

# HIGHER DIPLOMA IN ELECTRICAL ENGINEERING 2010-11

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



## PART A : INTRODUCTION

### A 1 Preamble

#### A 1.1 PROGRAMME AIMS

The programme aims to provide the students with a sound education in electrical engineering. The programme is designed to produce engineering technologists/technicians who will be able to practice electrical engineering with competence in Hong Kong, China and the neighboring regions. The programme emphasizes on foundation level knowledge and its applications, practical skills, problem-solving ability, and team-work spirit. It also paves the way for graduates to further their study for a professional qualification.

### A 2 General Information - Higher Diploma programme

#### A 2.1 PROGRAMME CODE AND TITLE

41073 - Higher Diploma in Electrical Engineering

#### A 2.2 DURATION AND MODE OF ATTENDANCE

Normally two years Full-time. The maximum period of registration is 4 years.

#### A 2.3 FINAL AWARD

Higher Diploma in Electrical Engineering

#### A 2.4 IMPLEMENTATION DATE

The revised credit-based programme is to start operation from 1997/98 academic year.

#### A 2.5 MINIMUM ENTRANCE REQUIREMENTS

The candidate should satisfy the general minimum entry requirements of The Hong Kong Polytechnic University for 2-year FT HD programmes. The following are the specific requirements of this programme:

*For those applying on the basis of HKALE, the subject requirements are:*

- HKALE Grade E or above in 1 of the following subjects: *Physics; Engineering Science; Pure Mathematics; Applied Mathematics; Chemistry and Computer Studies; OR*
- HKALE (AS-Level) Grade E or above in 2 of the following subjects: *Physics; Design & Technology; Mathematics & Statistics; Applied Mathematics; Chemistry; Computer Applications and Electronics;*

AND

- HKCEE Grade D or above in *Mathematics* or *Additional Mathematics* (only required for applicants without E in HKALE *Applied Mathematics* or *Pure Mathematics*; OR in HKALE (AS-Level) *Applied Mathematics* or *Mathematics & Statistics*); AND
- HKCEE Grade E or above in *Physics* or *Engineering Science* (only required for applicants without E in HKALE *Physics* or *Engineering Science*; OR in HKALE (AS-Level) *Physics* or *Design & Technology*).

*For those applying on the basis of other qualifications, the specified qualifications are:*

- Diploma in Electrical Engineering or in Electronics & Communications Engineering; OR
- Higher Certificate in Electrical Engineering or in Electronic Engineering.

### A 2.6 EXTERNAL RECOGNITION

This Higher Diploma programme is recognised by the Engineering Council for exemption from its Part-1 Examinations for professional membership, and is also accredited by the Institution of Electronic and Electrical Incorporated Engineers (IEEIE) as satisfying the academic requirements for its graduate membership.

## A 3 Curriculum

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 A3.1 to A3.2. The abbreviations used in these tables are:

AMA	Applied Mathematics
EE	Electrical Engineering
ELC	English Language Centre
ENG	Engineering Faculty
GEC	General Education Centre
IC	Industrial Centre

### SUBJECT DESCRIPTIONS

Subjects are referenced by subject codes, and categorised as non-deferrable (non-def), deferrable (def) or elective.

The subject code will have the form >ABCLSS= where 'ABC' is a letter prefix standing for the subject offering department and the type of programme >LSS= is a number code with >L= stands for the level and >SS= stands for the serial order of the subject offered by the Department concerned.

The level codes to be used are listed below

<u>Level code</u>		<u>Explanation</u>
0	=	Sub-A Level standard
1	=	A-Level standard
2	=	Standard comparable to year 1 of a 2-year FT HD programme
3	=	Standard comparable to year 2 of a 2-year FT HD programme

'*Non-def*' are those subjects which form the backbone of the vertical integration, and thus those which must be taken by every student in the prescribed semester, unless they are not allowed to do so due to the student's 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 taking the subject is determined by the student. The tables A3.3 and A3.4 show the times (semesters) in which these subjects are *recommended* to be taken, if the programme is to be completed in the optimum time.

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

Hong Kong Polytechnic University Higher Diploma in Electrical Engineering Level 2		Curriculum					Assessment Method	
		Teaching Dept.	Contact Hours		Credits	GPA Weight (W <sub>i</sub> )		
			Subject Code	Subject Title			Lt/Tu	Lab
<b>Non-Def Subjects</b>								
AMA203	Mathematics I a	AMA	42	--	3	0.4	40%	60%
ELC2501	University English I	ELC	--	--	2	0.4	40%	60%
ELC2502	University English II	ELC	--	--	2	0.4	40%	60%
ENG236	Computer Programming	ENG	53	--	3	0.4	100%	--
EE2711	Applied Electromagnetics	EE	36	12	3	0.4	40%	60%
EE2721	Electric Circuit Analysis	EE	42	12	3	0.4	40%	60%
EE2731	Electronics	EE	36	12	3	0.4	40%	60%
EE2741	Instrumentation and Measurements	EE	36	12	3	0.4	40%	60%
EE2751	Electrical Energy Systems	EE	36	12	3	0.4	40%	60%
EE2761	Information Technology	EE	33	12	3	0.4	40%	60%
<b>Def Subjects</b>								
ME2905	Mechanical Engineering	ME	42	--	3	0.4	40%	60%
GEC2801	China Studies	GEC	28	--	2	0.4	*	*
<b>IC Training</b>			Duration					
IC2105	Engineering Communication and Fundamentals	IC	120 hours throughout the year		4 Training Credits	-	100% Assessed and graded	-
IC2112	IC Training	IC	4 weeks equivalent (44 hrs/week in Summer)		4 Training Credits		100% Assessed and graded	-

\* Assessment method with be announced by the teaching department

Table A3.1

Hong Kong Polytechnic University Higher Diploma in Electrical Engineering Level 3		Curriculum					Assessment Method	
		Teaching Dept.	Contact Hours		Credits	GPA Weight (W <sub>i</sub> )		
			Subject Code	Subject Title			Lt/Tu	Lab
<b>Non-Def Subjects</b>								
EE3711	Analogue & Digital Circuits	EE	36	9	3	0.6	40%	60%
EE3731	Electromechanical Energy Conversion	EE	36	12	3	0.6	40%	60%
EE3741	Power Transmission and Distribution	EE	36	12	3	0.6	40%	60%
EE3802	Project Methodologies	EE	27	15	3	0.6	40%	60%
<b>Def Subjects</b>								
EE3721	Computer System Principles	EE	38	12	3	0.6	40%	60%
EE3761	Power Electronics and Drives	EE	36	12	3	0.6	40%	60%
EE3771	Project	EE	--	--	9	0.6	100%	--
<b>Electives (see note)</b>								
EE3751	Electrical Services in Buildings	EE	42	--	3	0.6	40%	60%
EE3781	Systems and Control	EE	38	9	3	0.6	40%	60%
EE3791	Software Engineering	EE	42	--	3	0.6	40%	60%
EE3801	Telecommunication Fundamentals	EE	39	6	3	0.6	40%	60%

Note: The Department reserves the right of not offering all the electives at any one year

Table A3.2

**SPECIFIED PROGRESSION PATTERN**

A normal student of the Higher Diploma programme is advised to take the following curriculum:

<p><b>YEAR 1</b> <b>Semester 1</b> (16 credit units)</p>	<p>AMA203 ELC2501 ENG236 EE2761 EE2721  ME2905</p>	<p><b>(Non-Deferrable Subjects)</b> Mathematics Ia University English I (2 credits) Computer Programming (2 credits in semester 1) Information Technology Electric Circuit Analysis  <b>(Deferrable Subject)</b> Mechanical Engineering</p>
<p><b>YEAR 1</b> <b>Semester 2</b> (17 credit units)</p>	<p>ELC2502 ENG236 EE2711 EE2731 EE2741 EE2751  GEC2801</p>	<p><b>(Non-Deferrable Subjects)</b> University English II (2 credits) Computer Programming (1 credit in semester 2) Applied Electromagnetics Electronics Instrumentation and Measurement Electrical Energy Systems  <b>(Deferrable Subject)</b> China Studies</p>
<p><b>YEAR 1</b> <b>120 hours</b> <b>throughout the year</b></p>	<p>IC2105</p>	<p>Engineering Communication and Fundamentals</p>
<p><b>YEAR 1</b> <b>4 weeks equivalent</b> <b>(44 hrs/week in</b> <b>Summer)</b></p>	<p>IC2112</p>	<p>IC Training</p>
<p><b>YEAR 2</b> <b>Semester 1</b> (15 credit units)</p>	<p>EE3711 EE3721 EE3731 EE3741 EE3802  EE3771</p>	<p><b>(Non-Deferrable Subjects)</b> Analogue &amp; Digital Circuits Computer System Principles Electromechanical Energy Conversion Power Transmission and Distribution Project Methodologies  <b>(Deferrable Subject)</b> Project (Continue in Semester 2)</p>
<p><b>YEAR 2</b> <b>Semester 2</b>  (9 credit units + 9 credit units for project)</p>	<p>EE3761 EE3771  EE3751 EE3781 EE3791 EE3801</p>	<p><b>(Deferrable Subjects)</b> Power Electronics and Drives Project  <b>(Electives: choose TWO subjects from the following list)</b> Electrical Services in Buildings Systems and Control Software Engineering Telecommunication Fundamentals</p>

**Table A3.3**

## **Part B : PHILOSOPHY AND OBJECTIVES**

### **B 1 Programme Philosophy**

The Higher Diploma (HD) programme aims to provide the necessary balance of theoretical studies and practical training to prepare students for a career as a higher technician or technician engineer in the field of electrical engineering. Graduates from the programme are expected to be able to assume technical positions to apply current technologies, make technical judgements, transfer and develop new technologies, and communicate clearly both in writing and orally at supervisory positions.

To achieve these aims, the programme is designed to consist of a balance of lectures/tutorials, laboratory work, practical training in the Industrial Centre and a project. The curriculum includes studies in the main streams of electrical theory and is supported by mathematics, computing, electronics, mechanical engineering, English, Chinese and general studies.

Level 2 of the HD and the BEng programmes have a similar curriculum and syllabuses. This similarity of the HD programme and the Degree programme is specially adopted in the Department to facilitate teaching and student learning. The students who show outstanding achievement in the 1st year of study will be offered the opportunity to transfer into the BEng(Hons) programme.

### **B 2 Programme Objectives**

The Higher Diploma programme in Electrical Engineering aims to provide the necessary balance of theoretical studies and practical training to prepare students for a career as a higher technician or technician engineer in the field of electrical engineering. The programme objectives are:

1. The program aims to provide HD students with a sound education in electrical engineering.
2. The program is designed to produce engineering technologist/technicians who will be able to practice electrical engineering and related disciplines.
3. The programme emphasizes on foundation level knowledge, application techniques, practical skills, problem solving ability, and team work spirit.
4. The programme also paves the way for graduates to further their study for a higher professional qualification.

### **B 3 Programme Outcomes**

To achieve the aims of producing higher technicians, the programme is designed to consist of a balance of lectures/tutorials, practical laboratory work, practical workshop training in the Industrial Centre and project. The curriculum includes studies in the mainstreams of electrical engineering supported by mathematics, computing, electronics, mechanical engineering, English, Chinese and general studies.

The approach will highlight the importance of practical application of electrical theory, with more emphasis being placed on applications. The workshop training and the laboratory training work will be an important part of the curriculum and reference is regularly made whenever possible to supplement the theoretical teaching in classrooms.

Following the University's aim of producing all-rounded graduates with professional competence, the Higher Diploma programme aims to develop students in the four main areas – to be a (i) competent professional, (ii) creative problem solver, (iii) effective communicator, and (iv) educated global citizen. Detail explanation of these areas is listed in the table below:

<b>Competent Professionals - A1, 2, 3, 4, 5, &amp; 6</b>	
<b>A1</b> Professional Competence (EE Specific)	Have a solid technical education in Electrical Engineering based on the understanding of its fundamentals and its current applications.
<b>A2</b> Professional Competence (Broad Based)	Possess broad engineering knowledge to enable the graduates to adapt, to change, and to satisfy likely career diversions.
<b>A3</b> Professional Competence (Practical Skills)	Understand and be able to apply modern experimental techniques and to be practical minded. Aware of technical and non-technical constraints
<b>A4</b> Teamwork and Leadership	Possess social abilities including inter-personal/public relations, team work, and social consciousness.
<b>A5</b> Global Outlook	Possess an inquiring and innovative attitude thus encouraging the individual to acknowledge the developments in Electrical Engineering on a global context
<b>A6</b> Lifelong Learning	To keep abreast of the developments in Electrical Engineering, Appreciation and the desire for lifelong learning.
<b>Creative Problem Solvers - B1 &amp; 2</b>	
<b>B1</b> Problem Solving	Apply fundamental principles of mathematics, science and engineering to identify and solve problems in the area of Electrical Engineering and related disciplines.
<b>B2</b> Critical Thinking & Creative Thinking	Possess intellectual abilities including creative thinking, cultural appreciation and critical thinking.
<b>Effective Communicators - C1</b>	
<b>C1</b> Biliteracy, Trilingualism, & Communication Skills	Language proficiency in English and Chinese to communicate clearly via graphic, numeric, verbal and written media.
<b>Educated Global Citizens – D1</b>	
<b>D1</b> Social Responsibilities	Have awareness and understanding of the ethical and social responsibilities of a technician engineer.

Table B3.1

The Programme Outcomes are in line with the Programme Objectives, and the corresponding mapping is shown in table B3.2.

	Programme Objectives				
		1	2	3	4
Programme Outcomes	A1	X	X		X
	A2	X	X		X
	A3		X	X	
	A4			X	
	A5				X
	A6				X
	B1	X			
	B2	X			
	C1	X	X		
	D1		X		

Table B3.2

#### B 4 Subject support to Programme Outcomes

Subjects	Programme Outcomes									
	A1	A2	A3	A4	A5	A6	B1	B2	C1	D1
AMA203							X		X	
ELC2501									X	
EE2761		X			X	X				
EE2721	X						X			
ME2905		X								
ELC2502									X	
ENG236		X								
EE2711	X					X		X		
EE2731	X									
EE2741	X					X				
EE2751	X				X	X	X			X
GEC2801		X							X	
IC2105			X	X						X
IC2112			X	X						X
EE3711	X						X			
EE3721	X					X	X			
EE3731	X					X	X			
EE3741	X					X	X			
EE3802	X			X						
EE3761	X									
EE3771	X		X	X	X		X	X		
EE3751	X				X		X			X
EE3781	X							X		
EE3791	X									
EE3801	X					X				

Table B4.1

Table B4.1 illustrates how the subjects support the Programme Outcomes through the teaching activities, practice on the part of students, and measurements.

## **B 5 Development of the Electrical Engineering themes in the Programme**

The Higher Diploma programme in Level 2 are designed to develop the basic principles of electrical and electronic engineering knowledge as well as integrating the related topics such as mathematics and other non-deferrable subjects. The Level 2 subjects are to support the ensuing parts of the programme in Level 3 and to establish foundations from which graduates can build a range of evolving knowledge and skills.

The subjects in Level 3 are designed to provide both further consolidation and specialised knowledge suitable to higher technician level. In the first semester the non-deferrable subjects provide solid materials in the main fields of power, machines, and circuit study. Electives are also provided so that the students may choose engineering management or building services subject. In the second semester, students are required to study computer and, power electronics as main subjects and then choose two electives from power, telecommunications, control and software engineering. All students are required to complete a final year project where an integration of electrical engineering principles are applied and individual performance is assessed.

## **B 6 The Achievement of Depth**

The need to achieve the required depth for the level of higher technicians is recognised in the design of the HD programme. The Level 2 subjects lay a solid foundation of study and the 7 weeks of Industrial Centre training provide the solid workshop skills training. The elective subjects in Level 3 provide more specialist areas which the student will wish to pursue further knowledge. Topics include power supply system analysis, telecommunications, control systems or software engineering.

The constraint of time with the need to achieve the required depth should not be compromised. The Department believes that the programme materials have been carefully arranged to make the best possible use of time, to educate our students to the level of higher technicians to be ready to contribute to local industry. The following are highlighted to reflect the salient points:

1. The teaching approach promoting critical, self-study learning with strong emphasis on applications.
2. The final year project, undertaken with strong emphasis on applications of knowledge, where students are assessed individually for their own contribution.
3. The balance of breadth with depth of knowledge, made in the overall programme design, which brings the knowledge of the graduates to a suitable higher technician level.
4. The emphasis on training in productive engineering skills and engineering design is introduced early in the programme.
5. Problem solving is advocated, as an important element of applications appreciation, throughout the programme.

## PART C : EDUCATIONAL AND ASSESSMENT METHODOLOGIES

### C 1 Teaching and Learning

#### C 1.1 PHILOSOPHY

The philosophy has been to gradually introduce an approach in which the lecturers are encouraged to "teach" less and the students to learn more. The Department's teaching approach is being revised continuously so as to enhance the students' ability to find out and learn for themselves. Teaching methods for replacing the out-dated 'chalk and talk' approach, or the 'monologue' lecturing style, with 'interactive teaching', are being further developed and promoted. It has indeed been our Department Policy to regard it as one of the top priorities, together with research. All of the classroom sessions are conducted as a combination of lecturing and tutoring, so that the active participation of the student is realized at all times. Other teaching aids such as interactive handouts, concept mapping, and computeraided learning software are also extensively utilized.

#### C 1.2 APPROACH USED

##### C 1.2.1 Teaching and Learning:

The approach is to wean students from rote-learning to self-study. The form of classroom teaching, however, is changing to become much more stimulating, with more student input expected. Tutorials are now integrated with the lectures, to give regular changes of activity within the lecture period, and thus keeping the students interested, alert, and participative.

The accepted philosophy is that 'if we perform the mental work for the learner, we reduce the learner's investment in learning, thereby reducing performance'. The student is encouraged and aided to adopt a 'deep' approach to study, which means that he should try to understand the underlying meaning rather than try to remember the words and the formulas, and to develop a critical awareness of the concepts being discussed and the relationship of these to other concepts. Emphasis is placed on the student's understanding of the basic principles and concepts. Students are not allowed to lose sight of the overall picture as a result of over-indulgence in mathematical details. Technical assumptions made in developing and applying basic theory are stressed. Emphasis is given to developing creativity and the ability to design. Students are not compelled to memorize large amounts of facts and formulas (except fundamental ones). The importance of problem solving in facilitating a full understanding of the topic is recognized. However, problem solving is not treated merely as a means of employing mathematical methods, but also for applying concepts. Problem solving is implemented extensively in all aspects of the Programme. The students are encouraged to think around the subject matter.

Handout notes are used extensively throughout the Programme, but it is generally intended that these, in themselves, are incomplete. Students will need to fill out the handouts before, during and after the lectures before the content can be regarded as complete. In this way, and by requiring students to submit regular written reports, the students develop their ability to write clearly and concisely.

From the outset, students are encouraged and provoked into taking an active role in the learning process. The quality of a student's answers to questions, and the quality of the questions asked by the student, is evaluated to provide feedback throughout the Programme in each subject. Towards the end of the 1st year, and throughout the remainder of the Programme, it is the norm

for students to give presentations of topics within the syllabus in front of their peers. This not only encourages them to adopt a self-study pattern, it also increases their self-confidence, their ability to argue from fundamentals and stresses their need to study the subject matter in depth to be able to answer questions from their peers.

### **C 1.2.2 Laboratory and Projects:**

In the Programme, the laboratory work is integrated into each subject, as is the assessment for the laboratory work. It is the subject-lecturer's responsibility to ensure that the laboratory work is being taken seriously by the students and to stimulate them by gradually moving into open-ended experiments/tests and mini-projects with design elements included.

Students are required to preview their laboratory assignments. As with lectures, the process of generating a self-learning attitude is gradual. In the early part of the Programme, laboratory sheets have fairly detailed instructions and students preview the experiments by means of a 'theory' section in the experiment instruction sheet. As students progress, less detailed information is presented and the student is expected to read around the experiment and contribute their own ideas as to how the experiment should be conducted.

Students are required to use log books for all experiments and to submit these and some formal laboratory reports for assessment.

Essentially each student is required to undertake a project. The projects are designed to be small group projects in which two or three students work on different aspects of a more ambitious project, while taking care that individual students are still assigned individual responsibility for their part of the work. This allows students to learn team work and it enables more advanced projects to be undertaken. As part of the supervision of the students' project and laboratory work, they are guided to gain skills such as the following:

1. Attention to detail and recognition that unless everything is done thoroughly, completely and correctly, their design, product or process may well be useless.
2. Ability to apply scientific methods to their work. This involves the discipline of keeping accurate and up-to-date records, to be constantly questioning both good and unexpected results, knowing how to go about experimental procedures, how to set up experiments and draw conclusions.
3. Recognition that they have to take personal responsibility for their work, to make sure that there are no mistakes, and not to assume that someone else will check their work.
4. Experience in working as part of a team, recognising that others can contribute necessary complementary skills and experience.

## **C 2 Project**

The project accounts for about 25 % of the total assessment in Level 3 and it provides an opportunity for students to apply specialised knowledge independently, to identify key engineering problems, to solve them and to communicate what is achieved orally and in a report. Thus, the project is one of the most important means whereby the aims of the Programme are achieved, and the assessment of performance in the project reflects the extent to which the student has benefited from the Programme.

## C 2.1 OBJECTIVES OF STUDENT PROJECTS

The project is intended as a challenge to intellectual and innovative abilities and to give students the opportunity to synthesize and apply the knowledge and analytical skills gained in the different disciplines. It should also provide students with some appreciation of the entire process of design and development. The progress from concept to final implementation and testing, through problem definition and the selection of alternative solutions is monitored. Students build self confidence, demonstrate independence, and develop professionalism by successfully completing the project assignment.

## C 2.2 PROJECTS PROPOSALS

Projects may be proposed by the students. They may also be proposed by academic members of staff, or jointly by student and staff. Project proposals must include an objective, a description of the method of approach, some description of the innovative features, and a cost estimate.

These proposals are then screened by the Project Committee (PC), which evaluates their suitability. The PC is normally chaired by a senior staff member. The membership includes the Programme Leader and representatives from each of the main subject disciplines who have a good research record and are involved in the teaching of the programme. The PC can accept, accept with modification, request a resubmission, or reject a project proposal. The suitability of a proposal may be judged by factors such as its intellectual level, its relevance to the aims of the Programme, the practicality in terms of time and funding allocated, and the availability of resources to carry out the project. A good project proposal defines a project which

- \* provides an intellectual challenge to an 'A' grade student;
- \* has a relatively straightforward core part which should be achievable by the *average* student;
- \* has stated objectives which reflect both of the above (i.e., 'core' and 'challenge', not necessarily explicitly);
- \* has an element of innovation, not necessarily in the research sense, but at least in the sense of 'not-covered or detailed in final-year lectures or in standard textbooks';
- \* requires the integration of skills, knowledge and understanding from - ideally - three or more subject areas or disciplines (e.g. rotating machines, electronic analogue circuits, software);
- \* will be capable of verification in some way (a control system is compared with another over a wide range of 'inputs', a simulation is compared with the system modelled - or at worst another model - an item of equipment built is tested to specification) so that no project is 'open-loop'; and
- \* will not normally be unduly expensive or require the purchase of equipment (as opposed to consumables) since it will usually be based on and around existing laboratory or research equipment (or equipment donated by industry).

## C 2.3 PROJECT MANAGEMENT

### C 2.3.1 Project Plan

At the beginning of the project, students are required to submit a clear project plan. The plan should not be too long but should cover such matters as:

- problem statement
- brief literature survey
- statement of how the problem is to be tackled

- division outline of hardware and software
- preliminary time schedule
- cost estimate

### C 2.3.2 Mid-year Progress Report

A mid-year progress report is the next stage, when students produce a two page summary of 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 PC by supervisors.

### C 2.3.3 Project Reports

A good project schedule includes adequate time for preparing a report of the appropriate standard. Two copies are submitted in mid-April, one is a formal Departmental record, while the other is circulated to the supervisor, the moderator, and the PC. To ensure that the project reports are prepared properly and of appropriate standard, students must first secure the approval of the supervisor and the moderator on the Title Page before submission of the Project Report to the Department.

### C 2.3.4 Project Assessment

1. Each project is assessed by a panel of three members, including a Chairman, a member with knowledge of the subject area (independent examiner), and the project supervisor.

The Chairman will be a senior academic staff member of the Department, with some background in the subject area.

The independent examiner will have sufficient knowledge of the subject area to be able 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.

2. All members of the Assessment Panel will read the project report before the assessment meeting. The Assessment Panel will reach their decision after:
  - a. listening to the student's presentation,
  - b. examining him orally on his work, and
  - c. seeing a demonstration of the project's outcome.
3. 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.

4. 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.
5. 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. An overall grade for the project 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.

### C 3 Industrial Centre Training

The Practical Training is done in the Industrial Centre of the Polytechnic University in the summer and throughout the year between levels 2 and 3. In this way the students gain some theoretical knowledge which they can relate to practical applications. There are a total of 9 subjects, each directed to a particular aspect of practical work. This gives students an appreciation, with some practical involvement, of fitting, machining, electrical wiring, installation, and electronic/electrical equipment manufacturing. An appreciation of practical manufacturing processes is very important to enable the students to apply their theoretical knowledge to practical problems after they graduate from the Programme and start working in industry.

The following information with regard to IC training should be noted by all Higher Diploma Student:

- These training credits will not be counted towards meeting the credit requirement for FT status of students.
- These training credits are not to be counted towards the credit requirement for award, but students have to pass (i.e. obtaining Grade D or above) IC training in order to be considered for an award.
- IC training will be graded at any time when an assessment is made. Only **ONE** aggregate grade would be given for an academic year to sum up the performance of the student in IC training for that year.
- If assessment of an IC subject completed in a particular academic year cannot be done in time for the grade to be reported in that particular year, the grade has to be reported during Semester One of the following academic year.
- The results of IC training would not be counted towards the Weighted GPA which is used for considering award classification.
- The results of IC training would be counted towards GPA calculation, which is computed at the end of every semester on the basis of the students' performance on all subjects taken since the start of their studies.

## **C 4 Student Feedback Questionnaire (SFQ)**

The Student Feedback Questionnaire (SFQ) is a system that PolyU uses to collect feedback from students on teaching and learning. The SFQ system is faculty-based, i.e., different faculties may have slightly different policies, procedures, and SFQ forms. However, the purposes, processing, and intended uses of the SFQ are essentially the same.

Under this system, students are asked to complete the SFQ in class to provide feedback on their experience of studying a subject. This SFQ exercise normally takes place in the last few weeks of the semester. However, for subjects that involve more than one teacher, it may take place earlier, when the teaching of the particular lecturer comes to an end. Some lecturers may also use the mid-semester SFQ to solicit feedback from students so as to modify or adjust their teaching to improve learning for the remaining weeks of the semester.

The PolyU values good teaching. We cherish the promotion of meaningful and relevant learning for our students, and believe that both teachers and students have a shared responsibility to enhance learning. Your feedback on teaching and learning will provide valuable information for us to assure the quality of our programmes, identify the strengths and weaknesses of the existing teaching and learning methodologies, and help us to improve the quality of teaching in the PolyU.

## Part D: ADMISSION, REGISTRATION AND ASSESSMENT

### D 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.

#### D 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.

#### D 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. 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.

#### D 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.

#### **D 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.

#### **D 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.

## **D 6 Principles of Assessment**

The prime purpose of assessment is to enable students to demonstrate that they have met the aims and objectives of the Programme, in particular that they have fulfilled the requirement of each subject and have, at the end of their study, achieved the standard appropriate to the award. Appropriate methods of assessment will be employed to achieve this purpose.

Assessment will also serve as feedback to students. Students will be informed of their performance in the assessment so that they are aware of their progress and attainment.

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.

## **D 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. 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.

## D 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.

## D 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.

## D 10 Appeal Against Examination Results

A student may appeal against the decision of the Board of Examiners within 5 working days after the public announcement of the examination results. The appeal should be made to the Head of Department in writing. The Departmental Examination Officer 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.

## D 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 D.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 D.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.

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

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 <sup>#</sup>	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	Credit transfer

Table D.11.2 Grade Point Average System

\* The overall 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 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).

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

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 and 3 are weighted 0.4 and 0.6 respectively. 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 ‘compulsory’ and ‘elective’ requirements.
- (c) Satisfying the 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.

Table D.11.3 Degree Classification Guidelines 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.

Classification	GPA or Weighted GPA <sup>@</sup>	Guidelines
1st	3.7 <sup>+</sup> - 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 <sup>+</sup> - 3.7	The student has reached a standard of performance/ attainment which is more than satisfactory but less than outstanding.
2:ii	2.3 <sup>+</sup> - 3.2 <sup>-</sup>	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 <sup>-</sup>	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’.

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.

## **D 12 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.

## **D 13 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.

**PART E: SYLLABUS**

<b>CODE</b>	<b>SUBJECT</b>	<b>PAGE</b>
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**Subject Description Form**

<b>Subject Code</b>	AMA203
<b>Subject Title</b>	Mathematics IA
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite / Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	This subject aims to introduce students to the fundamentals of basic engineering mathematics. Emphasis will be on the basic theory as well as application of mathematical methods to solving engineering problems.
<b>Subject Learning Outcomes</b>	Upon completion of the subject, students will be able to: <ol style="list-style-type: none"> <li>1. apply mathematical reasoning to analyse essential features of different engineering problems;</li> <li>2. extend their knowledge of mathematical techniques and adapt known solutions to different situations of engineering context;</li> <li>3. develop and extrapolate mathematical concepts in synthesizing and solving engineering problems;</li> <li>4. search for useful information in problem solving.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><i>Algebra of complex number:</i> Complex numbers; Geometric representation; n-th roots of complex numbers.</p> <p><i>Linear algebra:</i> Matrices and determinants; Vector spaces; Elementary algebra of matrices; Eigenvalues and eigenvectors; Normalization and orthogonality.</p> <p><i>Ordinary differential equations:</i> First and second order linear ordinary differential equations; Laplace transforms; Convolution theorem; Fourier transforms.</p>
<b>Teaching/Learning Methodology</b>	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.

<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Specific assessment methods	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
			1	2	3	4
	a. Continuous Assessment	40%	✓	✓	✓	✓
	b. Examination	60%	✓	✓	✓	✓
	Total	100%				
<p>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.</p> <p>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.</p> <p>To pass this subject, students are required to obtain grade D or above in <b>both</b> the continuous assessment and the examination components.</p>						
<b>Student Study Effort Expected</b>	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.			
<b>Reading List and References</b>	<u>Textbook:</u>					
	Chan, C.K., Chan, C.W. & Hung, K.F.	Basic Engineering Mathematics 2 <sup>nd</sup> edition	McGraw-Hill 2008			
	<u>References:</u>					
	Anton, H.	Elementary Linear Algebra 9 <sup>th</sup> edition	John Wiley & Sons 2004			
	Thomas, G.B., Weir, M.D. & Hass, J.R.	Thomas' Calculus 12 <sup>th</sup> edition	Addison Wesley 2009			
James, G.	Modern Engineering Mathematics 4 <sup>th</sup> edition	Prentice Hall 2007				

**Subject Description Form**

<b>Subject Code</b>	EE2711
<b>Subject Title</b>	Applied Electromagnetics
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To introduce to students the physical laws that govern the electromagnetic phenomena commonly encountered in electrical engineering systems.</li> <li>2. To familiarise students with the techniques for solving problems in electromagnetics.</li> <li>3. To provide students the foundation of electromagnetic field theory required for pursuing the EE programme.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Be able to apply mathematical techniques to formulate the fundamental field equations and to analyse electromagnetic phenomena related to electrical engineering systems. Appreciate the effect of material media and boundary conditions on the behaviour of field quantities. Interpret the physical meaning and phenomena behind mathematical equations and computed results.</li> <li>b. Have had hands-on experience in electromagnetic measurements and be able to compare/appreciate different kinds of field plotting mechanisms, e.g., to verify Laplace's equation with a resistance network.</li> <li>c. Be able to apply electromagnetic theory to the design of practical electromagnetic devices and components.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Static fields:</b> 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 and energy storage.</li> <li>2. <b>Time-varying Fields:</b> Faraday's Law and Lenz's Law; self-inductance, mutual inductance and stored energy.</li> <li>3. <b>Field Equations and EM Waves:</b> Maxwell's equations in integral form as a restatement of fundamentals. The continuity equation. The displacement current. Non-mathematical description of a plane-polarised wave.</li> <li>4. <b>Material Media:</b> Dipole, polarisation, permittivity, dielectrics and capacitors. MMF, ferromagnetism, permeability, reluctance and permeance, magnetisation curve and hysteresis. Magnetic circuits, permanent magnets. Conduction field.</li> <li>5. <b>Solution of Static Field Problems:</b> Hand-mapping, method of images, numerical and computer-based methods. Field analogues. Estimation of conductance, inductance, capacitance and field quantities from field plots.</li> <li>6. <b>Electromagnetic Design:</b> Magnetic circuit design for inductors, actuators and rotating machines. Design of cable insulation and capacitors. Concepts of electromagnetic interference and screening.</li> </ol>

	<p><b>Laboratory Experiments:</b></p> <ol style="list-style-type: none"> <li>Field plotting using resistance and impedance networks.</li> <li>Field plotting using the electrolytic tank.</li> <li>Field plotting using the resistive paper.</li> </ol>																																																																																															
<p><b>Teaching/Learning Methodology</b></p>	<p>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.</p> <table border="1" data-bbox="443 622 1469 808"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="9">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Tutorials</td> <td>√</td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Experiments</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										Teaching/Learning Methodology	Outcomes									a	b	c							Lectures	√		√							Tutorials	√		√							Experiments	√	√	√																																											
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**Subject Description Form**

<b>Subject Code</b>	EE2721
<b>Subject Title</b>	Electric Circuit Analysis
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To introduce the students to the fundamental concepts of electrical circuits with the aid of computer aided design packages.</li> <li>2. To provide the technical foundation for the later subjects in the areas of power systems, drives and control.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Ability to understand fundamental concepts in electrical circuits</li> <li>b. Ability to apply the appropriate techniques to solve problems in electrical circuits.</li> <li>c. Ability to solve problems using systematic approaches.</li> <li>d. Ability to analyse the transient response and steady-state response of continuous time systems.</li> <li>e. Ability to simulate, implement and perform tests for experimental circuits.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Fundamental concepts:</b> Ideal sources, Loop and nodal analysis, dependent sources, Thevenin and Norton's theorems, linearity, proportionality and superposition, instantaneous power, source loading and power transfer.</li> <li>2. <b>A.C. Analysis:</b> Phasor, impedance, admittance, power, power factor.</li> <li>3. <b>Circuit analysis in s-domain:</b> Exponential excitation, General interpretation of complex frequency, generalized impedance and admittance, Transfer function, Poles and zeros.</li> <li>4. <b>Harmonics:</b> Trigonometric Fourier series, Complex Fourier series, in systems and control applications to circuits.</li> <li>5. <b>Time domain analysis:</b> Continuity principle, transient analysis of RC, RL and RLC circuits, Solution by Laplace transform, test signals, first and second order circuits, over-damped, under-damped and critically damped responses.</li> <li>6. <b>Three phase circuits:</b> The generation of three phase power, power in three phase with star and delta loads, measuring three phase power.</li> </ol> <p><b>Laboratory Experiment:</b></p> <ol style="list-style-type: none"> <li>1. Thevenin, Norton's, and Maximum Power Transfer Theorems.</li> <li>2. 'Black Box' Measurement</li> <li>3. DC Transient in RC Circuits</li> <li>4. Transient response analysis of continuous systems</li> </ol>

<p><b>Teaching/Learning Methodology</b></p>	<p>Lectures and tutorials are the primary means of conveying the basic concepts and theories of circuits and linear systems. Practical applications are given through several experiments to supplement the concepts discussed in lectures. Laboratory preparations are introduced to encourage extra-readings on relevant materials.</p> <table border="1" data-bbox="443 367 1471 546"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="5">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> </tr> </thead> <tbody> <tr> <td>Lectures and tutorials</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Laboratory performance</td> <td></td> <td></td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>											Teaching/Learning Methodology	Outcomes					a	b	c	d	e	Lectures and tutorials	√	√	√	√		Laboratory performance			√	√	√																																																																							
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**Subject Description Form**

<b>Subject Code</b>	EE2731
<b>Subject Title</b>	Electronics
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Pre-requisite: EE2721
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To enable students to understand the fundamentals and design of basic electronic circuits.</li> <li>2. To enable students to have a better understanding of electronic engineering through integration of design, construction and testing of electronic circuits in a laboratory environment.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Identify the operation and basic applications of diodes, transistors, small signal amplifiers, power amplifiers, operational amplifiers and oscillators.</li> <li>b. Conduct the dc and ac analysis of electronic circuits so as to design single stage transistor amplifiers and analyze their frequency response.</li> <li>c. Evaluate the effects of negative feedback on electronic circuits.</li> <li>d. Report and present findings in a clear manner.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Diode and transistor circuits:</b> Current-voltage characteristics of p-n junction diode, characteristics of bipolar junction transistors (BJT) and field effect transistors (FET), load line and its applications to diode and transistor circuits, dc biasing and bias stability of bipolar and FET amplifiers.</li> <li>2. <b>Small-signal analysis of amplifiers:</b> Concept of amplifier, h-parameters of BJTs, small-signal equivalent circuits, analysis of voltage, current, and power gains, input and output impedances of RC coupled amplifiers, basic amplifier configurations, analysis of frequency response of amplifiers.</li> <li>3. <b>Power amplifiers:</b> Classification of power amplifiers, analysis of efficiency, power dissipation and distortion of class A, B, AB and C amplifiers, design considerations of power amplifiers.</li> <li>4. <b>Analogue integrated circuits:</b> Differential amplifiers, ideal and practical operational amplifiers, operational amplifier configurations, applications of operational amplifiers.</li> <li>5. <b>Feedback circuits and oscillators:</b> Types of negative feedback and their effects on gain, frequency and phase responses, distortion, noise, input and output impedances, examples of circuits with feedback, estimation of gain, principle of oscillators, conditions for oscillation, lead-lag network, Wien-bridge and other types of oscillators.</li> </ol>

	<p><b>Laboratory Experiment:</b> Bipolar junction transistor (BJT) amplifier, Junction field effect transistor (JFET) amplifier, Wien-bridge oscillator</p>																																																																																		
<p><b>Teaching/Learning Methodology</b></p>	<p>Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and practical applications are solicited through experiments and mini-projects, in which the students are required to solve design problems. Open-ended laboratory sessions are designed to follow up by extending the findings on the experiment. Students will also learn through active participation on the tutorial discussion sessions.</p> <table border="1" data-bbox="443 566 1473 745"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="4">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Tutorials</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Experiments</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table>	Teaching/Learning Methodology	Outcomes				a	b	c	d	Lectures	√	√	√		Tutorials	√	√	√		Experiments	√	√	√	√																																																										
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**Reference books:**

1. Thomas Schubert, JR. and Ernest Kim, "Active and Non-Linear Electronics", John Wiley & Sons, Inc., 1996
2. Michael Merchant, "Exploring Electronics", Prentice Hall, 1998
3. Albert Paul Malvind, "Electronic Principles", McGraw-Hill, 1999
4. Mitchel E. Schultz, "Basic Electronics", McGraw-Hill, Ninth Edition, 2003

**Subject Description Form**

<b>Subject Code</b>	EE2741
<b>Subject Title</b>	Instrumentation and Measurements
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To enable students to establish a broad knowledge base on principle of instrumentation.</li> <li>2. To enable students to understand different types measurement methods and errors in measurements.</li> <li>3. To enable students to understand typical units, standards of measurements 4. and methods of calibration.</li> <li>4. To enable students to understand the principle of operation and applications of various electrical and electronic instruments for measurements of electrical quantities.</li> <li>5. To enable students to understand characteristics and applications of various transducers.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Identify different subsystems in an instrumentation system, and describe the functions of each subsystem.</li> <li>b. Identify possible ways to reduce errors for a measurement process.</li> <li>c. Describe the operation principle of typical electrical/electronic instruments and transducers.</li> <li>d. Given a set of conditions, find the suitable measurement methods and the suitable measurement instruments/transducers.</li> <li>e. Given a set of conditions, design an analog electrical meter/bridge for the applications for the conditions.</li> <li>f. Write a technical report to present the findings in experiments.</li> <li>g. Have acquired communication skills with others in a team environment.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Preliminaries of Measurements:</b> Choice of measurement method; Precautions in measurement; Factors affecting instrument selection. (3 hours)</li> <li>2. <b>Standards, errors and Calibration:</b> Units and Standards; importance of the calibration hierarchy for product quality; Instrument and experimental errors; methods for calibration. (3 hours)</li> <li>3. <b>Analogue Instruments:</b> Moving coil, moving iron and electrodynamic instruments; Construction and principles of operation; Measurements of electrical quantities; Extension of instrument range. (6 hours)</li> <li>4. <b>Bridges:</b> General D.C. bridge theory; Construction and principles of operation; General A.C. bridge theory; classical bridges for inductance, capacitance and frequency measurements. (6 hours)</li> <li>5. <b>Oscilloscope:</b> Operating principle of CRT; Voltage, current, frequency and phase angle measurements; Probe compensation and application; Introduction to digital storage oscilloscope. (3 hours)</li> </ol>

	<p>6. <b>Electronic Instruments:</b> Direct electronic measuring meters; Methods of displaying and recording; Comparison with classical electrical measuring instruments; Application and operation principles of digital counters; Characteristics and application of digital multimeter; Instrument specifications. (9 hours)</p> <p>7. <b>Principles of Transducers:</b> Typical transducers for engineering measurement such as voltage, current, force, pressure, temperature etc.; static and dynamic characteristics of transducers. (6 hours)</p> <p><b>Laboratory Experiment:</b> Electronic multimeter. Force/displacement transducers. DC/AC bridges.</p>																																																																						
<p><b>Teaching/Learning Methodology</b></p>	<p>Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and practical applications are given through experiments, in which the students are expected to solve design problems with real-life 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.</p> <table border="1" data-bbox="443 846 1471 1014"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="7">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> <th>g</th> </tr> </thead> <tbody> <tr> <td>Lectures and tutorials</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>Laboratory performance &amp; reports</td> <td></td> <td></td> <td></td> <td></td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Teaching/Learning Methodology	Outcomes							a	b	c	d	e	f	g	Lectures and tutorials	√	√	√	√	√			Laboratory performance & reports					√	√	√																																							
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	Total student study effort	102 Hrs.
<b>Reading List and References</b>	<b>Reference books:</b> <ol style="list-style-type: none"><li>1. <u>Johnson, Curtis D.</u>, “<b>Process control instrumentation technology</b>”, Prentice Hall, 2003.</li><li>2. <u>Northrop, Robert B.</u>, “<b>Introduction to instrumentation and measurements</b>”, CRC Press, 1997</li><li>3. <u>Klaassen, Klaas B.</u>, “<b>Electronic measurement and instrumentation</b>”, Cambridge University Press, 1996</li><li>4. <u>Bell, David A.</u>, “<b>Electronic instrumentation and measurements</b>”, Prentice Hall, 1994</li><li>5. <u>Dally, James W.</u>, “<b>Instrumentation for engineering measurements</b>”, Wiley, c1993</li></ol>	

**Subject Description Form**

<b>Subject Code</b>	EE2751
<b>Subject Title</b>	Electrical Energy Systems
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>To provide an overview of the supply, utilisation and control of electrical energy</li> <li>To introduce energy and environmental issues, and assist students in placing these topics and technologies in perspective.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>To master the fundamental knowledge on electrical power systems.</li> <li>To identify, analyze, and solve technical problems using of mathematics and engineering techniques.</li> <li>To aware of equipment characteristics and environment issues on the modern electrical power system.</li> <li>To have the ability to work independently, and in teams when conducting laboratory work.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li><b>Nature of electrical energy system:</b> Power system layout, transmission and distribution structure, role of transformers. The interconnected power system. Emergence of HV DC transmission. Layout of a substation, distribution structure, overhead lines and cables, circuit breaking, overvoltage protection, protection concepts.</li> <li><b>Generation, energy &amp; environment:</b> Principles of energy conversion, power plant layout, types of generators and turbines. Pumped storage. Renewable and non-renewable sources. World energy resources. Sources of pollution - Coal: CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>2</sub>; acid rain, ozone depletion, global warming. Nuclear radiation and hazards. Environmental effects of hydro using the Three Gorges project as an example. Environmental effects of alternative energy sources. Restructuring world electricity systems. Sustainable development.</li> <li><b>Transformers:</b> Construction &amp; operating principles. 3<math>\phi</math> winding connections &amp; phase grouping. Equivalent circuits. Voltage regulation &amp; efficiency parallel operation.</li> <li><b>Line &amp; cables:</b> Overhead line construction including transposition and bundling. Primary (RLCG) and general (ABCD) parameter calculations. Line equations and performance charts. Corona loss and interference. Cable types and construction including void formation and cross bonding. Electrical stress calculation. Thermal characteristics.</li> <li><b>Tariffs:</b> Concepts of tariff design. Tariff structures. Conventional and new tariffs in different utilities. Dynamic tariff, marginal methods and load management concepts.</li> </ol> <p><b>Laboratory Experiment:</b> <u>Typical Titles</u></p> <ol style="list-style-type: none"> <li>Experiments on single phase transformer</li> <li>Experiments on three phase transformer</li> <li>Computer exercises on transmission line parameters calculations</li> </ol> <p><b>Case study:</b> <u>Typical titles</u></p>

	<ol style="list-style-type: none"> <li>Discuss the environmental impacts of nuclear power generation.</li> <li>Discuss the environmental impacts of fossil fuel power generation.</li> <li>Discuss the environmental impacts on the development of large scale hydropower station like the Three Gorges project.</li> <li>Explain why modern electric power systems are often interconnected.</li> <li>Discuss the renewable energy sources which may be used in Hong Kong.</li> </ol>																																																																																		
<p><b>Teaching/Learning Methodology</b></p>	<p><u>Lectures and tutorials</u> are used to convey the basic concepts and knowledge, to teach students the skills to identify, analyze, and solve technical problems, and to provide students feedback in relation to their learning.</p> <p><u>Laboratory experiments and case studies</u> are designed, as supplement to the lecturing materials, for students to gain practical experiences and be aware of equipment characteristics and environment issues on the modern electrical power system.</p> <table border="1" data-bbox="443 651 1469 815"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="4">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Tutorials and case studies</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Experiments</td> <td></td> <td></td> <td>√</td> <td>√</td> </tr> </tbody> </table>	Teaching/Learning Methodology	Outcomes				a	b	c	d	Lectures	√	√	√		Tutorials and case studies	√	√	√		Experiments			√	√																																																										
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	<p><b>Reference books:</b></p> <ol style="list-style-type: none"><li>1. Power System Analysis – Hadi Saadat, McGraw Hill, 1999</li><li>2. Power System Analysis – Arthur R. Bergen, Vijay Vittal, Prentice Hall, 2<sup>nd</sup> edition, 2000</li></ol>
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**Subject Description Form**

<b>Subject Code</b>	EE2761
<b>Subject Title</b>	Information Technology
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To provide the foundation knowledge in computer engineering, computer networking and data processing that is essential to modern information system design;</li> <li>2. To provide training in using information technologies to solve practical problems in engineering.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Understand the basic hardware and software structure of a computer system</li> <li>b. Understand the basic structure of the Internet and the services it provided</li> <li>c. Understand the concept of data processing and information systems</li> <li>d. Understand the basic of computer networking</li> <li>e. Have the ability to make use of Internet resources for solving problems</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b><i>Introduction to computers and computing:</i></b> Evolution and applications of computers and Microprocessors. Major computer hardware components: Memory and I/O. Software components – applications, utilities and operating systems. Case study: Windows and Linux. Internet and Internet services. Multi-tier Internet model. Internet programming case studies: web page design.</li> <li>2. <b><i>Introduction to data processing and information systems:</i></b> Introduction to Database systems – Case study: Microsoft Access/MySQL. Introduction to Information systems. System development life cycle. Structured tool for system analysis and design.</li> <li>3. <b><i>Networking Essentials:</i></b> Introduction to computer networking – LAN and WAN technologies, clients and servers, networking topologies. Networking models – OSI 7-layer model, IEEE 802 model. Network protocol case studies: Ethernet TCP/IP. Networking devices – modem, hub, bridge, switch, and router.</li> </ol> <p><b>Laboratory Experiments and other Practical Work:</b></p> <ol style="list-style-type: none"> <li>1. Installation and use of Windows</li> <li>2. Installation and use of Linux</li> <li>3. Web server configuration and setup using Apache</li> <li>4. Database management using Microsoft Access / MySQL</li> </ol>

<p><b>Teaching/Learning Methodology</b></p>	<p>Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and practical applications are given through laboratory experiments and case study, 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.</p> <table border="1" data-bbox="443 512 1471 710"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="5">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Tutorials</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Experiments</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>Case study</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table>										Teaching/Learning Methodology	Outcomes					a	b	c	d	e	Lectures	√	√	√	√		Tutorials	√	√	√	√		Experiments	√	√	√	√	√	Case study	√	√	√	√	√																																															
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**Reading List and  
References**

**Reference books:**

1. P. Norton, *Introduction to Computers*, 3<sup>rd</sup> ed., McGraw Hill, 1999.
2. S.M. Sarwar, *Linux, the textbook*, 1<sup>st</sup> ed., Addison Wesley, 2002.
3. H.M. Deitel, P.J. Deitel and T.R. Nieto, *Internet and World Wide Web: How to Program*, Prentice Hall, 2002.
4. W. Redmond, *MCSE Training Kit: Networking Essentials Plus*, Microsoft Press, 2000.
5. C.J. Date, *An Introduction to Database Systems*, 5<sup>th</sup> ed., Addison-Wesley, 2000.
6. K.C. Laudon and J.P. Laudon, *Management Information Systems*, 6<sup>th</sup> ed., Prentice-Hall, 2000

**Subject Description Form**

<b>Subject Code</b>	EE3711
<b>Subject Title</b>	Analogue and Digital Circuits
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Pre-requisite: EE2721, EE2731
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To enable students to understand the operation of digital and analog circuits</li> <li>2. To enable students to design, and verify the operation of digital and analog circuits</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. To understand the operations of fundamental digital circuits and analog circuits studied</li> <li>b. To be able to analyze and design fundamental digital circuits</li> <li>c. To have practical experience on digital and analog circuit analysis and design</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Digital system fundamentals:</b> Number systems and codes used in digital systems, truth table, Boolean postulates and theorems, logic gates and their characteristics.</li> <li>2. <b>Analysis and synthesis of combination circuits:</b> Simplification techniques, algebraic method, Karnaugh maps, don't care terms, multiple output prime implicant table, design using common MSI combinational circuits, hazards.</li> <li>3. <b>Digital integrated circuits:</b> TTL, MOS, ECL, structure of a basic logic gates, input and output V-I characteristics, transfer characteristics, switching thresholds, noise margins, propagation delay, rise time, fall time, transmission line effects, inter-family interfacing of digital ICs.</li> <li>4. <b>Sequential Circuits:</b> Typical structure, operation, design and applications of flip-flops, design and analysis of sequential circuits, structures of registers, counters and memory unit, introduction to Algorithmic State Machines and design of a synchronous circuits.</li> <li>5. <b>Signal conversion:</b> Voltage comparator, Schmidt triggers, analogue switches and sample &amp; 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.</li> <li>6. <b>Phase-locked Loop (PLL) circuits:</b> PLL circuits and their applications.</li> </ol> <p><b>Laboratory Experiment:</b> Logic circuit I, Logic circuit II</p>

<p><b>Teaching/Learning Methodology</b></p>	<p>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 analogue and digital circuits and apply the fundamental theory and knowledge learned to practice.</p>																																																																																																															
<p><b>Assessment Methods in Alignment with Intended Learning Outcomes</b></p>	<table border="1" data-bbox="443 367 1465 555"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="3">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Tutorials</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Experiments</td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table> <table border="1" data-bbox="443 633 1465 987"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="10">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1. Examination</td> <td>60%</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Test</td> <td>25%</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Laboratory</td> <td>10%</td> <td>√</td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4. Home work or in-class exercises</td> <td>5%</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>The outcomes on principle, analysis and design are assessed by the usual means of examination and test whilst those on practical experiences of circuit analysis and design are evaluated through laboratory work.</p>											Teaching/Learning Methodology	Outcomes			a	b	c	Lectures	√	√		Tutorials	√	√		Experiments	√	√	√	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%										
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**Subject Description Form**

<b>Subject Code</b>	EE3721
<b>Subject Title</b>	Computer System Principles
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Pre-requisite: ENG236
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To enable students to establish a broad knowledge of the organization and peripherals of a small computer system.</li> <li>2. To enable students to understand and apply assembly language programming.</li> <li>3. To enable students to develop a simple embedded computer system</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Given specifications of an application and the instruction set of the microprocessor, design an assembly program to carry out the necessary operations.</li> <li>b. Able to understand functions of basic computer peripherals.</li> <li>c. Given a set of conditions, design a basic computer system.</li> <li>d. Able to think logically and be able to present results in writing.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><b>COMPUTER SYSTEMS HARDWARE AND OPERATIONS:</b></p> <ol style="list-style-type: none"> <li>1. <b>Processor operation and internal architecture:</b> Operations of data registers, buses and data path, operations of ALU, arithmetic hardware, and general pipeline architecture.</li> <li>2. <b>Memory organization:</b> Characteristics of current memory technologies. Memory hierarchies and memory decoding mechanism.</li> <li>3. <b>Input and output systems:</b> Direct I/O system and memory mapped I/O; handshaking control, programmed I/O; interrupt and polling mechanisms.</li> <li>4. <b>Microprocessor hardware and interfacing:</b> System bus organization and interfacing techniques, CPU bus timing, system bus structure. Interface and operations of LSI chips applied in a computer system including: interrupt controller, UART and PIO.</li> </ol> <p><b>ASSEMBLY LANGUAGE PROGRAMMING</b></p> <ol style="list-style-type: none"> <li>5. <b>Memory addressing space and data representation:</b> Internal registers of 8086, addressing modes in 8086 soft-ware model.</li> <li>6. <b>Assembly language program:</b> Basic elements of an assembly language program, instruction mnemonics and directives, arithmetic operations and logical operations.</li> <li>7. <b>Programming techniques:</b> Arithmetic manipulations, elementary programming constructs, parameter passing, data initialization.</li> <li>8. <b>Coding and debugging:</b> Conversion of source programs to machine codes, use of software debugging monitor, Compilation of assembly source program, linking of object files.</li> </ol> <p><b>Laboratory Experiment:</b> 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.</p>

<p><b>Teaching/Learning Methodology</b></p>	<p>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 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.</p>																																																																																																								
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**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, 6<sup>th</sup> Edition, Prentice Hall, 2003
3. W.A. Triebel and A. Singh, The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications, 4<sup>th</sup> Edition, Prentice Hall, 2003

**Subject Description Form**

<b>Subject Code</b>	EE3731
<b>Subject Title</b>	Electromechanical Energy Conversion
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To provide students a general knowledge on common types of electric machines.</li> <li>2. To provide students the basic techniques of steady-state electric machine analysis.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Explain the construction, operating principles, performance characteristics, control and applications of major types of electric machines.</li> <li>b. Analyse the steady-state performance of electric machines using appropriate equivalent circuit models.</li> <li>c. Operate practical electric machines and to conduct relevant tests and experiments.</li> <li>d. Present results of electric machine studies in the form of tables, graphs, and written reports.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>General principles:</b> Force as rate of change of magnetic field energy with position. Singly- and doubly-excited devices. Primitive linear and rotary machines. Transformer and motional e.m.f.s.</li> <li>2. <b>Machine rating:</b> Losses, temperature rise and cooling methods. Thermal ratings. Transient heating.</li> <li>3. <b>Windings:</b> Phase and commutator windings. m.m.f. and flux density distribution in uniform air gap and salient-pole machines. Winding factors. E.m.f. equation. Harmonics. Production of rotating field.</li> <li>4. <b>D.C. machines:</b> Construction. E.m.f equation. Armature reaction and commutation. Operating characteristics of shunt, series and compound machines. Testing. Speed control.</li> <li>5. <b>Synchronous machines:</b> Cylindrical and salient-pole rotor construction. Synchronous impedance. Two-axis representation. Voltage regulation. Performance on infinite busbars. Power/load angle relationship. Synchronising torque. Stability. Synchronous motor.</li> <li>6. <b>Induction machines:</b> Squirrel cage and wound-rotor construction. Equivalent circuit. Torque-slip relationship. Starting, braking and generating. Testing. Speed control. Single-phase induction motors.</li> <li>7. <b>Special machines:</b> Operating principles and characteristics of shaded-pole motor, reluctance motor, hysteresis motor, universal motor, stepping motor and brushless d.c. motor.</li> </ol> <p><b>Laboratory Experiments:</b></p> <ol style="list-style-type: none"> <li>1. Load test, efficiency and speed control of a d.c. motor.</li> </ol>

	2. Performance evaluation of a three-phase cage induction motor. 3. Synchronous motor V-curves. 4. Temperature rise and ratings.																																																																																																																				
<b>Teaching/Learning Methodology</b>	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.																																																																																																																				
<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	<table border="1" data-bbox="443 568 1471 748"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="4">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Tutorials</td> <td>√</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>Laboratory work</td> <td></td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table> <table border="1" data-bbox="443 824 1471 1182"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="10">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1. Examination</td> <td>60%</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Tests</td> <td>20%</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Laboratory work and reports</td> <td>15%</td> <td></td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>4. Assignment</td> <td>5%</td> <td>√</td> <td>√</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td><b>Total</b></td> <td><b>100%</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p data-bbox="443 1200 1471 1335">It is a fundamental subject on electric machines. 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.</p>											Teaching/Learning Methodology	Outcomes				a	b	c	d	Lectures	√	√	√		Tutorials	√	√			Laboratory work		√	√	√	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%	√	√									<b>Total</b>	<b>100%</b>										
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<b>Reading List and References</b>	<b>Reference books:</b> <ol style="list-style-type: none"> <li>C. G. McPherson and Robert D. Laramore, <i>An Introduction to Electrical Machines and Transformers</i>. 2<sup>nd</sup> Ed. NY: John Wiley and Sons, 1990</li> <li>S. A. Nasar, <i>Electric Machines and Transformers</i>. NY: Macmillan Publishing Company, 1998</li> </ol>																																																																																																																				

### Subject Description Form

<b>Subject Code</b>	EE3741
<b>Subject Title</b>	Power Transmission and Distribution
<b>Credit Value</b>	3
<b>Level</b>	5
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Pre-requisite: EE2751
<b>Objectives</b>	1. The objective of this course is to introduce students to the fundamental knowledge which is essential for all electrical power engineers. It leads to a deeper insight into the design, power systems.
<b>Intended Learning Outcomes</b>	Upon completion of the subject, students will be able to: a. To master the fundamental knowledge and analytical techniques on electrical power systems. b. To identify, analyze, and solve technical problems to power system design, planning, and operation, making use of mathematics and engineering techniques. c. To aware of equipment characteristics and environment impacts on the modern electrical power system.
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Power System Layout:</b> Energy resources, renewable energy. Busbar systems and earthing practices. Tariff. Power factor improvement.</li> <li>2. <b>Reactive power and voltage control:</b> Voltage drop and power loss calculation. Voltage control using tap-changing and booster transformer, regulator, series and shunt compensation. Reactive power flow.</li> <li>3. <b>Surges:</b> Travelling wave, surge impedance and standing voltage. Lightning and switching surges. Surge mitigation, reflection and refraction. Use of lattice diagram. Protection against overvoltage.</li> <li>4. <b>Fault analysis:</b> 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 currents and voltages concepts and effects on protection setting.</li> <li>5. <b>Switchgear and protection:</b> 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.</li> <li>6. <b>Load flow:</b> Concepts &amp; formulation of load flow. Nonlinear loadflow equations and iterative solution methods, including Gauss-Seidal and Newton-Raphson methods. Power flow design case study.</li> </ol> <p><b>Laboratory Experiment:</b> <u>Typical titles</u></p> <ol style="list-style-type: none"> <li>1. Voltage regulation and reactive power compensation for short and medium length transmission lines.</li> <li>2. Static and electromechanical current measuring relays.</li> <li>3. Studies of surges on transmission lines</li> <li>4. Load flow analysis using interactive package "Powerworld"</li> <li>5. Symmetrical components</li> <li>6. Effects of different earthing methods in distribution system</li> </ol>

	<p>7. Grading of overcurrent relays</p> <p><b>Case study: Typical titles</b></p> <ol style="list-style-type: none"> <li>Sketch the layout of a double, 1 ½ and mesh busbar systems? Discuss their features on operation, cost, protection and control.</li> <li>What is the purpose of tariff? Describe the structure of different tariff systems.</li> <li>What is energy management system (EMS)? How tariff structure can help in EMS.</li> <li>Explain why reactive power can influence voltage regulation in transmission lines.</li> <li>What is series and shunt compensation? Explain their working principles and pros and cons.</li> <li>How booster transformer works to control the flow in transmission lines? Analysis their working principles with derived flow equations.</li> <li>Describe the types of surges that would occur in the power system and briefly explain how they are formed.</li> <li>Why surges will travel basically in the speed of light? Does it actually travel physically in the power system?</li> <li>Explain the concept theory on the formation of sequence impedances in the analysis of unsymmetrical load or fault.</li> <li>Find out the effect of earthing method on the healthy phase voltage during the L-E fault.</li> <li>Show the calculation of the phase and sequence current flows in both sides of a three phase, two winding transformer connected in delta – star.</li> <li>Explain how a SF6 circuit breaker works. What is its main feature and drawback when applied in the power system?</li> <li>Explain how arc is controlled in oil circuit breakers.</li> <li>Explain how the surge is formed when the contact of circuit breaker is opened.</li> <li>Why switching of capacitor need special circuit breaker? Explain the surge produced in switching capacitors.</li> <li>Why protection system is needed in the power system although most power equipments like transformers, cables, etc. are very reliable? Broadly classify the protection systems employed in the power system.</li> <li>What protection system is normally used in distribution system? Explain their operation criteria.</li> <li>Explain the difference between Gauss-Seidal and Newton-Raphson load flow methods?</li> <li>Study different types of on load tap changers. Explain their working principle and the merits of using on load tap changers.</li> <li>What is ring and radial distribution system? Compare their merits.</li> </ol>																																																																																														
<p><b>Teaching/Learning Methodology</b></p>	<p>The lecturer was the Planning Engineer in CLP. He had shared his 10-year experiences/knowledge with students via lectures and tutorials for conveying the concept and theories. The site visit to CLP System control and Castle Peak Power Power station has reinforced the pragmatic design and application in a realistic system. Problem solving skill and team work are trained via Laboratory work. The quiz system (extra credits for positive response during lecturing) encouraged students participation at classroom.</p>																																																																																														
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<b>Student Study Effort Expected</b>	Class contact:	
	▪ Lecture/Tutorial	36 Hrs.
	▪ Laboratory	12 Hrs.
	Other student study effort:	
	▪ Laboratory preparation/report	12 Hrs.
	▪ Self-study	42 Hrs.
	Total student study effort	102 Hrs.
<b>Reading List and References</b>	<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Elements of Power System Analysis – William D. Stevenson, Jr., McGraw Hill, 4<sup>th</sup> edition or later, 1982 or later.</li> <li>2. Electric Power Systems – B.M. Weedy, Wiley, 3<sup>rd</sup> edition or later, 1988 or later.</li> </ol> <p><b>Reference books:</b></p> <ol style="list-style-type: none"> <li>1. Power System Analysis – Arthur R. Bergen, Vijay Vittal, Prentice Halk, 2<sup>nd</sup> edition, 2000.</li> <li>2. Modern Power System Analysis – Turan Gönen, Wiley, 1988 or later</li> </ol>	

**Subject Description Form**

<b>Subject Code</b>	EE3751
<b>Subject Title</b>	Electrical Services in Buildings
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To enable students to understand the major design features, operating characteristics and functions of electrical and electronic equipment used in building services.</li> <li>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 and lighting systems in buildings.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Be able to plan efficient, safe and high quality distribution systems for domestic, commercial and industrial buildings.</li> <li>b. Be proficient to assess the suitability of different vertical transportation systems and fire fighting systems for a building.</li> <li>c. Be able to design and evaluate the effectiveness of lightning protection systems.</li> <li>d. Be able to integrate the lighting requirements and operating characteristics of light sources to the design of interior lighting and exterior lighting.</li> <li>e. Be able to search for information in solving technical problems.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Power Distribution in Buildings</b> - 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.</li> <li>2. <b>Requirements for Safe Design</b> - Overview of Supply Rules and Regulations, earth fault, electric shock and overcurrent protection. Fuses, MCB, MCCB and ACB design and selection criteria. Co-ordination of protection systems. Cable and wiring systems design.</li> <li>3. <b>Interference and power quality</b> - Installation requirements, grouping, interference, noise suppression and power supply in communication systems. Electromagnetic compatibility. Harmonics and voltage dips issues.</li> <li>4. <b>Lightning Protection Systems</b> - Lightning phenomena, estimation of exposure risk, requirements for system components. Standards for protection of structures against lightning.</li> <li>5. <b>Vertical Transportation Systems</b> - Lift, hoist and escalator drives, safety requirements and drive characteristics, grade of service and round trip time.</li> <li>6. <b>Lighting</b> - Characteristics of light sources. Classification of luminaries. Lamp control. Interior lighting design. Glare index calculation. Colour rendering. Utilisation of daylight. Exterior lighting design.</li> <li>7. <b>Fire Fighting Systems:</b> Outline, regulations, requirements and components of fire alarm systems, fire sprinkler systems, heat and smoke detector systems and BTM/BCF systems.</li> </ol> <p><b>Case Study:</b></p> <ol style="list-style-type: none"> <li>1. Distribution systems design for typical buildings in Hong Kong</li> <li>2. Applications of overcurrent and earth fault protection</li> </ol>

	<ol style="list-style-type: none"> <li>3. Co-ordination of various types of protective devices</li> <li>4. Electrical power quality issues in building services</li> <li>5. Lightning protection systems design</li> <li>6. Interior lighting and exterior lighting designs</li> <li>7. Fire protection for domestic, commercial and industrial buildings</li> </ol>																																																																																														
<b>Teaching/Learning Methodology</b>	<p>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.</p> <table border="1"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="5">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Tutorials</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Mini-projects</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table>	Teaching/Learning Methodology	Outcomes					a	b	c	d	e	Lectures	√	√	√	√		Tutorials	√	√	√	√		Mini-projects	√	√	√	√	√																																																																	
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**Subject Description Form**

<b>Subject Code</b>	EE3761
<b>Subject Title</b>	Power Electronics and Drives
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To enable students to understand the different forms of energy conversion via power electronic means.</li> <li>2. To enable students to understand the electrical characteristics and thermal considerations of various power electronic devices; such as BJT, power MOSFET, thyristors, GTO, IGBT, etc.</li> <li>3. To enable students to understand the operation principles circuit topologies, and basic design of various power electronic converters, such as controlled rectifiers, AC voltage controllers, dc-dc choppers and inverters.</li> <li>4. To enable students to understand the applications of power electronic converters in drive applications.</li> <li>5. To enable students to establish an in-depth understanding on various drive systems in the local industry.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Given a set of conditions, identify power electronic devices/system for application in these conditions.</li> <li>b. Given a set of operating conditions of a power electronic device, compute the heat transfer and design heat sink for the power device.</li> <li>c. Given a typical converter circuit, explain its operation and sketch the voltage and currents waveforms at various locations of the circuit.</li> <li>d. Given a typical converter circuit, know loading and operating conditions, compute and specify the required voltage and current ratings of the major components of the circuit.</li> <li>e. Perform a basic design of converter circuit.</li> <li>f. Describe the operation principle and characteristics of various power electric drive systems.</li> <li>g. Given an industrial application, identify the type and configuration of converter and drive system for the application.</li> <li>h. Write a technical report to present the findings in experiments.</li> <li>i. Able to work effectively in a team in performing experiments and reporting</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Power semiconductor device</b> - Power BJT, MOSFET, IGBT, thyristor and GTO.</li> <li>2. <b>Controlled Rectifiers</b> - Single-phase and three-phase AC/DC controlled rectifiers. Rectification and inversion. Semi-converters, full-converters and dual converters. Design of converter circuits.</li> <li>3. <b>AC Voltage Controllers</b> - Single-phase and three-phase voltage controllers. Phase control and integral-cycle control. Half-wave and full-wave controllers.</li> <li>4. <b>DC Choppers</b> - Step-down and step-up choppers. Thyristor chopper circuits. Chopper circuit design.</li> <li>5. <b>Inverters</b> - Single-phase and 3-phase bridge inverters. Voltage and frequency control. Pulse-Width-Modulation techniques. Harmonic reduction.</li> <li>6. <b>Electric Drive Systems</b> - D.C. drives fed from 1-phase and 3-phase controlled-rectifiers. Chopper-fed d.c. drives. 1,2 &amp; 4 quadrant operations. Induction motor drives fed from stepped wave/PWM inverters.</li> </ol>

	<p><b>Laboratory Experiments:</b>                  Typical SCR circuits. DC-DC chopper circuits. Computer simulations on fully/half controlled rectifiers.</p> <p><b>Case study:</b>                  Dive system of elevators &amp; MTRC</p>																																																																																							
<p><b>Teaching/Learning Methodology</b></p>	<p><u>Lectures and tutorials are effective teaching methods:</u></p> <ol style="list-style-type: none"> <li>To provide an overview or outline of power electronics.</li> <li>To introduce fundamental concepts and knowledge in electric power conversion using power electric technique and basic power converter topologies.</li> <li>To explain difficult ideas and concepts.</li> <li>To motivate and stimulate students interest in power electronics</li> <li>To provide students feedback in relation to their learning.</li> </ol> <p><u>Laboratory works is an essential ingredient of this subject:</u></p> <ol style="list-style-type: none"> <li>To supplement the lecturing materials.</li> <li>To add real world experience for the students.</li> <li>To provide deep understanding of power converters operation.</li> <li>To enable students to organise principle and challenge ideas.</li> </ol> <table border="1" data-bbox="443 846 1471 1003"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="10">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> <th>g</th> <th>h</th> <th>i</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>Tutorials</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>Experiments</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table>											Teaching/Learning Methodology	Outcomes										a	b	c	d	e	f	g	h	i	Lectures	√	√	√	√	√	√	√			Tutorials	√	√	√	√	√	√	√			Experiments	√	√	√	√	√	√	√	√	√																											
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<p><b>Reading List and References</b></p>	<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>Muhammad H. Rashid, Power Electronics: Circuits, Devices and Applications, 3<sup>rd</sup> Edition, Prentice Hall, 2004</li> </ol>																																																																																							

**Reference books:**

1. Ned. Mohan, Tore M. Undeland, William P. Robbins, Power Electronics: Converters, Applications & Design, 3rd Edition, Wiley, 2003
2. Bimal K. Bose, Power Electronics and Variable Frequency Drives: Technology and Applications, IEEE Press 1997
3. Skvarenina, T.L., "The Power Electronics Handbook", CRC Press, 2002
4. F. Mazda, "Power Electronics Handbook", Newnes 1997, 3<sup>rd</sup> Edition
5. Bradley, D.A., "Power Electronics", London; New York: Chapman & Hall, 1995, 2<sup>nd</sup> Edition
6. Vithayathil, J. " Power Electronics: Principles and Applications", New York, N.Y.: McGraw-Hill, 1995
7. Lander, C. W., "Power Electronics", McGraw-Hill, 1993, 3<sup>rd</sup> Edition

**Subject Description Form**

<b>Subject Code</b>	EE3771
<b>Subject Title</b>	Project
<b>Credit Value</b>	9
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Pre-requisite: At least 30 credits of level 2 Subject to approval of the Project Coordinator
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To ensure students have an opportunity to apply specialised theoretical knowledge together with practical skill to an identified engineering problem, to solve them and to communicate what is achieved orally and in a report.</li> <li>2. To ensure student to work effectively and efficiently in a team for a technical project (students are normally grouped into teams of three.)</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. To apply specialized knowledge.</li> <li>b. To identify key engineering problems, to solve them and to communicate what is achieved orally and in a written report.</li> <li>c. To develop a project which is sufficiently challenging.</li> <li>d. To monitor the progress of project from concept to final implementation and testing, through problem definition.</li> <li>e. To synthesize and apply their knowledge, analytical and practical skills gained in various disciplines</li> <li>f. To build team spirit, confidence and develop professionalism by successfully completing the project.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><b>Choice of Project</b> 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.</p> <p>The suitability of a proposal may be judged by factors such as its intellectual level, level of difficulty in technical aspects, relevance to the aims of the Programme, practicality in terms of time, funding and availability of resources.</p> <p><b>Project Plan</b> At the beginning of the project, students are required to submit a clear project plan (formal project proposal). The plan should not be too long but should cover such matters as:</p> <ul style="list-style-type: none"> <li>– problem identification statements</li> <li>– brief literature survey, background theory</li> <li>– suggested methods to solve the problem</li> <li>– division outline of hardware and software</li> <li>– preliminary time schedule</li> <li>– cost estimate</li> </ul> <p><b>Interim Progress Report</b> A progress report submitted between the end of the 1<sup>st</sup> semester and the start of the 2<sup>nd</sup> semester, when students produce a summary of 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 project coordinator by supervisors.</p>

**Final Project Report**

A good project schedule includes adequate time for preparing a report of the appropriate standard. One hardcopy copy and two CDs are submitted, before the examination period. These will be given to the Assessment Panel (see Assessment below) for understanding of the student's work and for assessment purposes. To ensure that the project reports are prepared properly and of appropriate standard, student groups must first submit a draft of the report to the supervisor for comments before final submission.

At the end of the 2<sup>nd</sup> semester, 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, 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,
- examining him orally on his work, and
- seeing a demonstration of the project's outcome.

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.

**Method of Assessment: 100% continuous assessment**

**I. Formal Project Proposal**

Students are required to submit a formal project proposal when the project is started. One hardcopy is required. The length of the proposal should be limited to 6 pages, excluding appendix, if any. **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

**Assessment Criteria**

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

**II. The Interim Progress Report**

Students are also required to submit an interim progress report at about the middle of project duration. Two hardcopies are required. The length of the proposal should be limited to 15 pages, excluding appendix, if any. **This will contribute to 15% of the final grade.**

	<p>The contents of the progress report should include:</p> <ul style="list-style-type: none"><li>A. Aims of the project (especially any change from the original aims).</li><li>B. Brief outline of the theory.</li><li>C. Work that has been carried out up to the date.</li><li>D. The system design and the block diagram of the system, plus some brief descriptions on the theory.</li><li>E. Difficulties encountered and the measures taken to solve them.</li><li>F. Proposed time table / schedule for the rest of the work up to the end of the project.</li><li>G. Difficulties expected in the coming period.</li></ul> <p><b>Assessment Criteria</b></p> <ul style="list-style-type: none"><li>1. <i>Method: alternatives and feasibility.</i></li><li>2. <i>Design / Implementation / Results.</i></li><li>3. <i>Project management.</i></li><li>4. <i>Writing quality.</i></li></ul> <p><b>III. The Final Report</b></p> <p>In writing a report it is advisable to form a framework for the report first. You may start with the formation of the titles of the chapters. Then you proceed on to decide the titles and structure of the sections within each chapter. Continuing the process, each section may be further expanded into appropriate sub-sections, divisions and sub-divisions etc., until a complete framework is formed. <b>The final report will contribute to 50% of the final grade.</b></p> <p>The content of the final report includes:</p> <ul style="list-style-type: none"><li>A. Aims of the project (especially any change from the original aims).</li><li>B. The motivation behind the project and a brief outline of the project work.</li><li>C. A summary of work done or developed in the project (not work done by others).</li><li>D. The system design and the block diagram of the system, plus some brief descriptions on the theory.</li><li>E. Testing and simulation results.</li><li>F. Comments on results obtained.</li><li>G. Difficulties encountered and the measures taken to solve them.</li><li>H. The achievement of the project, the conclusions from the work and suggestions for further work.</li><li>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.</li><li>J. A list of the references referred to the source of information in the report. This is compulsory.</li></ul> <p><b>Assessment Criteria</b></p> <ul style="list-style-type: none"><li>1. <i>Problem identification.</i></li><li>2. <i>Conceptual clarity and accuracy.</i></li><li>3. <i>Technical approach used.</i></li><li>4. <i>Literature search</i></li><li>5. <i>Writing quality and format of report</i></li></ul> <p><b>IV. The Presentation and Demonstration</b></p> <p>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.</p> <p>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 fulfillment of project objectives.</p> <p><b>The presentation and demonstration will contribute to 30% of the final grade.</b></p> <p><b>Assessment Criteria</b></p> <ul style="list-style-type: none"><li>1. <i>Problem identification.</i></li><li>2. <i>Conceptual clarity and accuracy.</i></li><li>3. <i>Technical methodology.</i></li><li>4. <i>Successfulness of the demonstration.</i></li><li>5. <i>Fluency and confidence in presentation and demonstration.</i></li></ul> <p><b>Note 1:</b> Each project group has to submit/carry out all the above four components before he/she is considered to pass the FYP.</p>
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	<p><b>Note2:</b> The final grade for the FYP will be calculated by taking the weighted average of the grades from the above four components.</p> <p><b>Note3:</b> Although it is a group project, different grades may be awarded to different members of the group if it is found that contributions from different members vary significantly.</p>																																																																																		
<p><b>Teaching/Learning Methodology</b></p>	<p>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.</p> <table border="1" data-bbox="443 562 1469 770"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="6">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> </tr> </thead> <tbody> <tr> <td>Discussion with the project Supervisor</td> <td>√</td> <td></td> <td>√</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Wiring of the project proposal</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td>√</td> <td></td> </tr> <tr> <td>Writing of the interim report</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Writing of the final report</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>Presentation and demonstration</td> <td></td> <td>√</td> <td></td> <td></td> <td></td> <td>√</td> </tr> </tbody> </table>	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		√				√																																		
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<p><b>Student Study Effort Expected</b></p>	<table border="1" data-bbox="443 1173 1469 1617"> <tr> <td>Class contact:</td> <td></td> </tr> <tr> <td>▪ Briefings</td> <td>5 Hrs.</td> </tr> <tr> <td>▪ Individual Discussions with supervisor</td> <td>~15 Hrs.</td> </tr> <tr> <td>Other student study effort:</td> <td></td> </tr> <tr> <td>▪ Information search, self study</td> <td></td> </tr> <tr> <td>▪ Execution of the project, report writing, preparation of presentation</td> <td>~240 Hrs.</td> </tr> <tr> <td>Total student study effort</td> <td>260 Hrs.</td> </tr> </table>	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.																																																																				
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<p><b>Reading List and References</b></p>	<p>Nil</p>																																																																																		

**Subject Description Form**

<b>Subject Code</b>	EE3781
<b>Subject Title</b>	Systems and Control
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To introduce various principles and techniques utilized in the analysis and design of feedback control systems, classical and modern control techniques with the aid of computer aided control system design packages. In particular:</li> <li>2. To facilitate a solid understanding of principles of open and closed-loop control systems</li> <li>3. To provide students a working knowledge of analytical tools such as Matlab</li> <li>4. To enable students to design control systems in time and frequency domains to solve multidisciplinary problems</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Understand the concepts of open-loop and closed-loop control systems.</li> <li>b. Obtain transfer functions for electromechanical systems.</li> <li>c. Predict the qualitative, quantitative time response behavior and stability of a linear system from knowledge of the pole and zero locations.</li> <li>d. Design a control system to meet response time and overshoot constraints.</li> <li>e. Use Matlab for design and simulation.</li> <li>f. Understand the concept of frequency response and able to plot and interpret Nyquist and Bode Plots.</li> <li>g. Ability to design control systems based on PID and able to tune such controllers.</li> <li>h. Ability to effectively communicate experimental results in written and oral reports.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction to feedback control systems:</b> Open-loop and closed loop systems, industrial process control systems, systems with time delay, digital control system, servos and regulators (6 hours).</li> <li>2. <b>Control system components:</b> Electronic, electrical and electro-mechanical system components, transducers and actuators, d.c. and a.c. servo motors (5 hours).</li> <li>3. <b>Control system analysis:</b> Steady state errors, dynamic response, control system performance criteria, relationship between time and frequency response, control system stability (6 hours).</li> <li>4. <b>Control system design:</b> Computer aided control system design, frequency domain methods, Bode plot, Nyquist diagram, lead-lag compensator (18 hours).</li> <li>5. <b>Industrial controllers:</b> Basic ideas of process control systems, proportional controllers, effects of integral and derivative control actions on system performance, manual and automatic tuning of controllers (3 hours).</li> </ol>

	<p><b>Laboratory Experiment</b> There will be three laboratory experiments on the topics of position control, frequency response and three-term controllers (3×3 hours).</p>																																																																															
<p><b>Teaching/Learning Methodology</b></p>	<p>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.</p> <table border="1" data-bbox="443 573 1465 757"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="8">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> <th>g</th> <th>h</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Tutorials</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Experiments</td> <td></td> <td></td> <td></td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table>										Teaching/Learning Methodology	Outcomes								a	b	c	d	e	f	g	h	Lectures	√	√	√	√	√	√	√		Tutorials	√	√	√	√	√	√	√		Experiments				√	√	√	√	√																										
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**Subject Description Form**

<b>Subject Code</b>	EE3791
<b>Subject Title</b>	Software Engineering
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	1. To provide students knowledge of software engineering techniques and their applications in producing high-quality software systems.
<b>Intended Learning Outcomes</b>	Upon completion of the subject, students will be able to: <ul style="list-style-type: none"> <li>a. Able to appreciate the importance of software engineering and understand different software engineering process models and methodologies.</li> <li>b. Able to apply software engineering techniques to prepare the requirement and specification documents.</li> <li>c. Compare the characteristics of classical software engineering and object-oriented system development.</li> <li>d. Able to work effectively in a team setting.</li> </ul>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction:</b> Concepts of well engineered software; software life-cycle; exploratory programming, software evolution; reliability and human factors in software engineering.</li> <li>2. <b>Software specification:</b> Requirements definition and specification, requirements validation and prototyping, formal specification.</li> <li>3. <b>Software design techniques:</b> Object-oriented design; function-oriented design and user interface design.</li> <li>4. <b>Software validation:</b> Top-down and bottom-up testing; structural testing; programme inspections.</li> <li>5. <b>Software management:</b> Software management structures; project planning and scheduling; cost estimation; software maintenance and documentation.</li> <li>6. <b>Computer-Aided Software Engineering:</b> Introduction of CASE.</li> </ol>

<p><b>Teaching/Learning Methodology</b></p>	<p><b>Mini project:</b> Form a software development team and establish the requirement and specification documents for a software system defined by the subject lecturer.</p> <p><b>Teaching/Learning Methodologies:</b> Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and applications are gained through the mini-project, in which the students are expected to produce both the requirement and specification documents by applying techniques learnt from lectures.</p> <table border="1" data-bbox="443 577 1471 763"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="4">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Tutorials</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Mini-project</td> <td></td> <td>√</td> <td></td> <td>√</td> </tr> </tbody> </table>											Teaching/Learning Methodology	Outcomes				a	b	c	d	Lectures	√	√	√		Tutorials	√	√	√		Mini-project		√		√																																																																						
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<p><b>Student Study Effort Expected</b></p>	<table border="1" data-bbox="443 1330 1471 1780"> <tr> <td colspan="12">Class contact:</td> </tr> <tr> <td colspan="10">▪ Lecture/Tutorial</td> <td colspan="2">42 Hrs.</td> </tr> <tr> <td colspan="12">Other student study effort:</td> </tr> <tr> <td colspan="10">▪ Mini-project</td> <td colspan="2">12 Hrs.</td> </tr> <tr> <td colspan="10">▪ Self-study</td> <td colspan="2">48 Hrs.</td> </tr> <tr> <td colspan="10">Total student study effort</td> <td colspan="2">102 Hrs.</td> </tr> </table>											Class contact:												▪ Lecture/Tutorial										42 Hrs.		Other student study effort:												▪ Mini-project										12 Hrs.		▪ Self-study										48 Hrs.		Total student study effort										102 Hrs.																							
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	<ol style="list-style-type: none"><li>2. I. Sommerville, Software Engineering, 8<sup>th</sup> Edition, Addison Wesley, 2007</li><li>3. D. Bell, Software Engineering for Students: a programming approach, 4<sup>th</sup> Edition, Addison Wesley, 2005</li><li>4. P. Jalote, An Integrated Approach to Software Engineering, 3<sup>rd</sup> Edition, Springer, 2005</li></ol>
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**Subject Description Form**

<b>Subject Code</b>	EE3801
<b>Subject Title</b>	Telecommunication Fundamentals
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	1. To provide a broad treatment of the fundamentals of telecommunication systems, with emphasis of digital communications.
<b>Intended Learning Outcomes</b>	Upon completion of the subject, students will be able to: <ul style="list-style-type: none"> <li>a. To understand the fundamentals of telecommunication systems and associated technologies.</li> <li>b. To be able to solve problems and design simple systems related to telecommunications.</li> <li>c. To be able to apply theory to practice by doing laboratory experiments on important telecommunication techniques.</li> <li>d. To appreciate the importance of creativity and critical thinking, and to realize that there is no perfect telecommunication system for any particular situation and that engineers have to find “optimum” solutions, or make optimum designs.</li> </ul>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Introduction to telecommunication systems:</b> Overview of communication signals. Signal and noise in communication systems. Transmission media (copper cable, optical fibre, atmosphere). Transmission bands (baseband, radio frequency, microwave, lightwave). Need for modulation.</li> <li>2. <b>Signal representation and analysis:</b> Fundamental signals in communication systems. Signal and system classifications. Special functions. Fourier series. Frequency domain representation for signals. Fourier transform. Convolution. Signal power calculation</li> <li>3. <b>Sinusoidal carrier modulation:</b> Amplitude and frequency modulation: theory, generation and detection. Noise performance. Frequency division multiplexing.</li> <li>4. <b>Pulse modulation:</b> Sampling of analog signals. Pulse amplitude modulation. Other pulse modulation schemes. Time-division-multiplexing. Pulse code modulation: quantization, encoding. Quantization noise. Differential pulse code modulation. Delta modulation.</li> <li>5. <b>Digital communications:</b> Digital transmission. Intersymbol interference. Eye diagrams. Error probability. Coding (source, error control, line). Digital carrier modulation.</li> <li>6. <b>Brief introductions to optical fiber communications:</b> Light sources in optical communication systems. Light transmission in optical fibers. Light detection</li> </ol>

	<b>Laboratory Experiments:</b> 1. Amplitude modulation 2. Time-division-multiplexing 3. Pulse code modulation									
<b>Teaching/Learning Methodology</b>	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	d					
	Lectures	√	√		√					
	Tutorials	√	√		√					
	Experiments			√						
<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed							
			a	b	c	d				
	1. Examination	60%	√	√		√				
	2. Tests and assignments	30%	√	√		√				
	3. Laboratory	10%			√					
	Total	100%								
	The outcomes on understanding the fundamentals and solving the simple problems related to telecommunication systems are assessed by all the assessment methods, examination, test, laboratory report and exercises, whilst the capability of applying theory to practice is evaluated through laboratory work. The way of thinking, consideration of the limitation of the telecommunication system are can also be assessed by the examination, test and experimental report.									
<b>Student Study Effort Expected</b>	Class contact:									
	▪ Lecture/Tutorial	39 Hrs.		6 Hrs.		Other student study effort:				
	▪ Laboratory			45 Hrs.		12 Hrs.		Total student study effort		
	▪ Self study and assignments			102 Hrs.						
	▪ Lab preparation and report									
<b>Reading List and References</b>	<b>Reference books:</b> 1. J.J. O'Reilly, Telecommunication Principles, Chapman and Hill, 1994 2. B. P. Lathi, Modern Digital and Analogue Communication Systems, Oxford University Press, 2009									

	<ol style="list-style-type: none"><li>3. F.G. Stremler, Introduction to Communication Systems, 3<sup>rd</sup> Ed., Addison-Wesley, 1992</li><li>4. H.P. Hsu, Analog and Digital Communications, 2<sup>nd</sup> Ed., McGraw-Hill, 2003</li><li>5. J.M. Senior, Optical Fiber Communications: Principle and Practice, 3<sup>rd</sup> Edition, Prentice Hall, 2009</li></ol>
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**Subject Description Form**

<b>Subject Code</b>	EE3802
<b>Subject Title</b>	Project Methodologies
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	1. The objective is to develop the students' engineering project execution skills necessary to write effective project proposals and to manage the project execution process from inception through final delivery.
<b>Intended Learning Outcomes</b>	Upon completion of the subject, students will be able to: a. Able to write effective project proposals b. Able to manage projects execution from inception to final delivery c. Able to improve written and verbal presentation skills in reporting project works
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <b>Basic Concepts of Project:</b> Systems thinking; Project initiation; Searching Engine; Project selection methodologies</li> <li>2. <b>Project Proposal:</b> Project proposal design; Basic sections of project proposal</li> <li>3. <b>Project Execution and Control:</b> Work Plan, Scheduling, Tracking and Budgeting of project; Risk management</li> <li>4. <b>Project Management and Delivery:</b> Project delivery process; Presentation, Demonstration and Report Writing</li> <li>5. <b>Team Work and Job Sharing:</b> Setting goals and dividing tasks, Job sharing, Team work arrangement, communication between team members.</li> <li>6. <b>Experimental Techniques:</b> Experimental Error and its Minimization Methods, Advance Measurement Tools, Graphical and Analysis tools</li> </ol>

<p><b>Teaching/Learning Methodology</b></p>	<p>Introductory lectures will be delivered to cover essentially the subject content components for formulating the project proposal, managing project execution, reporting and presenting the project findings. Students will finalize their project proposal submission in the initial stage by discussing with their respective project supervisors. Throughout the semester, students are provided with opportunities to attend workshops conducted by Education Development Centre for the purpose of improving their written and verbal presentation skills. Students are geared to focus on clarity, coherence and conciseness when presenting their project works.</p> <table border="1" data-bbox="443 539 1471 685"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="3">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>Workshops</td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table>											Teaching/Learning Methodology	Outcomes			a	b	c	Lectures	√	√	√	Workshops	√	√	√																																																																															
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<p><b>Reading List and References</b></p>	<p><b>Suggested Reading:</b></p> <ol style="list-style-type: none"> <li>1. Kerzner, Harold. <i>Project Management ? A Systems Approach to Planning, Scheduling, and Controlling</i>. 7<sup>th</sup> Edition. Van Nostrand Reinhold, NY. 2001.</li> <li>2. Meredith, Jack R. and Mantel, Samuel J. Jr. <i>Project Management, A Managerial Approach</i>, Fifth Edition. John Wiley &amp; Sons. NY, 2000.</li> </ol>																																																																																																								

	<ol style="list-style-type: none"><li>3. Nicholas, John M. <i>Managing Business and Engineering Projecs: concepts and implementation..</i> Prentice Hall, Englewood Cliffs, NJ. 1990.</li><li>4. Shtub, Avraham. <i>Project Management; Process, Methologies, and economics.</i> Prentice-Hall Inc., Englewood Cliffs, NJ. 2005.</li></ol>
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**Subject Description Form**

<b>Subject Code</b>	ELC2501
<b>Subject Title</b>	University English I
<b>Credit Value</b>	2
<b>Level</b>	2
<b>Pre-requisite / Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	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.
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to communicate effectively in an academic context through</p> <ol style="list-style-type: none"> <li>writing well-organised academic texts, such as expository essays</li> <li>using appropriate referencing skills in academic writing and speaking</li> <li>delivering effective oral presentations</li> </ol> <p>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.</p>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p>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.</p> <ol style="list-style-type: none"> <li><b>Written academic communication</b> 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.</li> <li><b>Spoken academic communication</b> 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.</li> <li><b>Reading and listening in academic contexts</b> 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.</li> <li><b>Language development</b> Improving and extending relevant features of students' grammar, vocabulary and pronunciation.</li> </ol>

<p><b>Teaching/Learning Methodology</b></p>	<p>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.</p> <p>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.</p> <p>Learning materials developed by the English Language Centre are used throughout this course. Additional reference materials will be recommended as required.</p>																																																						
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<p><b>Student Study Effort Expected</b></p>	<p>Class contact:</p> <ul style="list-style-type: none"> <li>▪ Seminars</li> </ul> <p>Other student study effort:</p> <ul style="list-style-type: none"> <li>▪ Classwork-related and project-related preparation and self-access work</li> </ul> <p>Total student study effort</p>						<p>28 Hrs.</p> <p>56 Hrs.</p> <p>84 Hrs.</p>																																																
<p><b>Reading List and References</b></p>	<p><b>Coursebook</b> English Language Centre. (2009). <i>University English I</i>. Hong Kong: The Hong Kong Polytechnic University.</p> <p><b>Recommended readings</b> Carter, R., Hughes, R. &amp; McCarthy, M. (2000). <i>Exploring grammar in context: Upper-intermediate and advanced</i>. Cambridge: Cambridge University Press. Leki, I. (1998). <i>Academic writing: Exploring processes and strategies</i>. Cambridge: Cambridge University Press. McCarthy, M. &amp; O'Dell, F. (2001). <i>English vocabulary in use: Upper-intermediate</i>. Cambridge: Cambridge University Press. Reinhart, S. (2002). <i>Giving academic presentations</i>. Ann Arbor, MI: University of Michigan Press.</p>																																																						

	<p>Verderber, R. F., Verderber, K. S. &amp; Sellnow, D. D. (2008). <i>The challenge of effective speaking</i> (14th ed.). Belmont, CA: Thomson/Wadsworth.</p> <p>Waters, M. &amp; Waters, A. (1995). <i>Study tasks in English</i>. Cambridge: Cambridge University Press.</p>
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**Subject Description Form**

<b>Subject Code</b>	ELC2502
<b>Subject Title</b>	University English II
<b>Credit Value</b>	2
<b>Level</b>	2
<b>Pre-requisite / Co-requisite/ Exclusion</b>	ELC2501 University English I Nil Nil
<b>Objectives</b>	To further develop those English language skills required by students to study effectively in the University's English medium learning environment.
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to communicate effectively in an academic context through:</p> <p>d. participating actively in academic discussions e. writing academic argumentative essays</p> <p>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.</p>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p>This syllabus is indicative. The balance of the components, and the corresponding weighting, will be based on the specific needs of the students.</p> <p><b>Written Academic Communication</b> - 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.</p> <p><b>Spoken Academic Communication</b> - 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.</p> <p><b>Reading and Listening in Academic Contexts</b> - Understanding the content and structure of ideas delivered orally and in print; distinguishing between 'fact' and 'opinion'.</p> <p><b>Language Development</b> - Further improving and extending relevant features of grammar, vocabulary and pronunciation.</p>
<b>Teaching/Learning Methodology</b>	<p>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.</p> <p>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.</p>

	Learning materials developed by the English Language Centre are used throughout this course. Additional reference materials will be recommended as required.						
<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	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 %					
<b>Student Study Effort Expected</b>	Class contact:						
	<ul style="list-style-type: none"> <li>▪ Seminars</li> </ul>	28 Hrs.					
	Other student study effort:						
	<ul style="list-style-type: none"> <li>▪ Classwork-related and project-related preparation and self-access work</li> </ul>	56 Hrs.					
	Total student study effort						
<b>Reading List and References</b>	<p><b>Coursebook</b> English Language Centre. (2009). <i>University English II</i>. Hong Kong: The Hong Kong Polytechnic University.</p> <p><b>Recommended readings</b> Damer, T. E. (2005). <i>Attacking faulty reasoning: A practical guide to fallacy-free arguments</i>. Belmont, CA: Thomson/Wadsworth. Hyland, K. (2006). <i>English for academic purposes: An advanced resource book</i>. London; New York: Routledge. Madden, C. G. &amp; Rohlck, T. (1997). <i>Discussion and interaction in the academic community</i>. Ann Arbor, MI: University of Michigan Press. McWhorter, K. T. (2008). <i>Study and critical thinking skills in college</i>. New York: Pearson/Longman. Meyers, A. (2005). <i>Gateways to academic writing: Effective sentences, paragraphs and essays</i>. White Plains, NY: Longman. Wood, N. V. (2001). <i>Writing argumentative essays</i>. Upper Saddle River, NJ: Prentice Hall. Zwier, L. J. (2002). <i>Building academic vocabulary</i>. Ann Arbor, MI: University of Michigan Press.</p>						

**Subject Description Form**

<b>Subject Code</b>	ENG236
<b>Subject Title</b>	Computer Programming
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite / Co-requisite/ Exclusion</b>	Nil/Nil/Nil
<b>Objectives</b>	<ul style="list-style-type: none"> <li>(i) To introduce the fundamental concepts of computer programming</li> <li>(ii) To equip students with sound skills in C/C++ programming language</li> <li>(iii) To equip students with techniques for developing structured computer programs</li> <li>(iv) To demonstrate the techniques for implementing engineering applications using computer programs.</li> </ul>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <p>Develop a good computer program using C/C++ programming language. To be specific, the students should be able to achieve the following:</p> <ul style="list-style-type: none"> <li>a) Familiarize themselves with at least one C/C++ programming environment.</li> <li>b) Be proficient in using the basic constructs of C/C++ to develop a computer program.</li> <li>c) Be able to develop a structured and documented computer program.</li> <li>d) Understand the fundamentals of object-oriented programming and be able to apply it in computer program development.</li> <li>e) Be able to apply the computer programming techniques to solve practical engineering problems.</li> <li>f) Be able to solve problems by using systematic approaches in a team.</li> </ul>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. Introduction to programming - Components of a computer; Programming environment; Process of application development.</li> <li>2. Bolts and Nuts of C/C++ - Preprocessor; Program code; Functions; Comments; Variables and constants; Expressions and statements; Operators.</li> <li>3. Program Flow Control - Branching and looping; Function parameters passing; Return values; Local and global variables; Scope of variables.</li> <li>4. Program Design and Debugging - Structured program design; Modular programming; Exceptions and debugging. Case study: Using the Visual C++ debugger.</li> <li>5. Basic Object Oriented Programming - Objects and classes; Private versus public; Implementing class methods; Constructors and destructors.</li> <li>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.</li> <li>7. Stream I/O - Input and output as streams; File I/O using streams.</li> <li>8. Using C/C++ in Engineering Applications - Solving practical problems using C/C++; Developing graphical user interfaces for engineering applications.</li> </ol>

<p><b>Teaching/Learning Methodology</b></p>	<p>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&amp;A will take place. The lectures and tutorials aim at achieving the learning outcomes a, b, c, d and e.</p> <p>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.</p> <p>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.</p> <p>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.</p>																																																																				
<p><b>Assessment Methods in Alignment with Intended Learning Outcomes</b></p>	<table border="1" data-bbox="443 734 1455 1272"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> </tr> </thead> <tbody> <tr> <td>1. In-class exercises</td> <td>10</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>2. Short-quizzes</td> <td>10</td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>3. Closed-book tests</td> <td>20</td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>4. Programming tests</td> <td>30</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>5. Mini-project</td> <td>30</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> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>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.</p>							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 %						
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<p><b>Student Study Effort Expected</b></p>	<table border="1" data-bbox="443 1581 1102 2042"> <tr> <td>Class contact:</td> <td>65 Hrs.</td> </tr> <tr> <td>▪ Lecture</td> <td>27 Hrs.</td> </tr> <tr> <td>▪ Tutorial</td> <td>26 Hrs.</td> </tr> <tr> <td>▪ Test/Quiz</td> <td>11 Hrs.</td> </tr> <tr> <td>▪ Mini-project presentation</td> <td>1 Hrs.</td> </tr> <tr> <td>Other student study effort:</td> <td>81 Hrs</td> </tr> <tr> <td>▪ Self-studying</td> <td>52 Hrs.</td> </tr> <tr> <td>▪ Homework</td> <td>17 Hrs.</td> </tr> </table>						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.																																															
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	▪ Mini-project/Report	12 Hrs.
	Total student study effort	146 Hrs.
<b>Reading List and References</b>	<b>Textbook:</b> 1. J. Liberty, S. Rao, and B. Jones, <i>Sams Teach Yourself C++ in One Hour a Day</i> . Sams, 2009. <b>Reference Book:</b> 1. H.M. Deitel and P.J. Deitel, <i>C++ How To Program</i> , 5 <sup>th</sup> ed., Prentice-Hall, 2005. 2. I. Horton, <i>Ivor Horton's Beginning Visual C++ 2005</i> , Wiley Publishing, 2006.	

**Subject Description Form**

<b>Subject Code</b>	ME2905
<b>Subject Title</b>	Mechanical Engineering
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"> <li>1. To develop an understanding of static equilibrium and Newton's laws of motion.</li> <li>2. To apply static equilibrium and Newton's Laws for solving engineering systems.</li> <li>3. To enable students to master the methods of problem formulation and solution for planar motion of particles and rigid bodies.</li> <li>4. To introduce the concepts and usages of work and energy.</li> <li>5. To provide students with a basic understanding of thermodynamics.</li> <li>6. To teach basic evaluation techniques of heat transfer processes.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. Identify parts in a machine or product in which their motion can be described by laws of rigid body or particle kinematics.</li> <li>b. Formulate the planar and rotational motions of a particle and a rigid body with a given physical description of a part in machinery or a product.</li> <li>c. Solve problems of momentum and energy exchanges in a system of particles.</li> <li>d. Understand the implication of thermodynamic laws and their applications to heat engine.</li> <li>e. Evaluate heat and work transfer for ideal heat engine cycles.</li> <li>f. Given a physical construction, evaluate the rate of heat transfer via conduction, convection and radiation of a one-dimensional system.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><b><i>Fundamentals of Mechanics</i></b> - Basic concepts of mechanics. Scalar and Vectors: Vector algebra and vector components. Position, Unit and Force Vector. Moment of a force about a point. Moment of a force about a line.</p> <p><b><i>Statics</i></b> - Equilibrium of a particle and the associated free-body diagrams. Equilibrium of a rigid body and the associated free body diagram.</p> <p><b><i>Dynamics</i></b> - Kinematics and kinetics of particles, rectilinear motion, plane curvilinear motion, relative motion, equation of motion, work and energy, impulse and momentum. Plane kinematics of rigid bodies, rotation, absolute motion, relative velocity, instantaneous centre of zero velocity, relative acceleration. Plane kinetics of rigid bodies, force, mass and acceleration, general equation of motion, work and energy, impulse and momentum.</p> <p><b><i>Fundamentals of Thermodynamics</i></b> - Working fluids and their properties; Perfect gas Law; Heat and work; First and Second Laws of Thermodynamics; Reversible and irreversible processes. Heat engine and pump. Heat engine cycle.</p> <p><b><i>Introduction to Heat Transfer</i></b> - Introduction of three modes of heat transfer (conduction, convection and radiation) and their governing equations; One-dimensional steady state conduction; Convective heat transfer coefficient; Black body and grey body radiation, and radiation exchanges between two surfaces.</p>

	<p><b>Laboratory Experiment:</b></p> <p>There are two 2-hour laboratory sessions: Typical Experiments:</p> <ol style="list-style-type: none"> <li>1. Gear train experiment</li> <li>2. Mechanical equivalent of heat</li> <li>3. Heat conduction and heat convection</li> </ol>																																																																				
<p><b>Teaching/Learning Methodology</b></p>	<p>Lectures are used to deliver the fundamental knowledge in relation to the topics as described in the section subject synopsis. (outcomes a to e).</p> <p>Tutorials are used to illustrate the application of fundamental knowledge to practical situations (outcomes a to e).</p> <p>Experiments are used to relate the concepts to practical applications and students are exposed to hand-on experience, proper use of equipment and application of analytical skills on interpreting experimental results (outcomes a, d to f).</p> <table border="1" data-bbox="443 712 1473 969"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="7">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> <th></th> </tr> </thead> <tbody> <tr> <td>Lecture</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>Tutorial</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td></td> </tr> <tr> <td>Experiment</td> <td>√</td> <td></td> <td></td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> </tbody> </table>								Teaching/Learning Methodology	Outcomes							a	b	c	d	e	f		Lecture	√	√	√	√	√			Tutorial	√	√	√	√	√			Experiment	√			√	√	√																							
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	▪ Self-study	42 Hrs.
	Total student study effort	104 Hrs.
<b>Reading List and References</b>	<ol style="list-style-type: none"> <li>1. Hibbeler R.C. and Fan S.C., Engineering Mechanics – Statics, SI 12<sup>th</sup> Edition, Prentice Hall, 2010.</li> <li>2. Hibbeler R.C. and Fan S.C., Engineering Mechanics – Dynamics, SI 12<sup>th</sup> Edition, Prentice Hall, 2010.</li> <li>3. Cengel Y.A. and Boles M.A., Thermodynamics: An engineering approach, 6<sup>th</sup> edition, McGraw Hill, 2007.</li> <li>4. Cengel Y.A., Heat and Mass Transfer: A practical approach, 3<sup>rd</sup> edition, McGraw Hill, 2006.</li> </ol>	

**Subject Description Form**

<b>Subject Code</b>	IC2105
<b>Subject Title</b>	Engineering Communication and Fundamentals
<b>Credit Value</b>	4 Training Credits
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	This subject offers a wide spectrum of coverage on various engineering fundamental matters, including Engineering Drawing and CAD, Basic Scientific Computing, Basic Mechatronic Practice, and Industrial Safety, that aims at providing the necessary fundamental knowledge and computing skills to all year 1 students interested in engineering.
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. explain the principles and conventional representation of engineering drawings according to engineering standards and use it as a medium in technical communication and documentation with CAD application, modeling and practice with application in mechanical, industrial systems, electrical, electronic and information engineering.</li> <li>b. apply scientific computing software for computing in science and engineering including visualization and programming.</li> <li>c. design and analyze practical controller hardware, software, actuation devices and human-machine interface for simple mechatronic systems including basic practice in hydraulic, pneumatic and electric systems with common engineering components such as motor drives, mechanical drives, gears, cams, belts, pulleys, couplings, bearings, seals and fasteners.</li> <li>d. explain basic occupational health and industrial safety requirements for engineering practice.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ol style="list-style-type: none"> <li>1. <u>Engineering Drawing &amp; CAD (TM8050 - 48 hours)</u> <ol style="list-style-type: none"> <li>1.1. Fundamentals of Engineering Drawing and CAD (39 hours)</li> </ol> <p>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</p> </li> </ol>

	<p>drawing.</p> <p>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 &amp; simulation, generation of 2D drawings from 3D parts and assemblies; drawing annotation including dimensioning, tolerancing, surface finishing, and part list.</p> <p>1.2. Electrical Drawing (3 hours)</p> <p>Wiring diagram and wiring table for electronic and electrical installation, functional representation of circuit, system block diagram, electrical &amp; electronic device symbols and layout, architectural wiring diagram with reference to the architectural symbols for electrical drawings in Hong Kong and international standards.</p> <p>1.3. Electronic Design Automation (6 hours)</p> <p>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.</p> <p>2. <u>Basic Scientific Computing (TM3012 - 27 hours)</u></p> <p>2.1. Introduction to MATLAB; interactive calculations, random number generators, variables, vectors, matrices and string; mathematical operations, polynomial operation, data analysis and curve fitting, file I/O functions.</p> <p>2.2. Basic plotting, formatting graph, 2D and 3D plots, annotations, contour, mesh and surface plots, colormap.</p> <p>2.3. M-file programming &amp; debugging; scripts, functions, logic operations, flow control and graphic user interfaces.</p> <p>3. <u>Basic Mechatronic Practice (TM0510 - 30 hours)</u></p> <p>3.1. Definitions of mechatronics; design and operation of typical mechatronic systems; appreciation of measurement system, actuator system, motor drives, mechanical drives, gear train and linkage, pneumatic and hydraulic systems, signal conditioning, and human-machine interfaces;</p> <p>3.2. Integration of system components using appropriate controller hardware and software such as PLC, PAC, and Microcontroller system; use of simulation software packages for pneumatic and hydraulic circuit design.</p> <p>4. <u>Industrial Safety (TM2009 - 15 hours)</u></p> <p>4.1. Safety Management: Overview, essential elements of safety</p>
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	<p>management, safety training, accident management, and emergency procedures.</p> <p>4.2. Safety Law: F&amp;IU Ordinance and principal regulations, OSH Ordinance and principal regulations.</p> <p>4.3. Occupational Hygiene and Environmental Safety: Noise hazard and control; dust hazard and control; ergonomics of manual handling.</p> <p>4.4. 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.</p>
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<b>Learning Methodology</b>	<p>The teaching and learning methods include lectures, workshop tutorials, and practical works. The lectures are aimed at providing students with an overall and concrete background knowledge required for understanding key issues in engineering communication, use of standard engineering components and systems, and importance of industrial safety. The workshop tutorials are aimed at enhancing students' in-depth knowledge and ability in applying the knowledge and skills to complete specific tasks. The practical works aim at facilitating students to review the diverse topics covered in this course and perform active learning with research, practice, questioning, and problem solving in a unified activity.</p>
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<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	<table border="1"> <thead> <tr> <th rowspan="2">Assessment Methods</th> <th rowspan="2">Weighting (%)</th> <th colspan="4">Intended Learning Outcomes Assessed</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>1. Assignment/Project</td> <td rowspan="3">Refer to individual Module Description Form</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Test/Quiz</td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>3. Report/Log Sheet</td> <td></td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>Total</td> <td>100</td> <td colspan="4"></td> </tr> </tbody> </table>						Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed				a	b	c	d	1. Assignment/Project	Refer to individual Module Description Form	✓	✓	✓	✓	2. Test/Quiz		✓	✓	✓	3. Report/Log Sheet		✓	✓		Total	100				
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<b>Student Study</b>	<b>Class Contact</b>	<b>TM8050</b>	<b>TM3012</b>	<b>TM0510</b>	<b>TM2009</b>
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<b>Effort Expected</b>	▪ Lecture	20 Hrs.	7 Hrs.	6 Hrs.	14 Hrs.
	▪ Tutorial	13 Hrs.			
	▪ In-class Assignment/ Hands-on Practice	15 Hrs.	20 Hrs.	24 Hrs.	1 Hr.
	<b>Other Study Effort</b>				
	▪ Coursework & Report	8 Hrs.			
	<b>Total Study Effort</b>	<b>128 Hrs.</b>			
<b>Reading List and References</b>	<p><b>Reference Software List:</b></p> <ol style="list-style-type: none"> <li>1. AutoCAD from Autodesk Inc.</li> <li>2. SolidWorks from Dassault Systèmes Solidworks Corp.</li> <li>3. MATLAB from The Mathworks Inc.</li> <li>4. PADS from Mentor Graphics Inc.</li> </ol> <p><b>Reference Standards and Handbooks:</b></p> <ol style="list-style-type: none"> <li>1. BS8888 Technical Product Specification (TPS) Specification</li> <li>2. Cecil H. Jensen, et al, Engineering Drawing and Design, McGraw-Hill, 2008.</li> <li>3. Warrendale, SAE fastener standards manual, Society of Automotive Engineers, 1997.</li> <li>4. Timothy H Wentzell, et al, Machine Design, Delmar Learning, 2004</li> <li>5. Czernik, Daniel, Gaskets: Design, Selection, and Testing, McGraw-Hill, 1995.</li> <li>6. Michael M. Khonsari, E. Richard Booser, Applied Tribology: Bearing Design and Lubrication, Wiley-Interscience, 2001.</li> <li>7. IEEE Standard 315 / ANSI Y32.2 / CSA Z99 Graphic Symbols for Electrical and Electronics Diagrams</li> <li>8. IEC 61082 Preparation of Documents used in Electrotechnology</li> </ol> <p><b>Reference Books:</b></p> <p>Training material, manual and articles published by Industrial Centre.</p>				

**Subject Description Form**

<b>Subject Code</b>	IC2112
<b>Subject Title</b>	IC Training I (EE)
<b>Credit Value</b>	4 Training Credits
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<ol style="list-style-type: none"><li>1) To provide trainees with simulated working environments and training of industrial practices in Electrical Engineering.</li><li>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.</li></ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"><li>a) identify relevant engineering theories and principles and to apply them in hands-on training exercises to determine system feasibility;</li><li>b) compare and contrast conceptual design, develop actual work sequences and methods for various electrical installations;</li><li>c) undertake the design, construction, testing and commissioning electrical distribution system in buildings on the basis of recognize the engineering standards, regulations and practices;</li><li>d) apply intelligent building control technology effectively and evaluate new building automation/intelligent control schemes; and</li><li>e) apply their knowledge and skills for system analysis.</li></ol>

<p><b>Subject Synopsis/ Indicative Syllabus</b></p>	<p><u>Lighting and Electrical System Design(TM0367)</u></p> <p>Interior lighting design and calculation; daylight illumination consideration; lumens and reflectors; T5, T8 and T11 lamps; energy conservation.</p> <p>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.</p> <p><u>Low-voltage Switchboard and Power Monitoring, AC control and PLC (TM0389)</u></p> <p>Specifications, standards and requirements of LV switchboard; IDMTL and electronic protection relays; schematic diagram, testing, commissioning and maintenance.</p> <p>Power monitoring and analysis, noise and harmonics; active filters and real-time capacitor bank.</p> <p>Introduction of programmable controller systems, sensors, actuators, drives, timers, counters, ladder logic programming and testing.</p> <p><u>Integrated Building Systems(TM0383)</u></p> <p>Proprietary and open systems (BMS, EIB and DALI); sensors and actuators; wiring circuit, scenes control; system design, programming and commissioning; intelligent building system integration.</p> <p><u>Electrical Installation and Basic Electronic Practice(TM0373)</u></p> <p>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,</p> <p>Identification of electronic circuit components, soldering and de-soldering, Dry film process, Etching process.</p>
<p><b>Learning Methodology</b></p>	<p>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.</p>

Assessment Methods in Alignment with Intended Learning Outcomes	Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed				
			a	b	c	d	e
	<u>TM0367 Lighting and Electrical System Design</u>						
	1. Assignment	40	✓	✓	✓		✓
	2. Test	30	✓	✓			
	3. Training Report	30	✓	✓	✓		✓
	Total	100					
	Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed				
			a	b	c	d	e
	<u>TM0389 Low-voltage Switchboard and Power Monitoring, AC control and PLC</u>						
1. Assignment	40	✓	✓	✓	✓	✓	
2. Test	30	✓	✓				
3. Training Report	30	✓	✓	✓	✓	✓	
Total	100						
Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed					
		a	b	c	d	e	
<u>TM0383 Integrated Building Systems</u>							
1. Assignment	40	✓			✓	✓	
2. Test	30	✓					
3. Training Report	30	✓			✓	✓	
Total	100						

	Assessment Methods	Weighting (%)	Intended Learning Outcomes Assessed				
			a	b	c	d	e
	<u>TM0373 Electrical Installation and Basic Electronic Practice</u>						
	1. Assignment	40	✓	✓	✓		✓
	2. Test	30	✓	✓			
	3. Training Report	30	✓	✓	✓		✓
	Total	100					
	<p>The assignment is designed to facilitate students to reflect and apply the knowledge periodically throughout the training.</p> <p>Test is designed to facilitate students to review the breadth and depth of their understanding on specific topics.</p> <p>Report writing is designed to facilitate students to acquire deep understanding on the topics of the training and to present those concepts clearly.</p>						
<b>Student Study Effort Expected</b>	<b>Class Contact</b>						
	▪ Lecture/Tutorial/Demonstration					30 Hrs.	
	▪ Workshop Practices					88 Hrs.	
	▪ Test					2 Hrs.	
	<b>Other Study Effort</b>					0 Hr.	
	<b>Total Study Effort</b>					<b>120 Hrs.</b>	
<b>Reading List and References</b>	<ol style="list-style-type: none"> <li>1. Training material, manual and articles published by the Industrial Centre.</li> <li>2. EMSD, Code of Practice for the Electricity (Wiring) regulations, 2003 Edition.</li> <li>3. IEE wiring regulation, 16<sup>th</sup> Edition.</li> </ol>						