic Communication Systems, Wiley, 1993
5. J. Hecht, Understanding Fiber Optics, 5th edn., Prentice Hall, 2006

Subject Description Form

Subject Code	EE4281
Subject Title	Industrial Computer Applications
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To introduce the applications of computing techniques in solving industrial problems and the following topics are included: Computer process control; Industrial instrumentation and systems; Image processing; Multimedia concepts.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Design and develop digital controllers. b. Write ladder logic for simple PLC applications. c. Understand the use of industrial networks. d. Apply image processing techniques in industrial automation.
Subject Synopsis/ Indicative Syllabus	1. ***Computer process control*****:** Modelling of the computer process control system, practical approaches to digital control implementation, PLC and microcomputer-based control systems. 2. ***Intelligent instrumentation and systems*****:** Embedded microcontrollers, industrial process controllers, applications of distributed digital control algorithms, industrial networks and SCADA system. 3. ***Image processing*****:** Digital image fundamentals, image representation, image enhancement, image segmentation, application of image processing in industrial automation. 4. ***Multimedia concepts and applications*****:** Multimedia fundamentals, image compression, video compression, hardware peripherals and software tools. **Laboratory Experiment:** PC based digital controller for temperature control Power failure monitoring using embedded controller Sequential control using PLC Automatic meter reading using computer vision
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-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.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	√	√	√	√
Tutorials	√	√	√	√
Experiment	√	√		

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. In-class Test (x2)	20%	√	√	√	√						
3. Mini-project Report	10%	√	√								
4. Mini-project Demo/Presentation	10%	√	√								
Total	100%										

One end-of-semester written examination; one mid-semester-test; one end-of-semester test; a mini-project on a small micro-processor based application; and a report/demonstration/presentation to accompany the mini-project.

Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	36 Hrs.
	▪ Laboratory (mini-project)	12 Hrs.
	Other student study effort:	
	▪ Mini-project report and preparation	12 Hrs.
	▪ Self-study	45 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. J.A. Rehg and G.J. Sartori, Industrial Electronics, Pearson Prentice Hall, 2006
2. A.V. Deshmukh, Microcontrollers: Theory and Applications, Tata McGraw-Hill, 2006
3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, 3rd Edition, Prentice Hall, 2008
4. T. Vaughan, Multimedia: Making It Work, 7th Edition, McGraw-Hill, 2008

Subject Description Form

Subject Code	EE4291
Subject Title	Intelligent Buildings
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE321
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.
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. 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, mobile phone system, 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, 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. (6 hours) 2. ***Building automation systems & controls*:** Philosophy, system configuration, system modules, distributed systems, communication protocol and on-line measurements. Fire protection, security and energy management. Control objectives. Sensors, controllers and actuators. Control system schematics system design. Microprocessor based controllers & digital controls. Examples of sub-systems such as: Digital Addressable Lighting Interface (DALI) (9 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 system*:** Voice communication systems, local area network, wireless LAN, public address, Digital TV, CCTV, teleconferencing, cellular phone system, radio paging and CABD. SMATV. Data networking. Short- and long-haul networks. Wideband network. Office automations. Public Address/Sound reinforcement 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. (6 hours) 6. ***Integrating the technologies and systems*:** The impact of information technology on buildings and people. Shared tenant services. Interaction and integration between building structure, systems, services, management, control and information technology. Application & design software packages. (5 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 organise 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	20%		√	√	√						
3. Mini-project/Assignments	20%	√				√					
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	42 Hrs.
Other student study effort:	
▪ Mini-project/Assignments	21 Hrs.
▪ Self-study	42 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. A.C. Sidwell, Australia's intelligent home, Construction Industry Institute, Australia, 1996
2. A. Harrison, Intelligent buildings in South East Asia, E & FN Spon, 1998
3. V. Boed, Networking and Integration of Facilities Automation Systems, London: CRC Press, 2000
4. P. Manolescue, Integrating Security into Intelligent Buildings, Cheltenharn, 2003
5. B.L. Capehart, Information Technology for Energy Mangers, Fairmont Press, 2004
6. L. Chow, The Intelligent Building Index: (IBI) manual: version 3.0, Hong Kong: Asian Institute of Intelligent Buildings, 2004
7. B.L. Capehart and L. C. Capehart, "Web based enterprise energy and building automation systems", Fairmont Press ; Boca Raton : CRC Press 2007

Subject Description Form

Subject Code	EE4301
Subject Title	Power System Protection
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3041
Objectives	1. To introduce students the modern knowledge of power system protection. 2. To enable students to understand the design philosophy and working principle of different protective schemes, and how they are applied to power systems.
Intended Learning Outcomes	Upon completion of the subject, students will: a. Have acquired a good understanding of knowledge, techniques and skills of power system protection. b. Be able to interpret nameplate data and able to select the most appropriate transducers for various protection schemes. c. Be able to carry out tests and analyse the performance of transducers and protection relays. d. Have the ability to apply and adapt applications of mathematics, engineering skills in the analysis, comparison, and interpretation of various power system protection schemes. e. Be able to present technical results in the form of a technical report.
Subject Synopsis/ Indicative Syllabus	1. ***Philosophy of protection*:** General considerations. Components of protection. Structure of protective relays. Trend of protection development. 2. ***Transducers*:** Input sources for protection system. Current and voltage transformers; sources of error; their performance under normal and abnormal conditions. 3. ***Non-unit protection*:** Non-unit protection for distribution networks – overcurrent and directional protection, techniques used to analyze their performances. Non-unit protection for transmission networks – distance relays, distance protection schemes, protection characteristics and impedance seen by distance relays. 4. ***Unit protection*:** Principles of unit protection. High impedance and low impedance differential protection and their applications. Bias differential protection and its application to transformers. 5. ***Digital protection*:** Principles of digital relaying. Digital relay architecture. Recent development of digital relaying techniques. **Laboratory Experiment:** Current Transformer Saturation. Directional Overcurrent Protection. Low Impedance and High Impedance Busbar Protection. Fault Simulation and Simulation of Digital Relay in EHV Transmission Line. **Case study:** 1. Explain how source impedance and fault location affect the performance of protective relays. 2. What do you understand about the terms reliability and stability of protective relays? 3. How protective relays achieve selectivity? Give examples and explain. 4. Explain the meaning of sensitivity of protective relays. How to decide a suitable sensitivity for protective relays? 5. What factors will affect CT accuracy and how to control them? 6. How to choose a suitable CT for protective relays? 7 Describe the voltage measurement methods in different voltage levels in a power network. 8. Pros and cons of using Capacitive Voltage Transformer (CVT). 9. How to achieve discrimination between overcurrent relays installed in radial feed feeders in distribution system? 10. When we grade overcurrent relays of different time / current characteristics, what precautions should we take? Give examples. 11. What are directional relay schemes? Explain how the relays are connected and how they are used. 12. Will directional relays mal-operate? Give one example. 13. What is the effect of load on distance relay operation? 14. What will affect the accuracy of measurement on distance protection relays? 15. Describe the communication methods used for protective relays in a power network. 16. What is the effect of power swing on distance protection relays? 17. How differential protection is applied in feeders, busbars, and transformers? 18. What is the difference between low impedance and high impedance differential protection? How can we achieve through fault stability in both protection systems? 19. How the inrush current on power transformer is formed and what is its effect on transformer protection? 20. Why bias is required in transformer differential protection? What is its effect on the range of windings to be protected? 21. Explain the working principle of harmonic bias used in transformer differential protection. 22. What is restricted earth fault protection and what is unrestricted earth fault protection? Why are they needed? What is the range of winding they can protect comparing to the bias differential protection? 23. Why digital relay is different from conventional protective relays? What additional features a digital relay can offer? 24. Compare the performance of the two basic digital relay algorithms, the sample and derivative algorithm, and the differential equation algorithm. What is the problem when they are applied in a power system? 25. Explain the working principle of the Fourier algorithm in digital relay technology. Why it has better performance than other algorithm? What is its drawback?

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 protection schemes used in industry, where appropriate, are discussed interactively in class. In laboratory classes, experiments are planned to let students design and carry-out an experimental strategy, record and critically analyze their results, reach conclusions about the interpretation and performance of power system protective schemes. Students are also asked to make preparations such as information gathering before laboratory classes. 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 power system protection.

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. Class Test/Quiz	20%	√	√		√						
3. Laboratory performance & reports	10%	√		√	√	√					
4. Mini-project & report	10%	√	√		√	√					
Total	100%										

The subject outcomes on concepts understanding, interpretation, analysis and applications of power system protection schemes are assessed by means of examination, quizzes and tests. The outcomes on engineering skills and applications, performance testing and analysis, as well as technical writing techniques, are evaluated by experiments, mini-project and reports.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	38 Hrs.
▪ Laboratory	8 Hrs.
Other student study effort:	
▪ Laboratory preparation/report	14 Hrs.
▪ Self-study	45 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. Network Protection and Automation Guide, AREVA T & D Ltd., 2002
2. P.M. Anderson (Editor in Chief), Power System Protection, McGraw Hill 1st Edition, 1999
3. W.A. Elmore, Protective Relaying Theory and Applications, Marcel Dekker, 2nd Edition, 2004
4. A.T. Johns & S.K. Salman, Digital Protection for Power Systems, IEE Power Series, 1995
5. Power System Protection, Vol. 1, 2, & 3, The Electricity Training Association, 1995

Subject Description Form

Subject Code	EE4341
Subject Title	Intelligent Systems Applications in Electrical Engineering
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To introduce students to the fundamentals of intelligent systems and their applications in Electrical Engineering including electrical power systems, control and utilization.
Intended Learning Outcomes	Upon completion of the subject, students will: a. Have acquired a good understanding of the fundamental concepts and characteristics and methodologies of intelligent systems. b. Be able to Appreciate the power and usefulness of intelligent techniques. c. Be able to Know the design of artificial intelligence systems, evolutionary computation algorithms, uncertainty representation and reasoning mechanisms. d. Be able to integrate the intelligent system approaches in real-life electrical power engineering problems and control problems. e. Have acquired communication skills with others in a team environment. f. Have acquired skills in presentation and interpretation of mini-project results and communicate in written form
Subject Synopsis/ Indicative Syllabus	1. ***Knowledge-based intelligent systems*:** Concepts and theory. Knowledge representation techniques. Structure of a rule-based expert system. Forward and backward chaining inference techniques. 2. ***Fuzzy systems*:** Concepts of Fuzzy reasoning. Membership Functions and Fuzzy sets. Fuzzy rules. Defuzzification methods. Fuzzy inference. Building a fuzzy expert system. 3. ***Artificial neural networks*:** Concepts of ANN. Neuron and perception. Multilayer neural networks. Forward and Backward Propagation. Neural Network Training. Hopfield network. 4. ***Evolutionary computation*:** Concepts of Evolutionary computing. Genetic algorithms. Chromosomes, fitness function, cross-over and mutation. Evolutionary Programming. 5. ***Hybrid algorithms*:** Simulated Annealing. Combined Genetic Algorithm and Simulated Annealing. Fuzzy Neural Systems. Fuzzy Genetic Algorithm. 6. ***Applications in power system problems in planning, operation and control*:** Applications in Control and Utilization – Intelligent process control. Intelligent robot control and Utilization. **Mini-project:** Performance of Genetic Algorithm **Case study:** To study the performance of genetic algorithm on solving different functions such as De Jong problems and Colville problems. To investigate the effects of parameter setting on the performance of genetic algorithm. To investigate the effect of solution acceleration technique on the performance of genetic algorithm.

	To apply genetic algorithm to different Electrical Engineering problems.
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 electrical 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	e	f
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	f				
1. Examination	60%	√	√	√							
2. Class Test	20%	√	√	√							
3. Mini-project Report and Presentation	20%	√			√	√	√				
Total	100%										

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

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	36 Hrs.
	▪ Mini-project	12 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	45 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, 2002
3. K. Warwick, A. Ekwue and R. Aggarwal, Artificial Intelligence Techniques in Power Systems, IEE Power Engineering Series 22, UK, IEE Press, 1997
4. L.L. Lai, Intelligent System Applications in Power Engineering, Wiley, 1998
5. T.S. Dillon and M.A. Laughton, Expert System Applications in Power Systems, Prentice Hall, 1990
6. Selected reference papers in IEEE Transactions and IEE Proceedings

Subject Description Form

Subject Code	EE501
Subject Title	Alternative Energy Technologies
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To enable students to establish a broad concept on alternative energy techniques in engineering. 2. To provide an in-depth knowledge on selected topics of alternative energy systems in engineering. 3. To enable students to understand typical alternative energy technologies, its associated issues of application and related technical considerations. 4. To enable students to understand the potential of alternative energy and characteristics & performance of various types of alternative energy systems. 5. To enable students to understand various techniques and systems for control and monitoring of alternative energy technologies, as well as the related communication protocol and interfacing requirements.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Describe the operation principle & control strategy of various alternative energy systems and topologies of these systems. b. Identify benefits & impacts of the applications of these alternative energy systems; such as their effects on environment and utility energy efficiencies. c. Describe the operation principle, characteristics and performance of various alternative energy devices/systems. d. Identify different alternative energy technologies for industrial & commercial plants and multi-storey buildings, including giving examples. e. Carry out literature search and report the findings in a presentation, when given a technical topic.
Subject Synopsis/ Indicative Syllabus	1. ***Energy resources and types*****:** Renewable and non-renewable energy resources. World potential and trends. Environmental effects. Alternative energy types and present developments. Role and importance of alternative energy. 2. ***Wind and solar energy*****:** Wind characteristics. Extraction characteristics. Windmill aerodynamics. Design and materials of windmills. Wind turbines. Types of wind turbines and connection. Siting and designs. Wind farms. Case study. On-shore and off-shore wind farms. Solar characteristics. Solar cells and solar thermal power. Photovoltaic conversion systems. Case study. Design and monitoring techniques. New developments. 3. ***Wave and tidal energy*****:** Wave and tide characteristics for energy extraction. Tidal schemes. Tidal sites. Single and multiple basin schemes. Case study. Wave energy schemes. Case study. Ocean energy conversion. 4. ***Geothermal energy and fuel cells*****:** Geothermal energy sources and methods. Characteristics. Hot dry rock technology. Case study. Fuel cells types and principles. Biomass energy types and case study. Future potentials. 5. ***Co-generation and combine-cycle plants*****:** New technologies for co-generation and CCGT. Efficiency and environmental benefits. Case study examples. Future development potentials. 6. ***Better utilization of energy resources*****:** Pollution reduction techniques. Clean coal technologies. Nuclear power. Environmental impacts of better utilization of energy. **Case study:** Selections of practical alternative energy systems in Hong Kong and overseas.

Teaching/Learning Methodology

Lectures and tutorials are effective teaching methods:
1. To provide an overview or outline of the subject contents.
2. To introduce new concepts and knowledge to the students.
3. To explain difficult ideas and concepts of the subject.
4. To allow students to feedback on aspects related 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 deeper understanding of the subject.
4. To enable students to organise principles and challenge ideas.

Case studies:
1. To give real example for some of the concept presented in the lectures.
2. To explain some practical considerations when applying technologies in real projects
3. To motivate and stimulate students interest.

Seminars from industrial experts may also be arranged, this will give student up-to-date status of the development in alternative energy area, as well as market trends.

Teaching/Learning Methodology	Outcomes				
	a	b	c	d	e
Lectures	√	√	√		
Tutorials	√	√	√		
Case studies			√	√	√
Mini-project/Assignments/Presentations				√	√

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. Class tests	20%	√	√	√							
2. Mini-project/Assignments/ Presentations	20%				√	√					
3. Examination	60%	√	√	√	√						
Total	100%										

The understanding on theoretical principle and practical considerations, analytical skills and problem solving technique will be evaluated. Examination, class tests, assignments, presentations 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	33 Hrs.
▪ Seminar/Case studies	9 Hrs.
Other student study effort:	
▪ Mini-project/Assignments	21 Hrs.
▪ Self-study	42 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. J. Twidell, Renewable Energy Sources, E&F N Spon
2. G. Boyle, Renewable Energy, Oxford, 2004
2. L.L. Freris, Wind Energy Conversion Systems, Prentice Hall
3. Diamant, Total Energy, Pergamon Press
5. W. Avery and C. Wu, Renewable Energy From the Ocean, A Guide to OTEC , Oxford University Press, 1994
6. CDM Consultancy Stage 1 Report, Study on the Potential Applications of Renewable Energy in Hong Kong, 2003 (from website of EMSD-EEO of HKSAR Government).
7. R. Messenger, Photovoltaic Systems Engineering, CRC Press, 2004
8. G.N. Tiwari, Solar Energy: Fundamental, Design, Modelling and Applications, CRC Press 2002
9. Biofuels for Transport: an International Perspective, International Energy Agency, 2004
10. Geothermal Energy Resources for Developing Countries, A.A. Balkema Publishers, 2002
11. M. Stiebler, Wind Energy Systems for Electric Power Generation, Springer 2008
12. J. Cruz, Ocean Wave Energy: Current Status and Future Perspectives, Springer-Verlag 2008

Subject Description Form

Subject Code	EE502
Subject Title	Modern Protection Methods
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
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 understanding the 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 the power system. 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.
Subject Synopsis/ Indicative Syllabus	1. ***Overview of protection systems and its development*****:** General considerations. Components of protection. Structure of protective relays. Trend of protection development. 2. ***Fault and transient in power systems*****:** Fault transient behaviour of power system. The use of Electro-Magnetic Transient Program (EMTP) and MATLAB software to simulate the transient behaviour of power system. 3. ***Current and voltage transducers*****:** Requirement 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 system. Features of directional and non-directional protection schemes for distribution system. 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 the assignments, in which the 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. Case studies 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	√	√		√
Case studies			√	

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	25%	√	√	√	√						
3. Assignments	15%			√							
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. Case studies 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	36 Hrs.
	▪ Laboratory	12 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	45 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, AREVA T & D Ltd., 2002
3. P.M. Anderson, Power System Protection, IEEE Press or McGraw Hill, 1999
4. A.E. Walter, Protective Relaying Theory and Applications, ABB Power T & D Co. Inc., Dekker, 1994
5. A.T. Johns and S.K. Salman, Digital Protection for Power Systems, IEE Power Series, 1995
6. Microprocessor Relays and Protection Systems – IEEE Tutorial Course, Publication No. 88EH0269-1-PWR, 1987
7. Advancements in Microprocessor Based Protection and Communication – IEEE Tutorial Course, Publication No. 97TP120-0, 1997
8. Power System Protection, Vol. 1, 2, & 3, The Electricity Council, Peter Peregrinus, 1981

Subject Description Form

Subject Code	EE505
Subject Title	Power System Control & 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. Analyse power system security control & operation; b. Analyse interconnected power system interchange and economic operation. c. 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. Be aware of new technologies development trends and environmental impacts of modern power system control and operation techniques; and f. 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. ***Frequency control & AGC*:** Frequency control and voltage control concepts. Control loops and analysis. Automatic generation control methodology and implementation. 3. ***Interconnected systems operation*:** System interconnection merits and problems. Economic interchange and control. Multi-area operation. 4. ***Unit commitment and economic dispatch*:** Priority lists. Methodologies for large system economic dispatch and unit commitment. Programming methods. 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	20%	√	√	√		√					
3. Mini project and report	20%	√	√	√	√	√	√				
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	42 Hrs.
	Other student study effort:	
	▪ Miniproject preparation/report	10 Hrs.
	▪ Self-study	53 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

Subject Description Form

Subject Code	EE509
Subject Title	High Voltage Engineering
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide students with knowledge to understand the techniques of analysis and design pertaining to high voltage engineering including causes and manner of insulation failure and problems encountered in practice.
Intended Learning Outcomes	Upon completion of the subject, students will: a. Be able to describe the insulation breakdown mechanisms so as to identify the failure phenomena of different insulation systems. b. Be aware of the design features of high voltage equipment so as to understand the application of common high voltage practices 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; 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; breakdown in commercial liquids; purification and breakdown test. 4. ***Breakdown of solid insulation*:** Breakdown due to treeing; breakdown due to surface flashover; breakdown due to surface tracking; breakdown in composite insulation. 5. ***Partial discharges*:** Classification of partial discharges by origin; partial discharge measurements. 6. ***High-voltage equipment*:** Applications of the above sections to the design of bushings, transformers, overhead lines, cables and circuit breakers. 7. ***Generation of high voltages*:** Cascade and series resonant methods for alternating voltages; doubler and multistage rectifiers for direct voltages; single-stage and Marx generators for impulse voltages. 8. ***High-voltage measurements*:** Measurement of leakage current; hv voltmeters; measurement of impulse voltages (peak voltage and wave-shape); Schering bridge. 9. ***High-voltage Applications Outside of T&D*:** Electrostatic hazards (such as dust explosions, oil-tanker explosions, integrated-circuit damage); applications such as in electrostatic precipitator, paint spraying (and powder coating), ore separation; lightning protection of buildings.

Teaching/Learning Methodology	Lectures are the primary means of conveying the fundamental knowledge to understand the techniques of analysis and design pertaining to high voltage engineering. Experiences on design and practical applications are given and demonstrated, and the students are expected to solve design problems with real-life constraints and to attain pragmatic solutions with critical and analytical thinking. Students will be required to form groups to work through cases covering practice on high voltage engineering applications and learn through active participation in the presentation of their findings.

Teaching/Learning Methodology	Outcomes	
	a	b
Lectures	√	√
Case study		√
Demonstration	√	

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed	
		a	b
1. Examination	60%	√	√
2. Continuous assessment	30%	√	√
3. Case study	10%		√
Total	100%		

The assessment methods include end of subject examination (60 %), continuous assessment (30 %) and case study (10 %). Examination and continuous assessment cover intended subject learning outcomes 1 and 2, while case study involves intended subject learning outcome 2. Examination is in form of three-hour, closed book examination; continuous assessment contains classwork, homework, class test, etc.; and case study provides practice on high voltage engineering applications.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	42 Hrs.
Other student study effort:	
▪ Case study	12 Hrs.
▪ Self-study	51 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference Books:

1. M.S. Naidu and V. Kamaraju, High Voltage Engineering, 2004
2. E. Kuffel and W.S. Zaengl, High Voltage Engineering – Fundamentals, 1984
3. R.H. Golde, Lightning Protection, 1977
4. A. Bradwell, Electrical Insulation, 1983
5. T.N. Bhar and E.J. McMahon, Electrostatic Discharge Control, 1983
6. W. Bartknecht, Dust Explosions, 1989
7. H. Haase, Electrostatic Hazards: Their Evaluation and Control, 1977
8. J.F. Hughes, Electrostatic Power Coating, 1984
9. F.H. Kreuger, Partial Discharge Detection in High Voltage Equipment, 1989
10. J.S.T. Looms, Insulators for High Voltage, 1988

Subject Description Form

Subject Code	EE510
Subject Title	Electrical Traction Engineering
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: EE3031 & EE4021 Exclusion: EE4251
Objectives	1. To provide students with a comprehensive understanding of traction systems from a systems engineering viewpoint. 2. To provide an appreciation of the current state-of-the-art design and applications of electric drives and railway signalling systems. 3. To enable students to understand the implications of design of traction and signalling systems on railway operations and traffic control. 4. To introduce the quality indicators of railway operations and their relationships with the performance of traction drives, power supply and signalling systems. 5. To identify the necessary future technologies to improve the service quality in railway systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Analyse the operation principles of the sub-systems in an electrified railway system in the state-of-the-art approaches and criticise their advantages and limitations with reference to practical railway lines. b. Identify the railway service quality parameters and evaluate the impact of the performance of the sub-systems to the overall system reliability, availability, safety and maintainability. c. Recognise the importance to engage in self-learning on latest technologies on railway systems at this advanced level of study.
Subject Synopsis/ Indicative Syllabus	1. ***General aspects of traction system*:** Technical and design aspects of railway electrification. Train dynamics and speed-time characteristics. AC and DC railways, power supplies and interference. Supply system requirements: performance under normal and emergency feeding conditions. 2. ***Traction drives and railway signalling*:** Single-phase drives; chopper drives; inverter drives. Requirement of Inverter substations. Principles of powering and regenerative braking; blended regenerative and rheostatic brake control. Induction motor control: VVVF control, PWM control and CVVF control. Philosophy of railway signalling; route capacity; track circuits; principles and equipment; layout of signals and track circuits; interlocking and control; train description; train protection and control. 3. ***Computer-aided design and operation of traction systems*:** Elements of design and analysis of traction systems: cost/benefit analysis; digital simulation of AC/DC power converter drives and traction equipment; computer-based design of block layouts and track circuits; power-factor, control, maximum-demand and energy-efficient operation; digital simulation of train performance for optimum headway, schedule speed and energy consumption; use of expert systems for system control and train scheduling. Computer modeling of non-linear source and traction load. Power quality issues of single phase AC traction: imbalance, harmonics and voltage dip; impact to traction system and public. Corrective measures and filter design. 4. ***Maglev and linear drives*:** Principle and limitations of electromagnetic techniques of suspension and levitation. Levitation using permanent magnet, superconducting magnets and eddy currents induced by mains frequency excitation. Suspension using controlled DC electromagnets. Operation of single-sided linear induction motors. Application of linear drives in high speed transit systems. **Laboratory Experiment:** Load-flow analysis in traction power system **Case Study:** 1. Traction drive systems 2. Feeding systems in AC traction 3. Signalling system installation
Teaching/Learning Methodology	Video clips together with computer animations are used to supplement conventional lectures. Case studies will be used extensively to highlight the practicality of the subject materials being covered. Practitioners are also invited to have experience sharing sessions with the class. A group project is to be carried out to demonstrate and integrate the knowledge learned.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lectures	√	√	
Tutorials		√	√
Project Work	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed									
		a	b	c							
1. Mini-project (group project)	20%			√							
2. Tests	20%	√	√								
3. Examination	60%	√	√								
Total	100%										

This is an advanced and yet introductory subject for students, particularly practicing engineers in the railway industry. The subject encompasses all the important elements in a typical railway and a number of case studies are used to supplement the analytical discussions. The outcomes are assessed through a mini-project (which aims to integrate the various aspects learnt), tests and written examinations.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	33 Hrs.
▪ Invited lecture	3 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Assignment and self-studies	63 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. M.H. Rashid, Power Electronics: Circuits, Devices and Applications, 3rd Edition, Prentice Hall 2004
2. Managing railway operations & maintenance : best practices from KCRC / edited by Robin Hirsch ; technical co-editors, Felix Schmid, Michael Hamlyn. A & N Harris ; Birmingham : University of Birmingham Press, 2007

Reference books/journals:

1. J. Pachl, Railway Operation and Control. VTD Rail Publishing, Mountlake Terrace (USA) 2004.
2. Bonnett, Clifford F. Practical railway engineering, London : Imperial College Press, 2005.
3. F.T. Barwell, Automation and Control in Transport, Pergamon Press, 1983
4. O.S. Lock, Railway Signalling, 3rd Edition, A & C Black, 1993
5. M.E. Leach, Railway Control System, 2nd Edition, A & C Black, 1993
6. Selected papers from IEE Proceedings – Electric Power Applications

Subject Description Form

Subject Code	EE512
Subject Title	Electric Vehicles
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Exclusion: EE543
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. Conduct a systematic analysis of the drivetrain and vehicle mechanics given the pertinent technical data. c. Understand various underpinning technologies for modern EVs, including electric motor drives, energy storage, batteries, charging methods, infrastructure and auxiliary systems. d. Explain the emerging technologies such as hybrid electric vehicles (HEVs), fuel cell electric vehicles (FEV) and energy storage methods. e. Present the results of study in the form of written reports and oral presentations.
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. V***ehicle 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 monitoring techniques. Open-circuit voltage and ampere-hour estimation. Battery load levelling. 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	d	e
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	d	e					
1. Examination	60%	√	√	√	√						
2. Test	25%	√	√	√	√						
3. Term paper	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	36 Hrs.
▪ Tutorial/Student presentation	6 Hrs.
Other student study effort:	
▪ Self-study and revision	55 Hrs.
▪ Assignment	8 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. C.C. Chan and K.T. Chau, Modern Electric Vehicle Technology, London: Oxford University Press, 2001
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, New York: RC Press, 2003
3. M. Ehsani, Y. Gao, S.E. Gay and A. Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004
4. Selected papers from relevant journals and conference proceedings, such as EVS

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 languages, operating systems, associated hardware. 2. To apply real time system software in engineering applications. 3. To test and verify real time systems and software.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. To appreciate the important issues in real time computing systems, and their relations in engineering applications. b. To identify and understand the real time issues in a computing OS system, and their mechanism of overcoming these obstacles. c. Communicate effectively during discussions and presentations. d. Have the ability to work independently, and in teams when conducting laboratory work.
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. Process Scheduling Example: a Real Time Control System in Coal-Fired Power Plant. 2. ***Real time systems design issues*:** Time Handling: Representation of Time, Time constraints, Time Service and Synchronization, the Master-Slave algorithm and the Time Distributed Clock algorithm. Real Time System Life Cycle: Requirement Specification, Statecharts. Structured Design Approaches: Event Based Model, Process-Based Model. Petri-net Models: Stochastic Petri-net (SPN) Model Analysis, Annotated Petri-nets, Time Arguemented Petri-nets. Real Time System Modelling Example: Autonomous Robot Control. 3. ***Real time software*:** Real Time Programming Discipline, Asynchronous and Synchronous Real Time Language. Verification and Validation of Real Time Software: Testing Real Time Properties, Simulation as a Verification Tool, Testing Control and Data flow. Languages for real-time systems; real-time software analysis and design. Properties of Real Time Operating Systems; Allocation and Scheduling, Inter-process and Inter-processor communication; Distributed and Fault Tolerance Systems, Case Study: Real Time Linux. 4. ***Real time system applications*:** Hardware-in-the-loop Power System Simulation using Parallel Computer. Multi-axis Robotic Manipulator using Distributed Real Time Control. **Laboratory Experiment:** Appreciation of real time Linux and its application in Motor Control **Case study:** Real time power system simulation / High precision motion control
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 practical case study, 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	√	√	√	
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. Tests (x2)	20%	√	√								
3. Assignment/Presentation	10%	√	√	√							
4. Laboratory exercise/Report	10%	√	√		√						
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 experiments, mini-project and the reports.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Seminar	36 Hrs.
	▪ Laboratory demo	6 Hrs.
	Other student study effort:	
	▪ Case Study	15 Hrs.
	▪ Self-study	48 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. P. Laplante, Real-Time Systems Design and Analysis - An Engineer's Handbook, IEEE Computer Society Press, 1993

Reference books:

1. S.T. Levi and A.K. Agrawala, Real Time System Design, McGraw-Hill, 1990
2. K.J. Astom, Computer Controlled Systems, Prentice Hall, 1984
3. G. Bochmann, Distributed Systems Design, Springer Verlag, 1983
4. J.E. Cooling, Software Design for Real-time Systems, Chapman & Hall, 1991
5. J.A. Stankovic and K. Ramamritham, Advances in Real-Time Systems, IEEE Computer & Society Press, 1993
6. Selected papers from Proceedings of Real-time Systems Symnposium (IEEE)

Subject Description Form

Subject Code	EE517
Subject Title	Fibre Optic Components
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To enable students to understand the fundamentals of light emission, detection, amplification, and light propagation in optical fibers. 2. To apply the knowledge learned to design fiber components and devices with specific specifications. 3. To appreciate the applications of fiber components in communication and sensing systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Appreciate the importance of optic fiber development from a historical perspective, understand important role of advanced fiber components in enhancing the performance of modern fiber systems. b. Know the operating principle of various fiber components, be able to analyze/characterize the performance of fiber components. c. Know the same function may be achieved by using different technology (e.g., electro-optic and acoustic modulation) and understand the advantage and limitations of each technology. d. Select the most appropriate principles/techniques to design a fiber optic component with required specification, read the data sheet of various fiber optic components.
Subject Synopsis/ Indicative Syllabus	1. ***Review of optics*****:** Wave/quantum nature of light. Polarization, index of refraction, reflection and refraction. 2. ***Optical fibers and cables*****:** Propagation of light in optical fibers. Different types of fibers. Fiber attenuation and dispersion. Optical fiber measurement. 3. ***Modulation of light*****:** Phase modulation, frequency modulation, intensity modulation. Birefringence and polarization modulation. Electro-optic, magneto-optic and acousto-optic effects. 4. ***Optical sources*****:** Emission and absorption of radiation. Population inversion. Optical feedback. Threshold condition. Laser modes. Light emitting diodes, semiconductor lasers, tunable lasers. 5. ***Optical amplifiers*****:** Rare-earth doped fibers, optical fiber amplifiers, semiconductor amplifiers. 6. ***Photo-detectors*****:** Photomultipliers, photoconductive detectors, junction detectors (p-i-n diode, avalanche photodiode). 7. ***Passive devices*****:** Fused biconical taper couplers. Thin-film multilayer interference filters. Wavelength division multiplexing (DWDM) devices. Fiber Bragg gratings and their fabrication techniques. Tunable Fabry-Perot filters. Optical isolators and circulators. 8. ***Integrated optic devices*****:** Introduction to integrated optics. Some integrated optical devices: beam splitters, directional couplers, wavelength-division multiplexing/demultiplexing devices and switches. **Laboratory Demonstration:** Observation of fiber modal patterns Characterization of single mode fibers: loss, dispersion, polarization dependent loss Measurement of source (LED, multi and single mode diode lasers) spectrums and power-current relations **Group-project Topics:** To choose from a list of 15 topics and write a study report and give a presentation
Teaching/Learning Methodology	Lectures are the primary means of teaching the basic concepts and theories. The understanding of basic principle is further enhanced through tutorials and laboratory demonstrations. Experiences and knowledge on design and applications of various integrated/fiber optic components, and on the use of alternative technologies to realise similar functionalities are gained though the use of examples during lectures and discussions during tutorials, and through assignments and group-study projects. 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. Tests and assignments: 25% — √ √ √ √ 3. Laboratory Demonstration: 5% — √ 4. Group-project & report: 10% — √ √ √ Total: 100% The outcomes on concepts, design and applications are assessed by examinations, test and assignments whilst those on practical considerations of optical components and systems design, as well as team work and technical report writing abilities are evaluated by group projects and the reports.
Student Study Effort Expected	Class contact: ▪ Lecture/Tutorial: 39 Hrs. ▪ Laboratory demo: 3 Hrs. Other student study effort: ▪ Self study and assignments: 53 Hrs. ▪ Group project and Report: 10 Hrs. Total student study effort: 105 Hrs.
Reading List and References	**Reference books:** 1. E. Hecht, Optics, 4th Edition, Addison-Wesley, 2002 2. G. Keiser, Optical Fiber Communications, 3rd Edition, McGraw-Hill, 2000 3. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, 2nd Edition, Wiley Interscience, 2007 4. D.K. Mynbaev and L.L. Scheiner, Fiber-Optic Communications Technology, Prentice-H 2001 5. Selected papers from relevant journals

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. The ability to perform design, simulation, and implementation of motion control algorithm, using appropriate tools and software. d. Communicate effectively on motion control system topics during discussions and presentations.
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	Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and practical applications are given through a practical case study, 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	√	√	√	
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	60%	√	√	√							
2. Tests (x2)	20%	√	√	√							
3. Report	10%			√							
4. Presentation	10%				√						
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	12 Hrs.
Other student study effort:	
▪ Case study	15 Hrs.
▪ Self-study	48 Hrs.
Total student study effort	105 Hrs.

Reading List and References

References books:

1. S. Meshkat, Advanced Motion Control, PCIM reference series in Power Conversion and Intelligent Motion, 1988
2. M.M. Gupta, Intelligent Control Systems: Concepts and Applications, IEEE Press, 1996
3. K. Rajashekara, Sensorless Control of AC Motors, IEEE Press, 1996
4. P.H. Garrett, Advanced Instrumentation and Computer I/O Design: Real Time Systems Computer Interface Engineering, Prentice Hall, 1994
5. Y. Oshima and Y. Akiyama, Servo Sensors Elements and Applications, PCIM reference series in Power Conversion and Intelligent Motion, 1988
6. W.S. Levine, The Control Handbook, CRC Press, 1996

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 more electric aircraft will be covered. 3. To give industrial concern in power electronics design including passive components, packaging and standards
Intended Learning Outcomes	Upon completion of the subject, students will: a. Have acquired 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 had a global view on recent development on power electronics and be aware of applications of power electronics in various industries d. Be able to 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 and AC-DC power conversion. 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, decentralised power, power modules, electro-magnetic compatibility, international standards and reliability. 5. ***Devices and packaging*****:** Hermetic and plastic packages, wire bonding, power devices, high temperature effect and substrates. 6. ***Magnetics and capacitors*****:** High frequency inductors and transformers, winding techniques, core loss analysis, optimisation of magnetics and power capacitors. **Laboratory Experiments:** Computer aided design for power electronics Power electronics for DC brushless motor Power Factor correction

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
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. Test (x2)	20%	√	√	√						
3. Laboratory performance/report	20%				√					
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	30 Hrs.
	▪ Laboratory	12 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	15 Hrs.
	▪ Self-study	48 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. E.H.J. Pallett, Aircraft Electrical Systems, Longman Science & Technical, 1987
2. T.J.E. Miller, Brushless Permanent-Magnet and Reluctance Motors Drives, Oxford Science Publcations, 1989
3. N. Mohan, Power Electronics: Converters, Applications and Design, John Wiley & Sons, 2002
4. F.P. McCluskey, High temperature Electronics, CRC Press, 1997
5. K.W.E. Cheng, Classical Switched Mode and Resonant Power Converters, The Hong Kong Polytechnic University, 2002

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 introduce to students the theory and application of optical fibre communication and sensing technology. 2. To introduce to students the state-of the-art and future techniques for higher-performance fibre-optic systems. 3. To equip students the ability to analyse fibre-optic digital communication systems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Appreciate recent developments in fibre optic communication systems. b. Appreciate the important of fibre optics technology to the development of communications. c. Calculate the link budgets of a fibre-optic link. d. Select the most appropriate passive and active fibre-optic components for fibre-optic sensor systems and fibre optic communication links. e. Appreciate the pros and cons of the various optical multiplexing techniques. f. Apply the appropriate fibre-optic equipment/instrument to perform temperature and strain measurements. g. Calculate the bit-error-rate performance of optical fibre communication systems; and h. Have had hands-on experience in the use fusion splicer to make low-loss fibre joints, the use of optical spectrum analyzer for spectral measurements. i. Appreciate the engineering applications of fibre-optics technologies. j. Appreciate the importance of optical fibre communications from a historical perspective. k. Appreciate the advantages of fibre-optic sensors to the electrical engineering industry. l. Interpret the physical meaning and phenomena behind mathematical equations and computed results.
Subject Synopsis/ Indicative Syllabus	1. ***Overview of optical fibre communications*:** Historical perspective, basic concepts, lightwave systems and components, channel capacity. 2. ***Optical transmitters*:** Modulation response of laser diodes and LEDs; External modulation. Driving circuitry. 3. ***Optical receivers*:** Receiver components. Receiver design and performance. 4. ***System design and performance*:** System architectures. Operating wavelength and system limitations. Power and rise-time budgets. Noise effects and other source of power penalty. 5. ***Advanced systems and techniques*:** Wavelength division multiplexers. System performance aspects of semiconductor laser amplifiers and optical fire amplifiers. Soliton transmission systems. Photonic switching. Coherent lightwave systems. 6. ***Introduction to fibre optic sensors*:** Intrinsic and extrinsic sensors. Intensity modulation sensors. Phase modulation sensors. Polarisation modulation sensors. Wavelength and frequency modulation sensors. Fibre grating sensors. 7. ***Multiplexed and distributed fibre optic sensors*:** Time division multiplexing. Wavelength division multiplexing. Frequency division multiplexing. Coherence division multiplexing. Optical time domain reflectometry. Optical frequency domain reflectometry. 8. ***Applications of fibre optic sensors*:** Fibre optic acoustic sensors, current sensors, temperature and strain sensors. Fibre optic gyroscopes. Fibre sensors for structural monitoring. Chemical sensors. **Laboratory Experiments/Demonstrations:** Optical spectrum analyzer for the observation of nonlinear effects and laser spectrum Insertion loss measurement of optical fibres Fibre Bragg grating sensors Optical fibre amplifiers
Teaching/Learning Methodology	Lectures, quizzes, tests, laboratory experiments, mini-projects, and examination.

Teaching/Learning Methodology	Outcomes											
	a	b	c	d	e	f	g	h	i	j	k	l
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	f	g	h	i	j	k	l
1. Quizzes	2%	√	√		√	√				√	√	√	
2. Tests	28%	√	√	√	√	√		√		√	√	√	√
3. Laboratory experiment report	5%		√	√	√		√		√	√	√	√	
4. Mini-projects	5%	√	√	√	√	√	√		√	√	√	√	
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:	
	▪ Lecture/Seminar	42 Hrs.
	Other student study effort:	
	▪ Mini-projects	9 Hrs.
	▪ Self-study	54 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. J.M. Senior, Optical Fiber Communications-Principles and Practice, 3rd Edition, Prentice Hall, 2008
2. J.C. Palais, Fiber Optic Communications, 5th Edition, Prentice Hall, 2005
3. G.P. Agrawal, Fiber-optic Communication Systems, 3rd Edition, Wiley, 2002
4. G. Keiser, Optical Fiber Communications, 3rd Edition, McGraw-Hill, 1999

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 establish a broad knowledge of open electricity market operation and to understand the major market models in the world. 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: a. Be able to acquire a good understand of different power market models and financial tools to hedge risks used in electricity supply industries. b. Be able to analyse the available transmission capacity and formulate equitable transmission pricing in electricity markets. c. Be able to assess ancillary services requirements based on security and economic considerations. d. Be able to present technical results in the form of technical report and verbal presentation
Subject Synopsis/ Indicative Syllabus	1. ***Introduction*:** Background. Competition and electricity industry structuring. Retail access and wheeling. Poolco and British model. Bilateral-contract and multilateral-contract models. Role of existing players. Power exchange. Independent system operators. Marketers, brokers and aggregators. 2. ***Electricity market*:** Purchasing electricity in an open market. Evaluating load and risk. Coordinating power suppliers. Use of financial tools. Managing risk. Derivatives and electricity futures. 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. 4. ***Transmission pricing*:** The costs of transmission services. Locational prices. Embedded cost allocation methods. Stranded assets. Game theory approach. 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 contribution 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	60%	√	√	√						
2. In-class Test	20%	√								
3. Cases study & presentation	20%	√	√	√	√					
Total	100%									

The outcomes on the concepts of modelling, analysis and applications are assessed by the usual means of examination and test 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	36 Hrs.
	▪ Presentation	6 Hrs.
	Other student study effort:	
	▪ Case study and report	12 Hrs.
	▪ Self-study	51 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Textbooks books:

1. Daniel S. Kirschen and Goran Strbac, Fundamentals of Power System Economics, Wiley 2004
2. Mohammad Shahidehpour, Hatim Yamin, and Zuyi Li, Market Operations in Electric Power Systems, John Wiley & Sons, 2002

Reference books:

1. S. Hunt and G. Shuttleworth, Competition and Choice in Electricity, Wiley, 1996
2. P.C. Christensin, Retail Wheeling, a Guide for End-users, Penn Well Publishing Co., 1998
3. M. Ilic, F. Grliana, and L. Fink, Power System Restructuring, Kluwer Academic Publishers, 1998
4. Utility Negotiating Strategies for End-users, Penn Well Publishing Co., 1998
5. K. Bhattacharya, M.H.J. Bollen, and J.E. Daalder, Operation of Restructured Power System, Kluwer Academic Publishers, 2001

Subject Description Form

Subject Code	EE525
Subject Title	Energy Policy and Restructuring of Electricity Supply Industry
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide students with a comprehensive knowledge in formulating practical energy policies for sustainable energy utilization. 2. To develop a conceptual framework for understanding key and practical issues of restructuring electricity supply industry.
Intended Learning Outcomes	Upon completion of the subject, students will: a. Be able to explain the effects of energy policy on development of environmental control measures and alternative energy technologies. b. Be able to identify the constraints in making energy utilization sustainable. c. Be able to formulate and evaluate energy conservation policies relating to recycling of materials, end-use energy management and integrated resources planning. d. Be able to identify the rationale and key issues for restructuring electricity supply industry. e. Be able to explain the market structures and regulatory framework for electricity supply industry. f. Be able to explain and evaluate different pricing concepts and pricing contracts in restructured electricity supply industry. g. Be able to present the results of study in the form of written technical reports and oral presentation.
Subject Synopsis/ Indicative Syllabus	1. ***Energy policy*****:** Scope and limit of energy policy. Policy responses: environmental control and clean energy technology, energy efficiency and alternative energy sources. Policy instruments and their evaluation. Sustainable energy concept: trade-off between energy consumption, resources availability and environment deterioration. 2. ***Energy conservation and demand side management*****:** Energy conservation policy: efficient utilization and transformation, recycling of materials and waste heat extraction. Load management: energy and load growth, direct and indirect load control. Integrated Resources Planning: system cost, end-use development and environment cost. 3. ***Restructuring of the ESI*****:** Electricity supply industry structures; Privatisation and competition; Market structures and architectures; Regulation of Electricity Markets; Key issues for China and Hong Kong. 4. ***Electricity pricing and management*****:** Short range marginal cost. Real time and time-of-day pricing applications. Analysis of BOT option. Transmission contracts pricing. Futures and forward markets. **Case Study:** 1. Functional analysis on energy policies 2. Practical application of sustainable energy measures 3. Analysis on key issues of ESI restructuring 4. Implementation issues on ESI restructuring

Teaching/Learning Methodology	The concept of energy policy, identifications and discussions of ways of restructuring electricity supply industry will be presented through lectures and tutorials on case studies and international experiences. Students are expected to take initiative to learn through the process of engagement and participation in lectures and tutorial sessions. Mini-Projects are used to enhance students learning experiences and practical applications. They provide students with the opportunity to develop independent evaluation, formulation and technical report writing skills pertinent to the field of energy policy and restructuring electricity supply industry.

Teaching/Learning Methodology	Outcomes						
	a	b	c	d	e	f	g
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	f	g			
1. Examination	60%	√	√	√	√	√	√				
2. Class Test/Quiz	25%	√	√	√	√	√	√				
3. Mini-project & report	15%		√	√	√		√	√			
Total	100 %										

The subject outcomes on concepts, evaluations and formulations are assessed by means of examination, quizzes and tests. The outcomes on practical formulations, implementation and evaluations of energy polices, restructuring electricity supply industry and electricity pricing, as well as technical writing, are assessed by mini-project and reports.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture/Tutorial	30 Hrs.
	▪ Case studies/Group discussion	12 Hrs.
	Other student study effort:	
	▪ Mini-project discussion/report	20 Hrs.
	▪ Self-study	43 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. M. Chick, Electricity and Energy Policy in Britain, France and the United States since 1945, Cheltenham, Northampton, Mass: Edward Elgar, 2007
2. S. Hunt, and G. Shuttleworth, Competition and Choice in Electricity, Wiley, 1999
3. A. Kerstin, Energy Policy Instruments: Perspectives on their Choice, Combinations and Evaluation, Lund University Press, 2006
4. International Energy Agency, Electricity Supply Industry, OECD/IEA, 1994
5. M. Shahidehpour, Restructured Electrical Power System, Operation, Trading and Volatility, Marcel Dekker. 2001
6. H. Khatib, Economic Evaluation of Projects in the Electricity Supply Industry, IEE, 2003

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 impact due to 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: a. Have acquired in-depth understanding of different types of power system stability problems. b. Be able to model the dynamic behaviours of system components under disturbances. c. Be able to apply and adapt applications of mathematics and engineering skills in the analysis of stability problems. d. Be able to discuss the causes and effects of instabilities and recommend possible solutions. e. Have acquired skills in presentation and interpretation of experimental results and communicate in written form
Subject Synopsis/ Indicative Syllabus	1. ***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). 2. ***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. 3. ***Dynamic stability & power system stabilisers*****:** Eigenvalue and modal analysis. Generator and load modelling. Power system stabiliser. Small-signal stability of multi-machine systems. PSS Design and commissioning. 4. ***AC/DC systems and FACTS devices*****:** HVDC link operation. Control of the d.c. terminals to damp a.c. dynamic instability and improve transient stability. Flexible AC transmission devices; power angle control. **Laboratory Experiment:** Power system stability analysis using Power System Stability Tools "DST".

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. 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		√			√

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	20%	√	√	√	√						
3. Laboratory Performance & Report	20%				√	√					
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	38 Hrs.
	▪ Laboratory	8 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	47 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

Subject Description Form

Subject Code	EE527
Subject Title	Auto-tuning for Industrial Processes
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To facilitate a solid understanding of system identification. 2. To provide students with a solid knowledge of adaptive control. 3. To present a detailed survey of different auto-tuning methods used in industry.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Conduct parametric and non-parametric estimation for unknown processes. b. Design self-tuning and adaptive controllers. c. Design auto-tuning control systems based on relay auto-tuner. d. Use CAD package for design and simulation. e. Effectively communicate experimental results in written and oral reports.
Subject Synopsis/ Indicative Syllabus	1. ***System identification***: Lower-order modelling, Frequency response identification, Continuous-time and discrete-time identification, Identification by correlation, Least-squares algorithm, Recursive least-squares, Extended least-squares. Computer implementation of these algorithms. 2. ***Auto-tuning***: PID auto-tuning, Relay auto-tuning, Applications in industry. 3. ***Self-tuning control***: Self-tuning algorithms, Minimum variance and generalised minimum variance, Pole-placement algorithms, Model reference adaptive systems. **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. Case studies 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	e
Lectures	√	√	√		
Tutorials	√	√	√		
Case studies	√	√	√	√	√

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. Case studies	40%	√	√	√	√	√					
Total	100%										

The outcomes on concepts, analysis and design are assessed by the usual means of examination whilst those on technical reporting and presentation are evaluated by the case studies.

Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	33 Hrs.
	▪ Case study	9 Hrs.
	Other student study effort:	
	▪ Case study preparation/report	16 Hrs.
	▪ Self-study	47 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. L. Ljung, System Identification: Theory for the User, Upper Saddle River, N.J., Prent Hall, 1999
2. C.C. Hang, T.H. Lee and W.K. Ho, Adaptive Control, Research Triangle Park, N Instrument Society of America, 1993
3. Selected papers from IEEE Transactions and IEE proceeding and other relevant journal
4. P.E. Wellstead and W. Zarrop, Self-tuning Systems: Control and Signal Processi Cichester, England: New York; Wiley, 1991
5. K. J. Astrom abd B. Wittenmark, Adaptive control, Reading : Mass., Addison-Wesley, 1995.

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. Provide students with a sound knowledge of system modelling techniques in areas of prediction and control. In addition, modern control design techniques will also be introduced.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Model systems using State Variable and Bond Graph Models. b. Design optimal controllers for system models. c. Apply computer packages for control system modelling and design. d. Report and present the technical findings in logical and organised manner. e. Practice their knowledge in team work.
Subject Synopsis/ Indicative Syllabus	1. ***System models*****:** State Space Models, State Space Representations of Transfer Functions, Bond graphs, State Space Modelling using Bond graphs. 2. ***Optimisations***: Multivariables optimisations; Optimisations with constraints. 3. ***Optimal control*****:** Calculus of variations, Formulation of optimal control problems, Pontryagin maximum principle, Riccati equation, Application to linear regulator, Application to time and fuel optimal systems, Bang Bang control. 4. ***Case Studies*****:** Application of the above topics in the solution of engineering problems. **Laboratory Experiments:** Matlab Fundamentals Transformation of System Models with Matlab Simulations of optimal control 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 control 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	20%	√	√	√							
3. Laboratory performance & reports	10%			√	√	√					
4. Assignments & class works	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 and practical considerations of designing control systems, as well as technical reporting and teamwork, are evaluated by experiments and the reports.

Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	33 Hrs.
	▪ Laboratory	9 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	15 Hrs.
	▪ Self-study and assignments	48 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Reference books:

1. M. Gopal: Control Systems, 3rd Edition, Tata McGraw-Hill, 2008.
2. D.C. Karnopp, D.L. Margolis and R.C. Rosenberg, Systems Dynamics: Modelling and Simulation of Mechatronic Systems, Wiley, 2006
3. K. Ogata, Modern Control Engineering, Prentice-Hall, 2002
4. F.S. Hillier, Introduction to operations research, McGraw Hill, 2005
5. A.C. Chiang, Elements of Dynamic Optimization, McGraw Hill, 1992

Subject Description Form

Subject Code	EE529
Subject Title	Power Electronics for Utility Applications
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To enable students to understand the problems faced by modern power utilities and how power electronics can overcome these problems. 2. To introduce to students to the various topologies of the power electronics circuits. 3. To provide basic understanding of the emerging power electronics technologies for power utility applications. 4. To enable students to understand the harmonics issues in power utility and means of controlling it using power electronics. 5. To enable students to design power electronics circuit that can control active and reactive power flow.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Explain why power electronics are needed in modern power system and understand of various emerging power electronics technologies for power utility applications. b. Explain the main topologies of power electronic circuits used in utility applications and how these differ from low power applications. c. Determine the harmonic filter required to satisfy the harmonic standard for a given harmonic load in a power system. d. Identify power electronics topologies for used in controlling active and reactive power in a power system. e. Communicate and work effectively on why and how power electronics can be used for power utility applications in terms of written reports and oral presentations
Subject Synopsis/ Indicative Syllabus	1. ***Power electronics revolutions in utility applications*:** Power Electronics and utility needs: control of power flow in the utility grid, power transport and voltage support, distributed generation, improvement of electrical energy efficiencies, power quality; an overview of power electronics systems and their applications. 2. ***Inverters for high power applications*:** Basic principles of current and voltage source inverters for high power applications, Multi-level Inverters, Analysis of their performance, AC and DC harmonics, Interaction with power grid. 3. ***Transmission systems*:** High power issues, Source side model, power transfer and voltage control issues, Damping of oscillation issues, Power Electronics solutions. 4. ***Power system harmonic elimination techniques*:** Harmonics measures, Harmonic models, Harmonics standards, Propagation of Harmonics, Passive Filters, Source side issues, Active Filters. 5. ***Reactive power compensations*:** concepts of reactive power, traditional means of controlling reactive powers, Power electronics applications for Static VAr Compensation (SVC), control of SVC, Harmonic issues, Analysis of performance and instabilities, Damping capabilities, Voltage Source Static Condensers (STATCON). 6. ***New applications of power electronics for power system controls*:** Power Electronics for HVDC system, Flexible AC Transmission Systems, Unified Power Flow Controller (UPFC), Battery Energy Storage Systems, Analysis of performance and Control strategies.

Teaching/Learning Methodology

Lectures and tutorials are the primary means of conveying the basic concepts and theories. Mini-projects are designed to supplement the lecturing materials so that the students are given a design. They are given in the beginning of the study. Students are encouraged to form group to jointly investigate an power electronics utilization problem and they have to present the projects in front of the class.

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	20%	√	√	√	√						
3. Mini-project & Report	20%	√	√	√	√	√					
Total	100%										

It is a high power electronics application 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 power design, as well as technical reporting and teamwork, are evaluated by mini-project and the reports.

Student Study Effort Expected

Class contact:	
▪ Lecture	30 Hrs.
▪ Tutorial/Student presentation	12 Hrs.
Other student study effort:	
▪ Mini-project/report	15 Hrs.
▪ Self-study	48 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Textbooks:

1. N. Mohan, J.M. Undeland and W. Robbins, Power Electronics: Converters, Applications & Design, 3rd Edition, Wiley, 2003
2. Ghosh and Ledwich, Power Quality Enhancement Using Custom Power Devices, Kluwer, 2002

Reference books:

1. Hingorani and Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, 2000
2. Zhang, Rehtanz and Pal, Flexible AC Transmission Systems: Modelling and Control, Springer, 2006
3. M.H. Rashid, Power Electronics Handbook: Devices, Circuits and Applications, Elsevier, 2007
4. K.W.E.Cheng, Classical Switched Mode and Resonant Power Converters, The Hong Kong Polytechnic University, 2002

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 and interfacing requirements. 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, power electronics topologies, control strategy, grid connection, voltage support, power quality improvement, environmental impact, improvement of utility energy efficiencies. 2. ***Solar energy utilisation*****:** Solar irradiation on earth, potentials of solar energy, solar thermal system systems, photovoltaic systems, characteristics and performance of different solar devices and systems of different configurations, case study. 3. ***Energy saving control and monitoring systems*****:** Theory of energy saving, Remote control and monitoring systems, communication protocols, interface requirements, energy saving examples in multi-storey buildings, intelligent home concept, energy saving control in industrial plants. 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, 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	20%	√	√	√	√	√					
3. Mini-project & Report	20%	√	√	√	√	√	√				
Total	100%										

It is a fundamental energy saving 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 and teamwork, are evaluated by experiments, mini-project and the reports.

Student Study Effort Expected

Class contact:	
▪ Lecture/Tutorial	30 Hrs.
▪ Seminar/Case study	12 Hrs.
Other student study effort:	
▪ Mini-project/report	15 Hrs.
▪ Self-study	48 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Reference books:

Battery Storage Systems
1. S. Dhameja, Electric Vehicle Battery Systems, Boston, Mass.: Newnes, c2002
2. C.C.Chan, Modern Electric Vehicle Technology, New York, Oxford: Oxford University Press, 2001
3. D. Kirsch, The Electric Vehicle and the Burden of History, New Brunswick, N.J., London: Rutgers University Press, c2000
4. Electric & Hybrid Vehicle Technology International, a Journal published annually by UK & International Press
5. C.C. Chan, The State of the Art of Electric and Hybrid Vehicles, Proc. of the IEEE, Vol. 90, Issue 2, 2002

Solar Energy Utilisation
6. S. Yannas, Solar Energy and Housing Design, Architectural Association, 2004
7. International Energy Agency, Solar Energy in Building Renovation, James & James, 1997
8. G.N. Tiwari, Solar Thermal Engineering Systems, Narosa Pub. House, 1997
9. R. Messenger, Photovoltaic Systems Engineering, CRC Press, 2000
10. C. Prapanavarat, Investigation of the Performance of a Photovoltaic AC Module, Generation, Transmission and Distribution, IEE Proceedings, Vol: 149, Issue 4, Jul 2002
11. Web site of Energy Efficiency and Renewable Energy from the Dept. of Energy of USA, http://www.eere.energy.gov/
12. Web site of the Key Centre of Photovoltaic Engineering in University of New South Wales, http://www.pv.unsw.edu.au/

Energy Saving Control and Monitoring Systems
13. M. Wiebe, A Guide to Utility Automation: AMR, SCADA, and IT Systems for Electric Power, c1999
14. Bela Liptak, Instrument Engineers' Handbook, 4th Edition, Volume Two: Process Control and Optimization, CRC 2005.

Lighting, Ballast, and Variable Speed Drives
15. P. Bertoldi, A. Ricci, and Anibal De Almedia, Energy Efficiency in Household Appliances and Lighting, Berlin, New York: Springer, c2001
16. M.H. Rashid, Power Electronics Handbook: Devices, Circuits and Applications, Elsevier, 2007
17. Guidelines on Energy Efficiency of Lift and Escalator Installations, 2000 Edition, Electrical and Mechanical Services Department (EMSD), the Government of the HKSAR, Hong Kong
18. K.W.E.Cheng, Design and Fabrication of Electronics and Optical Systems for Advanced Automotive Lighting Systems, The Hong Kong Polytechnic University, 2007

Subject Description Form

Subject Code	ELC2501
Subject Title	University English I
Credit Value	2
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	This subject aims to help students to study effectively in the University's English medium learning environment and, more specifically, to improve and develop their English language proficiency within a framework of academic contexts. In striving to achieve the two interrelated objectives, attention will be given to developing the core competencies the University has identified as vital to the development of effective life-long learning strategies and skills.
Intended Learning Outcomes	Upon completion of the subject, students will be able to communicate effectively in an academic context through a. writing well-organised academic texts, such as expository essays b. using appropriate referencing skills in academic writing and speaking c. delivering effective oral presentations To achieve the above outcomes, students are expected to use language and text structure appropriate to the context and to critically select relevant information to develop a theme in a text.
Subject Synopsis/ Indicative Syllabus	This syllabus is indicative. The balance of the components, and the corresponding weighting accorded to each, will be based on the specific needs of the students. 1. **Written academic communication** Identifying and employing functions common in written academic discourse; note-taking from reading and listening inputs; understanding and applying principles of academic text structure; developing paraphrasing, summarising and referencing skills; improving editing and proofreading skills; achieving appropriate tone and style in academic writing. 2. **Spoken academic communication** Recognising the purposes of, and differences between, spoken and written communication in English in academic contexts; identifying and practising the verbal and non-verbal interaction strategies in oral presentations; explaining and presenting ideas that require the development and application of logical thinking. 3. **Reading and listening in academic contexts** Understanding the content and structure of information delivered orally and in print; reading and listening for different purposes e.g. as input to tasks, and for developing specific reading or listening skills; using a dictionary to obtain lexical, phonological and orthographical information. 4. **Language development** Improving and extending relevant features of students' grammar, vocabulary and pronunciation.

Teaching/Learning Methodology	The subject is designed to introduce students to the communication skills, both oral and written, that they may need to function effectively in academic contexts. The study method is primarily seminar-based. Activities include teacher input as well as individual and group work involving drafting and evaluating texts, mini-presentations and discussions. Students will be referred to information on the internet and the ELC's Centre for Independent Language Learning. Learning materials developed by the English Language Centre are used throughout this course. Additional reference materials will be recommended as required.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below.

Specific assessment methods/tasks (Continuous assessment)	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c			
1. Short academic text	60%	✓	✓				
2. Team oral presentation	40%		✓	✓			
Total	100 %						

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

Students' oral and writing skills are evaluated through assessment tasks related to the learning outcomes. Students are assessed on the accuracy and the appropriacy of the language used in fulfilling the assessment tasks, as well as the selection and organisation of ideas.

Student Study Effort Expected	Class contact:	
	▪ Seminars	28 Hrs.
	Other student study effort:	
	▪ Classwork-related and project-related preparation and self-access work	56 Hrs.
	Total student study effort	84 Hrs.

Reading List and References

Coursebook

English Language Centre. (2009). *University English I*. Hong Kong: The Hong Kong Polytechnic University.

Recommended readings

Carter, R., Hughes, R. & McCarthy, M. (2000). *Exploring grammar in context: Upper-intermediate and advanced*. Cambridge: Cambridge University Press.

Leki, I. (1998). *Academic writing: Exploring processes and strategies*. Cambridge: Cambridge University Press.

McCarthy, M. & O'Dell, F. (2001). *English vocabulary in use: Upper-intermediate*. Cambridge: Cambridge University Press.

Reinhart, S. (2002). *Giving academic presentations*. Ann Arbor, MI: University of Michigan Press.

Verderber, R. F., Verderber, K. S. & Sellnow, D. D. (2008). *The challenge of effective speaking* (14th ed.). Belmont, CA: Thomson/Wadsworth.

Waters, M. & Waters, A. (1995). *Study tasks in English*. Cambridge: Cambridge University Press.

Subject Description Form

Subject Code	ELC2502
Subject Title	University English II
Credit Value	2
Level	2
Pre-requisite / Co-requisite/ Exclusion	ELC2501 University English I Nil Nil
Objectives	To further develop those English language skills required by students to study effectively in the University's English medium learning environment.
Intended Learning Outcomes	Upon completion of the subject, students will be able to communicate effectively in an academic context through: a. participating actively in academic discussions b. writing academic argumentative essays To achieve the above outcomes, students are expected to use language and text structure appropriate to the context and to critically select relevant information to develop a thesis and arguments in a text.
Subject Synopsis/ Indicative Syllabus	This syllabus is indicative. The balance of the components, and the corresponding weighting, will be based on the specific needs of the students. ***Written Academic Communication*** **-** Understanding and applying principles of the text structure of persuasive and argumentative academic texts; further developing paraphrasing, summarising and referencing skills; improving editing and proofreading skills; achieving appropriate tone and style in academic writing. ***Spoken Academic Communication*** **-** Identifying and practising the verbal and non-verbal interaction strategies in academic discussions; explaining and presenting ideas that require the development and application of creative and critical thinking. ***Reading and Listening in Academic Contexts*** **-** Understanding the content and structure of ideas delivered orally and in print; distinguishing between 'fact' and 'opinion'. ***Language Development*** **-** Further improving and extending relevant features of grammar, vocabulary and pronunciation.
Teaching/Learning Methodology	The subject is designed to introduce students to the communication skills, both oral and written, that they may need to function effectively in academic contexts. The study method is primarily seminar-based. Activities include teacher input as well as individual and group work involving drafting and evaluating texts, mini-presentations and discussions. Students will be referred to information on the internet and the ELC's Centre for Independent Language Learning. Learning materials developed by the English Language Centre are used throughout this course. Additional reference materials will be recommended as required.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks (Continuous assessment)	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b				
1. Seminar discussion	40%	✓					
2. Discursive essay	60%		✓				
Total	100 %						

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

Students' oral and writing skills are evaluated through assessment tasks related to the learning outcomes. Students are assessed on the accuracy and the appropriacy of the language used in fulfilling the assessment tasks, as well as the selection and organisation of ideas.

Student Study Effort Expected

Class contact:	
▪ Seminars	28 Hrs.
Other student study effort:	
▪ Classwork-related and project-related preparation and self-access work	56 Hrs.
Total student study effort	84 Hrs.

Reading List and References

Coursebook

English Language Centre. (2009). *University English II*. Hong Kong: The Hong Kong Polytechnic University.

Recommended readings

Damer, T. E. (2005). *Attacking faulty reasoning: A practical guide to fallacy-free arguments*. Belmont, CA: Thomson/Wadsworth.

Hyland, K. (2006). *English for academic purposes: An advanced resource book*. London; New York: Routledge.

Madden, C. G. & Rohlck, T. (1997). *Discussion and interaction in the academic community*. Ann Arbor, MI: University of Michigan Press.

McWhorter, K. T. (2008). *Study and critical thinking skills in college*. New York: Pearson/Longman.

Meyers, A. (2005). *Gateways to academic writing: Effective sentences, paragraphs and essays*. White Plains, NY: Longman.

Wood, N. V. (2001). *Writing argumentative essays*. Upper Saddle River, NJ: Prentice Hall.

Zwier, L. J. (2002). *Building academic vocabulary*. Ann Arbor, MI: University of Michigan Press.

Subject Description Form

Subject Code	ELC3504
Subject Title	English for Effective Workplace Communication
Credit Value	2
Level	3
Pre-requisite / Co-requisite/ Exclusion	ELC2501 University I & ELC2502 University English II
Objectives	This subject aims to develop the English language skills required by students to communicate effectively in their future professional careers.
Intended Learning Outcomes	By the end of the subject, students should be able to communicate effectively in workplace contexts through: a. interacting professionally in a job interview; b. writing appropriate correspondence related to engineering professions; and c. writing logical and coherent reports. To achieve the above outcomes, students are expected to use language and text structure appropriate to the context, select information critically, present ideas systematically and logically, and provide support for stance and opinion.
Subject Synopsis/ Indicative Syllabus	This content is indicative. The balance of the components, and the corresponding weighting, will be based on the specific needs of the students. 1. **Job interviews and work-related discussions** Practising the specific verbal and non-verbal skills required when communicating with potential employers in job-seeking interviews. 2. **Workplace correspondence** Selecting and using relevant content; organising ideas and information; maintaining appropriate tone, distance and level of formality; achieving coherence and cohesion; adopting an appropriate style, format, structure and layout. 3. **Workplace reports** Selecting and using relevant content; organising ideas and information; describing tables and graphs; discussing and analysing data; adopting an appropriate style, format, structure and layout. 4. **Language appropriacy** Using context-sensitive language in spoken and written English. 5. **Language development** Improving and extending relevant features of grammar, vocabulary and pronunciation.
Teaching/Learning Methodology	The subject is designed to introduce students to the communication skills, both oral and written, that they may need to function effectively in their future professions. The study method is primarily seminar-based. Activities include teacher input as well as individual and group work involving drafting and evaluating texts, mini-presentations, discussions and simulations. Students will be referred to information on the Internet and the ELC's Centre for Independent Language Learning.

	Learning materials developed by the English Language Centre are used throughout this course. 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. Job interview	40%	✓					
2. Email and report writing	60%		✓	✓			
Total	100 %						

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

Students' oral and writing skills are evaluated through assessment tasks related to the learning outcomes. Students are assessed on the accuracy and the appropriacy of the language used in fulfilling the assessment tasks, as well as the selection and organisation of ideas.

Student Study Effort Expected	Class contact:	
	▪ Seminars	28 Hrs.
	Other student study effort:	
	▪ Classwork-related and project-related preparation and self-access work	56 Hrs.
	Total student study effort	84 Hrs.

Reading List and References

Coursebook

English Language Centre. (2009). *ELC 3504 English for Effective Workplace Communication*. Hong Kong: The Hong Kong Polytechnic University.

Recommended readings

Appleman, J. E. (2008). *10 steps to successful business writing*. Alexandria, VA.: ASTD.
Ashley, A. (1992). *A handbook of commercial correspondence* (2nd ed.). Oxford: Oxford University Press.
Aspinall, T. & Bethell, G. (2003). *Test your business vocabulary in use* (1st ed.). Cambridge: Cambridge University Press.
Bilbow, G. T. (2004). *Business writing for Hong Kong* (3rd ed.). Hong Kong: Longman.
Guffey, M. E. (2004). *Essentials of business communication* (6th ed.). Mason, OH: South-Western College Publication.
Krannich, C. R. & Krannich, R. L. (2003) *Interview for success: A practical guide to increasing job interviews, offers, and salaries*. Manassas Park, VA: Impact Publications.
Potter, J. (1992). *Common business English errors in Hong Kong*. Hong Kong: Longman.
White, A. (2003). *Interview styles and strategies*. Mason, OH: South-Western College Publication/Thomson Learning.

Subject Description Form

Subject Code	ENG224
Subject Title	Information Technology
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	To pr To provide the foundation knowledge in computers, computer networks and data processing that is essential to modern information system design
Intended 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 computer hardware and software components. 2. Understand the architecture and functions of a computer operating system and be able to use the services it provided for managing computer resources. 3. Understand the basic structure of a database system and be able to set up and configure a simple database system. 4. Understand the principles of computer networks and be able to set up and configure a simple computer network. Category B: Attributes for all-roundedness 5. Solve problems using systematic approaches.
Subject Synopsis/ Indicative Syllabus	1. Introduction to computers Introduction to applications of information technology in different engineering disciplines. Introduction to computer hardware components: CPU, RAM, ROM, I/O devices and internal buses. Software components: applications, utilities and operating systems. Case study: Linux – user Interfaces, file management and process management. (10 hours) 2. Computer Networks Introduction to computer networks: LAN and WAN, client-server and peer-to-peer architectures, network topology. OSI 7-layer model. TCP/IP protocol: UDP and TCP, port multiplexing, IP addressing and routing protocols. Internet applications. Networking devices: DSL modem, hub, bridge, switch, and router. Case studies: Ethernet – cabling, topology and access methods. (18 hours) 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. (14 hours)
Teaching/Learning Methodology	There will be a mix of lectures, tutorials and laboratory works to facilitate effective learning. Students will be given case studies to understand and practice the design and usage of database systems.

Assessment Methods in Alignment with Intended Learning Outcomes	<table><tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr><tr><td>A1</td><td>A2</td><td>A3</td><td>A4</td><td>B1</td><td></td></tr><tr><td>1. Continuous Assessment</td><td>40%</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr><tr><td>2. Examination</td><td>60%</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td></tr><tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr></table> The assessment methods include an end-of-subject examination (60%), three tests (15%), and two laboratory work (10%), tutorial sessions with four tests (10%), three assignments (5%). The examination cover intended subject learning outcomes A1, A2, A3, A4 and B1. The continuous assessments (three tests from the lecture portion, 4 tests from the tutorial portion and 3 Assignments) cover intended subject learning outcomes A1, A2, A3, A4. The lab works (with 1 test) cover intended subject learning outcomes A2,A3 and B5. The examination is a 2.5-hour, closed-book examination, and all of the tests are closed book. The laboratory sessions give the student a hands-on experience of an Unix OS (assessed by an end-of-lab test) and the construction of a data base (assessed by an end-of-lab report).
Student Study Effort Expected	<table><tr><td>Class contact:</td><td></td></tr><tr><td>▪ Lecture</td><td>28 Hrs.</td></tr><tr><td>▪ Tutorial</td><td>9 Hrs.</td></tr><tr><td>▪ Laboratory</td><td>17 Hrs.</td></tr><tr><td>Other student study effort:</td><td></td></tr><tr><td>▪ Assignment Preparation and Laboratory Report Writing</td><td>36 Hrs.</td></tr><tr><td>▪ Self study</td><td>36 Hrs</td></tr><tr><td>Total student study effort</td><td>126 Hrs.</td></tr></table>
Reading List and References	1. M. Small, Information *Technology and the Internet: The Kernel*, McGraw Hill, 2007. 2. D. E. Comer, *Computer Networks and Internets: with Internet Applications*, 4th ed., Prentice-Hall, 2004. 3. W. Stalling, Data and Computer Communications, 8th ed., Prentice-Hall, 2007. 4. *C.J. Date,* An Introduction to Database Systems, *5th ed., Addison-Wesley, 2000.* Peter Rob & Carlos Coronel, *Database Systems: Design, Implementation, and Management*, 7th Edition, Thomson, 2007. 5. Michael Mannino, *Database Design, Application Development, & Administration*. 3rd Ed., McGraw-Hill, 2007

Subject Description Form

Subject Code	ENG232
Subject Title	Engineering Science
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	This subject aims: 1. to enable students to establish a broad knowledge base on the atomic structure and properties of materials with an emphasis on using this knowledge to solve engineering problems. 2. to provide a basic understanding on relationship between material properties and manufacturing processes so that they (students) are able to select those that are appropriate taking into consideration green design and environmental issues. 3. to enable students to understand the forms of energy and their conversion.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. apply the knowledge of materials science to analyze and solve basic engineering problems related to stress, strain and fracture of materials. 2. select appropriate materials and manufacturing processes for different products taking into consideration of issues in cost, quality and environmental concerns. 3. familiarize and apply thermodynamic properties of common substances, such as air and water, for the reversibility and efficiency considerations of energy balance, usage , and waste disposal in common energy transformation devices and systems.
Subject Synopsis/ Indicative Syllabus	***Materials Science and Engineering*** (27 hours) **Atomic Structure and Structure of Crystalline Solids:** Atomic structure; Bonding forces and energies; Primary interatomic bonds and secondary bonding; Crystal structures and energy levels; Introduction to phase diagram. **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 optical detectors; Laser; Light propagation in optical fibers. **Mechanical Properties of Materials:** Concept of stress and strain; Stress-strain behaviour; Elastic properties of materials; Tensile properties; Elastic recovery after plastic deformation; Hardness; Stress concentration; Design and safety factors; Fracture and fatigue. **Dislocations and Strengthening Mechanism:** Characteristics of dislocations; Mechanism of strengthening in metals; Grain size reduction; Solid solution strengthening; Strain hardening; Precipitation hardening. **Manufacturing Technology of Materials:** Role of materials in manufacturing; Relationship between manufacturing processes and material properties; Process capability. **Applications and Selection of Engineering Materials:** Metallic materials; Ferrous and non-ferrous alloys; Ceramics; Polymers; Thermoplastics and thermosets; Composite materials. **Process Selection and Ecological Design:** Cost consideration in materials selection; Selection of materials and manufacturing processes; Green manufacturing and environmentally conscious design. ***Energy Utilization*** (15 hours) **Energy Trends, Conversion and Engineering:** World consumption of primary energy sources; Technologies and issues in the conversion of different sources of energy.

	Basic Concepts and Laws of Energy Conversion: Thermodynamic states, variables and systems; Thermodynamic properties of H_2O; Work, heat, and internal energy; Conservation of mass and energy; Reversibility of energy exchange; Energy balance for a flow. **Basic Cycles and Common Thermal Systems:** Rankine cycle and the steam engine; Refrigeration and heat pump; Ideal gas basics; Otto cycle and the internal combustion engine; Brayton cycle and the gas turbine.
Teaching/Learning Methodology	This subject will be taught via lectures, tutorials, mini projects, case studies and experimental works. Tutorials, mini projects, case studies and experimental works will be conducted in small groups to facilitate discussion. ***Laboratory Experiment*** (4 hours) 1. Tensile strength of metallic and plastic materials. 2. Conversion of fuel energy into engine power.
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: Overall Assessment: 0.60 × End of Subject Examination + 0.40 × Continuous Assessment Continuous Assessment including tests, assignments, laboratory reports, mini projects and case studies. Examination is a close-book written examination.

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		1	2	3
1. Tests	20	√	√	√
2. Assignments (including project reports, laboratory reports and case study reports)	20	√	√	√
3. Written examination	60	√	√	√
Total	100 %			

Student Study Effort Expected	
Class contact:	
▪ Lectures	42 Hrs.
▪ Tutorials	12 Hrs.
▪ Laboratory works	4 Hrs.
Other student study effort:	
▪ Performing assignments	36 Hrs.
▪ Literature search and private study	32 Hrs.
Total student study effort	126 Hrs.

Reading List and References	1. Bolton, W., Engineering Science. 4th Ed., Newnes Oxford, 2001. 2. Callister, W.D. Jr., Material Science and Engineering – an Introduction. 7th Ed., John Wiley & Sons, Inc., 2007. 3. Manufacturing with Materials, by Open University, Butterworths, 1st Ed., 1990. 4. Cambridge Engineering Selector CES 4th Ed., Pack by M. Ashby and D. Cebon, Granta Design Ltd. 5. Sonntag, Borgnakke & Wylen, Fundamentals of Thermodynamics, Wiley & Sons, Inc., 2003. 6. Eastop, T.D. and McConkey, A., Applied Thermodynamics for Engineering Technologists. 5th Ed., Longman Group UK, 1993.

Subject Description Form

Subject Code	ENG236
Subject Title	Computer Programming
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	(i) To introduce the fundamental concepts of computer programming (ii) To equip students with sound skills in C/C++ programming language (iii) To equip students with techniques for developing structured computer programs (iv) To demonstrate the techniques for implementing engineering applications using computer programs.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: Develop a good computer program using C/C++ programming language. To be specific, the students should be able to achieve the following: a) Familiarize themselves with at least one C/C++ programming environment. b) Be proficient in using the basic constructs of C/C++ to develop a computer program. c) Be able to 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) Be able to apply the computer programming techniques to solve practical engineering problems. f) Be able to solve problems by using systematic approaches in a team.
Subject Synopsis/ Indicative Syllabus	1. Introduction to programming - Components of a computer; Programming environment; Process of application development. 2. Bolts and Nuts of C/C++ - Preprocessor; Program code; Functions; Comments; Variables and constants; Expressions and statements; Operators. 3. Program Flow Control - Branching and looping; Function parameters passing; Return values; Local and global variables; Scope of variables. 4. Program Design and Debugging - Structured program design; Modular programming; Exceptions and debugging. Case study: Using the Visual C++ debugger. 5. Basic Object Oriented Programming - Objects and classes; Private versus public; Implementing class methods; Constructors and destructors. 6. Pointer and Array - The stack and the free store; Create and delete objects in the free store; Pointer arithmetic; Passing function arguments by pointer; Returning values by pointer; Array of objects; Array and pointer; Array of pointers; Pointer of array; Character array; Command-line processing. 7. Stream I/O - Input and output as streams; File I/O using streams. 8. Using C/C++ in Engineering Applications - Solving practical problems using C/C++; Developing graphical user interfaces for engineering applications.
Teaching/Learning Methodology	The subject is delivered through weekly lectures. Tutorials in terms of exercises related to the lecturing materials follow in the same week. Tutors will aid the lecturers in helping the students finishing the exercises, and interactive Q&A will take place. The lectures and tutorials aim at achieving the learning outcomes a, b, c, d and e. To assure students' understanding of fundamental concepts, short-quizzes and closed-book tests are arranged regularly. The learning outcomes b, c and d can be evaluated at different check-points.

	To enhance the students' problem solving skill in a given programming environment, open-book programming tests are arranged regularly. The learning outcomes a, b, c, d and e can be evaluated at different check-points. After all the subject materials have been delivered, students are asked to finish a mini-project in a team. The project involves a practical engineering problem of some stated specifications. Apart from meeting the learning outcomes a-e, the students have to practice solving problems using systematic approaches in a team. The learning outcome f should be reflected from the mini-project result.
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	e	f
1.In-class exercises	10	✓	✓	✓	✓	✓	
2. Short-quizzes	10		✓	✓	✓		
3. Closed-book tests	20		✓	✓	✓		
4. Programming tests	30	✓	✓	✓	✓	✓	
5. Mini-project	30	✓	✓	✓	✓	✓	✓
Total	100 %						

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

The short-quizzes and closed-book tests are for assessing the understanding of fundamental concepts. The in-class exercises and programming tests are conducted within the programming environment to help students familiarized with it. The problems to be solved by the students are typically presented as practical engineering problems. Through conducting the mini-project that lasts for several weeks, students would be able to experience how to solve problems by using systematic approaches in a team.

Student Study Effort Expected	Class contact:	65 Hrs.
	▪ Lecture	27 Hrs.
	▪ Tutorial	26 Hrs.
	▪ Test/Quiz	11 Hrs.
	▪ Mini-project presentation	1 Hrs.
	Other student study effort:	81 Hrs
	▪ Self-studying	52 Hrs.
	▪ Homework	17 Hrs.
	▪ Mini-project/Report	12 Hrs.
	Total student study effort	146 Hrs.

Reading List and References

Textbook:

1. J. Liberty, S. Rao, and B. Jones, *Sams Teach Yourself C++ in One Hour a Day*. Sams, 2009.

Reference Book:

1. H.M. Deitel and P.J. Deitel, *C++ How To Program*, 5th ed., Prentice-Hall, 2005.
2. I. Horton, *Ivor Horton's Beginning Visual C++ 2005,* Wiley Publishing, 2006.

Subject Description Form

Subject Code	ENG237
Subject Title	Basic Electricity and Electronics I
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	1. Introduce the fundamental concepts of operation of electric circuits applicable to all engineering students. 2. Develop the ability on 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 the electric circuit operating principles; 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	1. DC Circuits Introduction to electric circuits. Potential and potential difference. Charge and flow of charge. Voltage and current as two basic variables. Kirchhoff's current and voltage laws. Independent and dependent sources. Resistance. Simple circuit styles: voltage divider, current divider, series and parallel circuits. Nodal and mesh analyses. Thévenin and Norton theorems. Power dissipation. Source loading and maximum power transfer. 2. Capacitance, Inductance and First Order Transients Constitutive relations of capacitor and inductor. Brief introduction to physics (electric and magnetic fields). 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. Time constant. 3. Transformers Concept of ideal transformer (assuming sinusoidal voltages and currents). Dot convention. Analyze circuit with ideal transformer. Calculate reflected sources and impedances across ideal transformers. Applications in galvanic isolation and voltage/current level conversion. 4. Steady-state Analysis of AC Circuits Average and rms values. 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 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. Real and reactive powers. Power factor. 5. Digital Logic Circuits Binary number system: addition, subtraction, multiplication and division in binary number systems. Conversion between binary and decimal numbers. Two's complement. Boolean algebra. Basic logic gates. Flip-flops. Karnaugh maps. Don't care condition. Combinational Logic circuit designs and modules. **Laboratory Experiments:** 1. Instrumentation and circuit theorems 2. First order transient 3. Simple digital circuits

Teaching/Learning Methodology	On a subject of fundamental nature with large classes, lectures are the primary and effective means of conveying the basic circuit principles (outcome a) and demonstrating suitable application (outcome b). In order to strengthen the understanding of the basic concepts (outcome a) and to facilitate small-group discussions on examples and exercises (outcome b), tutorials with a maximum class size of 20 are provided. Experiments are essential for students to relate the concepts to practical applications (outcome b) and they are exposed to hand-on experience and proper use of equipment and also analytical skills on interpreting experimental results (outcome c).

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 (Please tick as appropriate)					
		a	b	c			
1. Examination	60	√	√				
2. Class Tests	16	√	√				
3. Assignments	12	√	√				
4. Lab Logbooks & Report	12		√	√			
Total	100 %						

It is a level-2 subject covering fundamental concepts of circuit analysis and basic applications. Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the mid-term class tests and regular quizzes which provide timely feedbacks to both lecturers and students on various topics of the syllabus. Experiment logbooks and reports reflect the students' laboratory skills, usages of appropriate equipment and data analysis on experiment results.

Student Study Effort Required		
	Class contact:	
	▪ Lectures	26 Hrs.
	▪ Laboratory experiment	9 Hrs.
	Other student study effort:	
	▪ Supplementary tutorials/consultations	25 Hrs.
	▪ Self-study	42 Hrs.
	Total student study effort	102 Hrs.

Reading List and References

Textbooks:

1. G. Rizzoni, Fundamentals of Electrical Engineering, First Edition, New York: McGraw-Hill, 2009.

References:

1. C.K. Tse, *Linear Circuit Analysis,* London: Addison-Wesley, 1998.
2. D.A. Neamen, *Micoelectronics: Circuit Analysis and Design*, Boston: McGraw-Hill, 3rd Edition, 2006.
3. R.A. DeCarlo and P.M. Lin, *Linear Circuit Analysis*, Second Edition, Oxford University Press, 2001.
4. A.H. Robbins and W.C. Miller, *Circuit Analysis: Theory and Practice*, Thomson Learning, 2nd Edition, 2000.

Subject Description Form

Subject Code	ENG238
Subject Title	Basic Electricity and Electronics II
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	ENG237 (Basic Electricity and Electronics I)
Objectives	To introduce students to an extended aspect of basic electricity and electronics applicable to engineering students. Several classes of electronic devices and circuits will be covered, including bipolar junction transistor (BJT) and amplifiers, metal-oxide-semiconductor field-effect transistor (MOSFET) and amplifiers, and operational amplifiers. An introduction to electrical machines will be given.
Intended Learning Outcomes	Upon satisfactory completion of the subject, the students are expected to: a) describe the fundamental aspects of diodes, bipolar junction transistor (BJT) and amplifiers, metal-oxide-semiconductor field-effect transistor (MOSFET) and amplifiers, and operational amplifiers. b) describe the fundamental aspects of electrical machines.
Subject Synopsis/ Indicative Syllabus	1. Diode Fundamentals Semiconductor basics. P-N junction basics. Input, output and transfer characteristics of practical diodes. Biasing through load line concept. (3 hours) 2. Transistors and Biasing Circuits Bipolar junction transistor (BJT). DC biasing and analysis of BJT circuits. Metal-oxide-semiconductor field-effect transistor (MOSFET). DC biasing and analysis of MOSFET circuits. Load line and graphical large-signal analysis. Transistor amplification concept. (6 hours) 3. Transistor Amplifiers and Small-signal Concepts Basic BJT and MOSFET amplifier configurations: common emitter and common source configurations. Small-signal models and parameters. Concept of transconductance. Voltage gain. Input and output impedances. Introduction to loading effect. (9 hours) 4. Operational Amplifiers Ideal operational amplifier. Defining characteristics (i.e., infinite gain and infinite input resistance). Basic op-amp circuits: inverting amplifier, non-inverting amplifier, summing amplifier, difference amplifier, integrating amplifier and differentiating amplifier. Specific op-amp circuits: instrumentation amplifier; current-to-voltage converter and voltage-to-current converter. Design applications. (9 hours) 5. Frequency Domain Analysis Transfer functions from ac circuits in terms of $j\omega$. Introduction to frequency domain, from $j\omega$ to s. General s-domain transfer functions. Simple first-order filter circuits. Concepts of pole, corner frequency and bandwidth. Use of $j\omega$ axis for magnitude and phase plots for sinusoidal driving sources. Extension to asymptotic plots and Bode plots. (6 hours) 6. Fundamentals of Electrical Machines Electromagnetics. Transformer analysis using magnetic circuit models. DC motors and generators. (9 hours)

Teaching/Learning Methodology	Lectures are the primary means of conveying the fundamental knowledge to understand the concepts pertaining to the fundamental aspects of electrical and electronic principles. Tutorials with problem-based questions are given, and the students are expected to solve those problems and to know the basic approaches to solving the problems. Students will be required to form groups to work on laboratories which will give them a hands-on experience in the devices, circuits and machines that are taught in the lectures.

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	e	
1. Examination	60	√	√				
2. Test	24	√	√				
3. Laboratory	16	√	√				
Total	100 %						

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

The assessment methods include an end-of-subject examination (60%), two tests (12% each), and four laboratory works (8% for formal report and 8% for logbook). The examination and continuous assessments (two tests and four laboratory works) cover intended subject learning outcomes a) and b). The examination is a three-hour, closed-book examination and the two tests are closed book and 1.5 hours each. A logbook with four laboratory recordings and a formal report on one particular laboratory work will be assessed.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture	42 Hrs.
	▪ Tutorial (13 hrs) and laboratory (11 hrs)	24 Hrs.
	Other student study effort:	
	▪ Self study	33 Hrs.
	▪ Report writing for laboratory	6 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Textbook:

1. Donald A. Neamen, *Microelectronics: Circuit Analysis and Design*, Third Edition, Boston: McGraw-Hill, 2006.

References:

1. C.K. Tse, *Linear Circuit Analysis,* London: Addison-Wesley, 1998.
2. G. Rizzoni, *Principles and Applications of Electrical Engineering*, Fifth Edition, New York: McGraw-Hill, 2006.
3. A.S. Sedra and K.C. Smith, *Microelectronic Circuits,* Fifth Edition, New York: Oxford University Press, 2004.
4. R.W. Goody, *PSPICE for Windows – A Circuit Simulation Primer*, Englewood Cliff: Prentice-Hall, 1995.

Subject Description Form

Subject Code	ENG307
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 about the role of the professional engineer in practice and their responsibilities towards 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 its relationship between technology and environment and the implied social costs and benefits. 2. Understand the social, political, legal and economic responsibility and accountability of a profession in engineering and the organizational activities of professional engineering institutions. 3. Be aware of the short-term and long-term effects on the use of technology relating to safety and health aspects. 4. Observe the professional conduct, the legal and more constraints relating to various engineering aspects.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Identify and evaluate the effects on the use of technology relating to social, culture, economic, legal, health and safety, environment and welfare of the society. (b) Explain the importance of professional training of institutions, professional conduct, ethics and responsibilities in various engineering activities (local and overseas). Particularly the Washington Accord. (c) Work in a team setting to discuss the specific project of the eight dimensions on project issues related to engineers and present the findings.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** Impact of technology on society: Innovation and creativity, the history and the trend of technology on the social and culture on society. Environmental protection and related issues. Role of the engineer in energy conservation, ecological balance and sustainable development. The outlook of Hong Kong's industry, its supporting organizations and impact on development from the China Markets. Industrial health and safety including the work of the Labour Department and the Occupational Health and Safety Council and the legal dimension such as contract law and industrial legislation. The Professional Institutions: both local and overseas. Washington Accord and the qualification and criteria of professional engineers. Professional ethics, bribery and corruption including the work of the ICAC. Social responsibilities of engineers.
Teaching/Learning Methodology	In class, there will be short lectures to provide essential knowledge and information on the relationship between society and the engineer under a range of dimensions. There will be discussions, case studies, seminars to engage student's in-depth analysis of the relationship. Students will form into groups and throughout the course, students will work on engineering cases by completing the following learning activities: 1. Case analysis; students will base on the case analysis, and provide weekly summary report on the relationship of dimensions to the project. 2. The final report will be the Case portfolio which includes i. Presentation slides; ii. Feedback critique; iii. Weekly summary report and iv. Reflection. 3. Final presentation. The coursework of this subject involves students to work in groups to study cases from the perspectives of eight dimensions 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 portfolio reports on these case studies.
Assessment Methods in Alignment with Intended Learning Outcomes	See table below
Student Study Effort Expected	See table below
Reading List and References	**Reference books:** (1) Johnston, F. Stephen, Gostelow, J.P. and King, W. Joseph (2000) Engineering and society challenges of professional practice. Upper Saddle River, N.J.: Prentice Hall (2) Hjorth, Linda; Eichler, Barbara; Khan, Ahmed (2003) Technology and Society Abridge to the 21st Century. Upper Saddle River, N.J.: Prentice Hall **Reading material:** Engineering journals: - Engineers by The Hong Kong Institution of Engineers - Engineering and Technology by The Institution of Engineers and Technology Magazines: - Times - Far East Economics Current newspaper: - South China Morning Post - China Daily - Ming Pao Daily

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	
1. Continuous	60%						
• Group weekly learning activities (40%)		✓	✓	✓			
• Final presentation (individual presentation) (30%)		✓	✓				
• Group report and individual reflection report (30%)		✓	✓	✓			
2. Examination	40%	✓	✓				
Total	100 %						

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

Continuous Assessment: 60 % Examination: 40%

Class contact:	
▪ Lectures and Review	30 Hrs.
▪ Tutorial and Presentation	12 Hrs.
Other student study effort:	
▪ Research and Preparation	60Hrs.
▪ Report writing	14Hrs.
Total student study effort	116 Hrs.

Subject Description Form

Subject Code	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) undertake the design, construction, testing and commissioning electrical distribution system in buildings on the basis of recognize the engineering standards, regulations and practices; 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	Lighting and Electrical System Design(TM0367) 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. Low-voltage Switchboard and Power Monitoring, AC control and PLC (TM0389) 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. Integrated Building Systems(TM0383) Proprietary and open systems (BMS, EIB and DALI); sensors and actuators; wiring circuit, scenes control; system design, programming and commissioning; intelligent building system integration. Electrical Installation and Basic Electronic Practice(TM0373) 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.
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. Assignment	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					

Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed				
TM0373 Electrical Installation and Basic Electronic Practice		a	b	c	d	e
1. Assignment	40	✓	✓	✓		✓
2. Test	30	✓	✓			
3. Training Report	30	✓	✓	✓		✓
Total	100					

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.

Report writing is designed to facilitate students to acquire deep understanding on the topics of the training and to present those concepts clearly.

Student Study Effort Expected

Class Contact	
▪ Lecture/Tutorial/Demostration	30 Hrs.
▪ Workshop Practices	88 Hrs.
▪ Test	2 Hrs.
Other Study Effort	0 Hr.
Total Study Effort	**120 Hrs.**

Reading List and References

1. Training material, manual and articles published by the Industrial Centre.
2. EMSD, Code of Practice for the Electricity (Wiring) regulations, 2003 Edition.
3. IEE wiring regulation, 16th Edition.

Subject Description Form

Subject Code	IC2131
Subject Title	Freshman Seminar for Engineering
Credit Value	2 Training Credits
Level	2
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	The objectives of this subject are to: (1) Introduce students to the engineering broad discipline and enthuse them about their major study (2) Cultivate students' creativity and problem-solving ability, and global outlook (3) Expose students to the concept and an understanding of entrepreneurship (4) Engage the students in desirable forms of learning at university that emphasizes self-regulation, autonomous learning and deep understanding
Intended Learning Outcomes	Upon completion of the subject, students will: a. Be able to demonstrate an understanding and an enthusiasm about the engineering broad discipline and their major study b. Develop their problem-solving ability and global outlook c. Be able to demonstrate an understanding of entrepreneurship d. Be able to search for information, formulate a project plan, and manage a project with initiative
Subject Synopsis/ Indicative Syllabus	***1. Renowned Speaker Seminar (5 hours*)*** The seminar will be given by a renowned speaker to introduce students to the engineering broad discipline and to enthuse them about their major study. The seminar will also cultivate students' global outlook. It will be composed of a pre-seminar (1 hour), the actual seminar (2 hours) and a post seminar (1 hour, plus 1 hour online quiz). The pre-seminar aims at preparing the students for the actual seminar. The actual seminar will be delivered by a renowned speaker. The post-seminar aims at re-enforcing the students' understanding and appreciation after the actual seminar. ***2. Departmental Seminars (7 hours*)*** Four departmental seminars will be delivered by chair professors and reputable professionals in the engineering broad discipline to arouse students' interests in engineering and to cultivate their sense of belonging to the profession. After attending the departmental seminars, the students will be required to write a reflective essay to summarize their understanding (3 hours). ***3. Freshman Project (36 hours*)*** The freshman project aims at developing students' creativity, problem-solving skills, and team-work abilities through hands-on tasks. Students will work in small groups under the guidance of instructors to design and implement an engineering solution to some given problems creativity, problems solving through interaction, participation and team works. ***4. Entrepreneurship Project (12 hours*)*** The entrepreneurship project is designed to develop students' appreciation and understanding about entrepreneurship and the commercialization process by attending training workshop and writing business plans. Groups with good performance will be encouraged to enter entrepreneurship competition such as the Global Student Challenge. (* Note: hours indicate total student workload)
Teaching/Learning Methodology	***Seminars*** The renowned speaker seminar and departmental seminars are designed to arouse the students' interest about engineering. The delivery mode will be *interactive* and *engaging*. Students will be motivated to make preparation by searching for information and doing background reading. They will be encouraged to raise questions and discuss with the presenters. Online quizzes and reflective essays will be designed to measure students' learning outcomes as well as to encourage participation and interaction. ***Freshman Project*** For the Freshman Project, students will form groups comprising 5 to 6 students coming from different departments. They will work collaboratively with their group members to design and implement an engineering solution to a given problem under the guidance of instructors. There will be close staff-students and students-students *interaction*. Students will be given the opportunities to develop *creativity*, *problem-solving skills* and *team-work abilities*. Assessment tasks will consist of *log book* writing, *demonstration*, *presentation*, and *reports*. These are designed to evaluate individual student's performance and achievement as well as to encourage active participation. ***Entrepreneurship Project*** Students will work in small groups on an entrepreneurship project. Students will produce a business plan and give a presentation. Assessment will focus towards students' understanding about entrepreneurship and innovation and creativity. Students will also be encouraged to participate in competition (such as the Global Challenge Club) to put their entrepreneurship project to a more practical context.
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
Seminars Online quizzes and reflective essays	20%	✓			
Freshman Project Individual log book, group project report and demonstration	40%		✓		✓

	Entrepreneurship Project Business plan	40%			✓	✓
	Total	100 %				

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

Online quizzes for the renowned speaker seminar and reflective essays for the departmental seminars can measure the students' *understanding* about the engineering discipline. Through log book, students' participation and progress in the freshman project can be assessed. Through project demonstration, and project reports, students can demonstrate their *creativity*, *problem-solving skills* and *team-work abilities*. Through the business plan, the students' understanding about entrepreneurship can be assessed. They can also demonstrate their *ability to search for information*, *formulate a project plan*, and *manage a project with initiative*.

Student Study Effort Expected	Class contact:	
	▪ Projects	48 Hrs
	▪ Seminars	9 Hrs
	Total student study effort	57 Hrs
Reading List and References	H. Scott Fogler and Steven E. LeBlanc, *Strategies for creative problem solving*, Upper Saddle River, N.J. : Prentice Hall, 2008 N.J. Smith (ed), *Engineering project management*, Oxford, UK; Malden, MA: Blackwell, 2008 Gene Moriaty, *The engineering project: its nature, ethics, and promise,* University Park, Pa.: Pennsylvania State University Press, 2008. K. Allen, *Entrepreneurship for scientists and engineers*, Upper Saddle River, N.J. : Prentice Hall, 2010.	

Subject Description Form

Subject Code	IC2132
Subject Title	Engineering Drawing and Industrial Safety
Credit Value	2 Training Credits
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject covers the fundamentals of Engineering Drawing, CAD and Industrial Safety for Engineering students.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** a. explain 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 with application in mechanical, industrial systems, electrical, electronic and information engineering; b. explain basic occupational health and industrial safety requirements for engineering practice.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Engineering Drawing & CAD (TM8050 - 48 hours) 1.1. Fundamentals of Engineering Drawing and CAD (39 hours) Principles of orthographic projection; sectioning; dimensioning; sketching; general tolerances and surface finishes; conventional representation of screw threads and fasteners; types of drawings including part drawing and assembly drawing. Introduction to CAD; 2D drawings and general concepts on 3D computer modeling including extruding, revolving, sweeping, and lofting; parametric feature based solid modeling; construction and detailing of solid features; solid model modification and its limitations; concepts of assembly modeling including bottom up and top down approaches for the generation of parts, subassemblies, and final assembly; virtual validation & simulation, generation of 2D drawings from 3D parts and assemblies; drawing annotation including dimensioning, tolerancing, surface finishing, and part list. 1.2. Electrical Drawing (3 hours) Wiring diagram and wiring table for electronic and electrical installation, functional representation of circuit, system block diagram, electrical & electronic device symbols and layout, architectural wiring diagram with reference to the architectural symbols for electrical drawings in Hong Kong and international standards. 1.3. Electronic Design Automation (6 hours) Introduction to electronic design automation software; circuit schematics capture and representation; placement of components, capturing, annotation, labeling, net list. Electronic parts library, symbols, decals, physical packages, discrete components, integrated circuits, logic and analogue circuits, electronic parts creation and application. 2. Industrial Safety (TM2009 - 15 hours) 2.1. Safety Management: Overview, essential elements of safety management, safety training, accident management, and emergency procedures. 2.2. Safety Law: F&IU Ordinance and principal regulations, OSH Ordinance and principal regulations. 2.3. Occupational Hygiene and Environmental Safety: Noise hazard and control; dust hazard and control; ergonomics of manual handling. 2.4. Safety Technology: Mechanical lifting, fire prevention, dangerous substances and chemical safety, machinery hazards and guarding, electrical safety, first aid, job safety analysis, fault tree analysis, personal protective equipment.
Teaching/ Learning Methodology	The teaching and learning methods include lectures, tutorials, and practical in-class assignments. The lectures are aimed at providing students with an overall and concrete background knowledge required for understanding the key issues in engineering drawings and that of the industrial safety. The tutorials and practical in-class assignments are aimed at enhancing students' in-depth knowledge and ability in applying the knowledge and skills learnt.
Alignment of Assessment and Intended Subject Learning Outcomes	See table below

Specific Assessment Methods/ Task	**% Weighting**	**Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)**	
		a	**b**
Continuous Assessment			
• Assignment	Refer to individual Module Description Form	✓	✓
• Tests		✓	✓
Total	100%		

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

Specific Assessment Methods/ Task	**Remarks**
Assignment / Project	The assignments are designed to facilitate students to reflect and apply the knowledge periodically throughout the training.
Tests	Tests are designed to facilitate students to review the breadth and depth of their understanding on specific topics.

Student Study Effort Expected

Class Contact	TM8050	TM2009
• Lecture	20 Hrs.	14 Hrs.
• Tutorial	13 Hrs.	
• In-class Assignment/ Hands-on Practice	15 Hrs.	1 Hr.
Total Study Effort		**63 Hrs.**

Reading List and References

Reference Software List:

1. AutoCAD from Autodesk Inc.
2. SolidWorks from Dassault Systèmes Solidworks Corp.
3. PADS from Mentor Graphics Inc.

Reference Standards and Handbooks:

1. BS8888 Technical Product Specification (TPS) Specification
2. Cecil H. Jensen, et al, Engineering Drawing and Design, McGraw-Hill, 2008.
3. IEEE Standard 315 / ANSI Y32.2 / CSA Z99 Graphic Symbols for Electrical 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	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	See table below.

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d		
1. Assignments	35%	✓	✓	✓	✓		
2. Tests	20%	✓	✓	✓	✓		
3.Examination	45%	✓	✓	✓	✓		
Total	100%						

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		
	Class contact:	
	▪ Lecture/Tutorial 2 hours/week for 14 weeks	28 Hrs.
	▪ Tutorial/Case Study 1 hour/week for 14 weeks	14 Hrs.
	Other student study effort:	
	▪ Studying and self learning	50 Hrs.
	▪ Assignment and report writing	28 Hrs.
	Total student study effort	120 Hrs.

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

Subject Description Form

Subject Code	MM2021
Subject Title	Management & Organisation
Credit Value	3
Level	2
Pre-requisite / Co-requisite/ Exclusion	Exclusion: People and Management (MM2191)
Role and Purposes	This subject contributes to the achievement of the BBA (Hons) Programme Outcomes by enabling students with an understanding of management functions, group and individual dynamics within organisations and to apply such concepts to analyse and solve problems in business situations (Outcomes 7 and 11). The subject also provides students with knowledge and skills in leadership, teamwork, and decision making (Outcome 8). In addition, it prepares students on how to analyse and resolve ethical issues in various business settings (Outcome 5).
Subject Learning Outcomes	Upon completion of the subject, students will be able to: a. explain the nature of managerial work in a variety of forms of organisations, and analyse the impact of the external environments, both domestic and global, on managers' jobs (Outcome 7); b. explain and analyze the functions of management in organisations, i.e. planning, organising, leading, and controlling (Outcomes 7 & 11); c. apply the essence of human behavior in teamwork, leadership, and decision making and evaluate the implications for the management of organisations (Outcomes 8 and 11); d. analyse and compare the arguments surrounding social responsibility and ethical behavior in organisations and businesses (Outcome 5).
Subject Synopsis/ Indicative Syllabus	**Management Functions** The major elements of the management functions: planning, organising, leading, and controlling, and their importance for the effective management of business organisations. **Planning** Foundations of planning. Decision making and problem solving. Global business environment. Strategic management. **Organising an Enterprise** Review of a variety of organisational structures and the identification of the conditions under which they are appropriate. Managerial communication and information technology. Staffing and human resource management. **Leading** The manager's role as a leader. Foundations of human behaviour. Leading and motivating employees – individuals and groups.
	Controlling Foundations of control. Operations and quality management. Controlling for organisational performance. **Social Responsibility and Managerial Ethics** Arguments for and against social responsibility as a business objective. Factors affecting managerial ethics. Approaches to improving ethical behaviour.
Teaching/Learning Methodology	The two-hour weekly lecture will be structured to guide and promote students' understanding of relevant management and organisation concepts. In addition, there will be one tutorial of one hour per week. The tutorials will adopt a student of centred approach, including case study, in-class exercises, newspaper and professional articles for discussion and team-presentation.
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.		
Continuous Assessment	**50%**						
1. Individual Work - 20%				√	√		
2. Group Project - 15%		√	√	√	√		
3. Participation - 15%		√	√	√	√		
Examination	**50%**	√	√	√	√		
Total	100 %						

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 –

- Read the key chapters of the recommended textbooks and indicative journals in subject outline;
- Demonstrate the basic understanding of management functions which are presented in the lectures;
- Analyse business situations and problems in contemporary business settings;
- Identity teamwork, leadership and decision making process in the business environment;
- Discuss the ethical issues arising from the cases and other questions;
- Participate in in-class exercises, case study, professional articles or discussion question to be presented in the lectures.

	Feedback is given to students immediately following the presentations and all students are invited to join this discussion.	
Student Study Effort Expected	Class contact:	
	▪ Lectures	28 Hrs.
	▪ Tutorials	14 Hrs.
	Other student study effort:	
	▪ Preparation for lectures/ seminars	42 Hrs.
	▪ Preparation for individual work/ group project/ examination	42 Hrs.
	Total student study effort	126 Hrs.
Reading List and References	**Recommended Textbooks** Stephen P. Robbins & Mary Coulter, Management, Prentice Hall, 10th edition, 2009. Jones & George, Essentials of Contemporary Management, 3rd edition; McGraw Hill, 2009. Daft, R.L., New Era of Management, 9th edition; South-Western Cengage learning, 2009. Bateman & Snell, Management – Leading & Collaborating in the Competitive World, 8theedition, McGraw-Hill, 2009. **Reference Textbooks** Hill & McShane, Principles of Management, 1st edition, McGraw Hill, 2008. Kinicki & Williams, Management, 3rd edition, McGraw Hill, 2008. DuBrin, Essentials of Management, 8th edition. South-Western Publishing, 2009. Daft & Marcic, Understanding Management, 6th edition, South-Western Publishing, 2009. Kreitner, Management, 11th edition, South-Western Publishing, 2009. Lussier, Management Fundamentals, 4th edition, South-Western Publishing, 2009. Hitt, Black, Porter, Management, 2nd edition, Prentice-Hall, 2009. **Indicative Periodicals & Newspapers Readings** Company Annual Reports The Asian Wall Street Journal The Economist South China Morning Post Business Week	

	Indicative Journal Readings Academy of Management Journal Academy of Management Review Asia Pacific Journal of Management Journal of Management Journal of Organizational Behavior Human Relations

Subject Description Form

Subject Code	MM4521
Subject Title	China Trade Management
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
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. c. describe, analyse and evaluate business strategies and practices in China. 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. e. have further developed their oral and written communication skills
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 (Please tick as appropriate)					
		a	b	c	d	e	
Continuous Assessment	**50%**						
1. Group Project – 30%							
2. Presentation – 15%		✓	✓	✓	✓		
3. Written Report – 15%						✓	
4. Class Participation – 20%					✓		
Examination	**50%**	✓	✓	✓	✓		
Total	100 %						

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	28 Hrs.
▪ tutorial	14 Hrs.
Other student study effort:	
▪ Group project	20 Hrs.
▪ Reading	28 Hrs.
Total student study effort	90 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)

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

"Made in China" – *The Travels of a T-shirt in the Global Economy* by Pietra Rivoli (John Wiley, 2005), pp.59-107

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

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

Appendix II

Foundation Year

1. Introduction

Foundation programme was offered to non-local students, mostly from the Chinese mainland, as a preparatory study, in order to prepare them for their intended proper 3-year undergraduate programmes. The programme was a one-year study and each student was required to complete a total of 32 credits. The graduates directly entered the first year of studies of their chosen undergraduate programmes.

From September 2005, the foundation study was merged into the programmes offered by individual departments who became the hosts. The foundation year then formed an integrated part of a 4-year undergraduate degree curriculum. Students in the foundation year with the Department are regarded as the year 1 students of the 4-year BEng (Hons) programme.

2. Programme Structure

Duration
A student normally takes four years full-time with an option of an additional year for sandwich. The maximum period of registration is eight years.

Final Award
The award is a Bachelor degree with honours in Electrical Engineering.

Programme
The students will complete 10 subjects, 30 credits, as well as 2 credits on the subjects of Foundation Year Seminars, in the first year, i.e. a total of 32 credits. There are 5 compulsory subjects (common to all non-local students) and another 5 subjects stipulated by the Departments. The typical foundation year study is as follows:

	Semester One
	Compulsory subjects
ENG1001	Foundation Year Seminar I
APSS184	Understanding the Hong Kong Community
ELC1004	English for University Studies I
AMA103	Foundation Mathematics I for Science and Engineering
AP101	College Physics I
CBS2050*	Elementary Cantonese
	* Compulsory for non-Cantonese speakers. Cantonese speakers may choose one of the following subjects in lieu, subject to approval.
	GEC225 Exploration of the Cosmos GEC270 History of Hong Kong APSS185 Discovering Psychology
	Semester Two
	Compulsory subjects
ENG1002	Foundation Year Seminar II
AMA104	Foundation Mathematics II for Science and Engineering
ELC1005	English for University Studies II
AMA105	Logic: Qualitative and Quantitative
AP102	College Physics II

One of the following subjects GEC230 APSS186 ELC1003	Elective subject Ecological Perspectives – The Challenge of Our Times Understanding Ethics in Daily Life Extended Writing Skills * Compulsory for non-Cantonese speakers. Cantonese speakers may choose the following subject in lieu, subject to approval. GEC274Appreciation of Chinese Art and Design

In the subsequent three years, the students follow the identical study pattern in the 3-year programme as described in the main content of this document. As a result, the students should finish a total of 134 credits, as well as fulfilling the training and language requirements, when they graduate. The 2011/12 Foundation Year students joining Year-1 of the Undergraduate programme in 2012/13 will follow the curriculum and associated regulations applicable to the 2012/13 cohort of students of the programme.

Foundation-year Mentor

The students in the foundation year are full members of the Departments. A departmental foundation-year mentor will be assigned to them. The class representative will be a member of the Student-Staff Consultative Committee.

3. Registration & Assessment

The same set of regulations on registration and assessment, as stipulated in Section 6, applies.

While the graduation requires the completion of 134 credits and the GPA calculation includes the results of all subjects throughout the four years, the WGPA calculation, which leads to award classification, excludes all subjects in the foundation year. In other words, the award classification only considers the students' performance on the subjects taken in the normal 3-year programme.

Appendix III

Major Programme in Electrical Engineering

With the growing demand of graduates having broad educational qualifications, in addition to those with specialised skills, the University is introducing degree programmes combining "Major" and "Minor" disciplines. In response to this, the Department of Electrical Engineering has been offering a Major in Electrical Engineering option for students starting from 2001/02 academic year.

Starting from 2011 cohort, students taking this option must obtain 81 credits in the Major Programme in Electrical Engineering and 18 credits from a minor programme. If the 18 credits taken are a free collection of electives in any combintation of disciplines in conjunction with a Major programme, these students will graduate with a Major only. For the Minor programme, at least 9 credits must be level 3 or above.

In order to graduate, students should take 3 additional credits on a subject from level 1 to level 4 so that the total number of credits taken is 102, the same credit requirement as stipulated by the BEng programme in Electrical Engineering.

1. Programme Requirement

Students are required to complete the following 81 credits for graduation in the Major Programme in Electrical Engineering. They must include the following credits:

(a) all first-year subjects in Electrical Engineering, except the business subject (33 credits);
(b) all second-year subjects, except the business subject (30 credits);
(c) the compulsory final-year subjects (15 credits);
(d) one EE level-4 elective (3 credits)
(e) all training credits.

All subjects are in common with the BEng(Hons) degree in Electrical Engineering offered by the Department of Electrical Engineering.

A student is eligible for award if he/she also satisfies the following graduation requirements.

- Satisfying the WIE and IC Training requirements
- Having a Grade Point Average (GPA) of 2.0 or above at the end of the programme
- Having sat for GSLPA[#] in both Chinese and English (unless exemption is given)
- Satisfying the co-curricular activities requirements
- A pass in Foundation Mathematics (AMA106)*

The mandatory requirements for GSLPA will be abolished with effect from the 2011/12 cohort of intakes, including students on Foundation Year programmes in 2010/11 who progress to Stage 1 of FT undergraduate degree programmes in 2011/12. However, students admitted to Senior Years in 2011/12 either on advanced standing or under the Senior Year quota are required to take GSLPA before graduation.

* It is only applicable to admittees who do not have a "pass" in the A-level Mathematics subject(s) and who have not been given credit transfer for the subject AMA201 stipulated in the curriculum. These students are required to take a mandatory Mathematics Benchmark Test (MBT) prior to the commencement of their studies. Those who passs the MBT are exempted from this graduation requirement and they follow the normal study pattern. Those who fail or do not attend the MBT are required to take a non-credit bearing subject AMA106 "Foundation Mathematics", which is a pre-requisite for AMA201. A pass in AMA106 is thus a graduation requirement for such students.

2. Programme Curriculum

To be eligible for graduation in the major in Electrical Engineering, students are required to complete 81 credits as specified. All the subjects in the table below are compulsory. The tables below illustrate the typical progress pattern.

Typical First Year Study:

	Semester One
AMA201	Mathematics I
ELC2501	University English I (2 credits)
ENG224	Information Technology
ENG232	Engineering Science
ENG236	Computer Programming (2 credits in semester 1)
ENG237	Basic Electricity and Electronics I
	Semester Two
AMA202	Mathematics II
CBS2080	Fundamentals of Chinese Communication
ELC2502	University English II (2 credits)
EE3061	Analysis Methods for Engineers
ENG236	Computer Programming (1 credit in semester 2)
ENG238	Basic Electricity and Electronics II
GEC2801 or equivalent	China Studies (2 credits)
	(1 subject from the Minor Programme)
IC2131	Freshman Seminars for Engineering (57 hours in Semester 1 and 2) (2 training credits)
IC2132	Engineering Drawing and Industrial Safety (63 hours in Semesters 1, 2 and 3) (2 training credits)
IC2112	IC Training I (EE) (4 weeks in summer) (4 training credits)

Typical Second Year Study:

	Semester One
ELC3504	English for Effective Workplace Communication (1 credit in semester 1)
EE2011	Applied Electromagnetics
EE3011	Analogue and Digital Circuits
EE3041	Power Transmission and Distribution
EE3131	Telecommunication Fundamentals
GEC2xxx	Broadening General Education Subject (2 credits)
	(1 subject from the Minor Programme)
	Semester Two
ELC3504	English for Effective Workplace Communication (1 credit in semester 2)
EE3021	Electromechanical Energy Conversion
EE3031	Power Electronics and Drives
EE3111	Project Methodologies (2 credits)
EE3121	Computer System Principles
EE321	Electrical Services in Buildings
	(1 subject from the Minor Programme)

EE3502	**Semester Three (Summer Period at the end of Year 2)** Summer Practical Training (6 weeks in summer) (3 training credits)

Typical Final Year Study:

EE3051 EE4021 EE4031 EE4041	**Semester One** Systems and Control Electrical Machines Power Systems Engineering Project Management **(1 subject from the Minor Programme)**
ENG307	**Semester Two** Society and the Engineer One EE level-4 elective An additional subject of 3 credits (any subject from level 1 to level 4) **(2 subjects from the Minor Programme)**

3. Professional Recognition

Students who wish to take the major/minor option should note that the Major programme may not meet the academic requirements for Graduate Membership from the professional institutions, such as The Hong Kong Institution of Engineers.

4. Admission and Registration

Same as in Full-time BEng (Hons) Degree Programme in Electrical Engineering

5. Award Classification

For students who have completed a Major and a Minor programme or a Major programme combined with free electives, their award classification will be based on both their "Major GPA" and "Minor GPA".

"Major GPA" is derived based on all subjects of the Major programme plus the University mandatory subjects in general education. The "Major GPA" is weighted and the level weightings are the same as set for the full degree from which the Major programme is developed.

The mechanism for deriving the "Major GPA" is same as that for the GPA for award classifications of students on the single-discipline programme, except that there will be fewer subjects to be counted for the "Major GPA" due to the difference in the curriculum between a Major programme and a single-discipline programme.

"Minor GPA" is derived based on the 18 credits of Minor study (either a specific Minor or free combination of electives). "Minor GPA" is unweighted.

The “Major GPA” and the “Minor GPA” will be presented separately to the Boards of Examiners for consideration.

In order to be eligible for a particular award classification, a student should have comparable standard of performance in both his/her major and minor studies.

In cases where the attainment of students in the minor study warrants the granting of one classification lower than that the students deserve for his major study, the Board of Examiners has the discretion to recommend the upper classification which reflects the performance on the major study better. This is based on the fact that the award parchment to be granted to students who enrol on a major programme will only state the award title for the major programme.